The Dynamics of Natural Gas Supply Coordination in a New World

Timothy A. Boon von Ochssée

Clingendael International Energy Programme

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Cooperation or competition between gas-exporting countries from a Russian perspective

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Preface

The Clingendael International Energy Programme (CIEP) has been involved in international natural gas market and energy policy research from its inception in 2001. As part of the wider research into international natural gas market developments, two PhD projects, in cooperation with the University of Groningen, on the evolving Russian gas infrastructure investment strategy and possibilities for cooperation in the international gas market, were integrated into that research agenda. Both studies, 'The Dynamics of Gas Supply Coordination in a New World' and 'Russian Gas to Europe: Creating Access and Choice', are an academic effort which aims to provide greater insight into the investment challenges Russia faces in the gas value chain in Europe and in the world gas markets. They are unique in that they strive to disentangle the political from the economic intricacies involved in such a topic through a multi-disciplinary approach that is part theoretical, part empirical.

The interregional gas market is undergoing a myriad of changes that are both complex and novel. Only a short while ago, few could have believed the world's major gas markets would become as integrated as they have become today. The expansion of liquefied natural gas (LNG) played a major role in these developments. In the years running up to the international financial and economic crisis of 2008-2009, the advent of new trade and pricing patterns has helped catalyse the globalisation of the world's regional gas markets. Developments such as unconventional gas in the US, the assertion of various existing and emerging gas-exporting countries point to the ever-changing face of the increasingly interregional gas market. This interregional gas market is also inescapably influenced by geopolitical factors, especially in a system with changing international political and economic relations. The European gas market in particular faces a host of economic and political challenges as Russia and Europe and the US reshape their relationships.

Analysing the natural gas market in a multi-disciplinary manner helps us pursue the task of capturing both the political as well as economic complexities of developments in the gas market. These two studies differ from the typical endeavours on energy in general, and gas in particular, in that they are a multi-disciplinary effort at explaining the complexities Russia faces in an uncertain and dynamic interregional gas market. They strive to highlight the economic-strategic aspects of gas infrastructure investments and their impact on market structures and cooperation.

The activities and research programmes of CIEP subscribe to an integral approach to energy policy. Academic research can contribute to a good discussion on national, European and global energy sector developments and policies. With these two works, CIEP intends to make such a contribution to the public debate on the international economic and geopolitical aspects of oil and gas markets, particularly with respect to the European Union's security of supply.

These two studies are the result of the generous cooperation and help of the University of Groningen and CIEP's sponsors, as well as other actors in the private and public sector, whose support has been essential in this regard.

May 2010 **Coby van der Linde**

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Glossary

Notations

tbd	thousand billion barrels
tmb	thousand million barrels
bbl(s)	barrel(s)
$/bbl	dollar per barrel
mb/d	million barrels per day
tcm	thousand cubic meters
bcm	billion cubic meters[1]
bcm/y	billion cubic meters per year
mmbtu	million British Thermal Units
$/mmbtu	dollar per million British Thermal Units
mcm	thousand cubic meters
mcm/y	thousand cubic meters per year
$/mcm	dollar per thousand cubic meters
EUR	Euro
km	kilometre
MJ/cm	mega joule per cubic metre
MW	mega watt
R/P ratio	Reserves-to-Production ratio
RUR/US$	Russian rouble per dollar
mln	million

Countries, governmental and intergovernmental organisations

ALNAFT	*Agence Nationale pour la Valorisation des Resources en Hydrocarbures*
CECO	Caspian Economic Cooperation Organisation
CENTCOM	United States Central Command
CIA	Central Intelligence Unit
CIS	Commonwealth of Independent States
CMEA	Council for Mutual Economic Assistance
CSTO	Collective Security Treaty Organisation
CREG	Commission de Régulation de l'Électricité et du Gaz
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EEA	European Economic Area

[1] A standard cubic meter is defined by a cubic meter at 0 atm. and 0 degrees Celsius. On average, the calorific value of European gas (including Norway) is 40 mega joule (MJ) per cubic meter. The different cubic meters of gas are converted to 'European' cubic meters (excluding data from BP and IEA and other data where explicitly stated). A Russian cubic meter has to be multiplied by 0.9. This conversion factor can be explained by the following definition: a Russian cubic meter of gas has a pressure of 1 atm. and is defined at a temperature of 20 degrees Celsius. On average, the calorific value of Russian gas is 38.5 MJ per cubic meter [CIEP 2008].

EEC	Eurasian Economic Community
EU	European Union
FAS	Federal Antimonopoly Service
FYROM	Former Yugoslav Republic of Macedonia
GATT	General Agreement on Tariffs and Trade
GCC	Gulf Cooperation Council
GECF	Gas Exporting Countries Forum
GFU	*Gassforhandlingsvutvalget* (Norwegian Gas Sales Committee)
GUAM	Georgia, Ukraine, Azerbaijan, and Moldova Organisation for Democracy and Economic Development
IGU	International Gas Union
IMF	International Monetary Fund
MENR	Ministry of Energy and Natural Resources
NATO	North Atlantic Treaty Organisation
NPD	National Petroleum Directorate
OECD	Organisation for Economic Co-operation and Development
OPEC	Organisation of the Petroleum Exporting Countries
OSCE	Organisation for Security and Cooperation in Europe
SCO	Shanghai Cooperation Organisation
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
US	United States (of America)
US DOE	United States Department of Energy
USSR	Union of Soviet Socialist Republics
WB	World Bank
WTO	World Trade Organisation

Research institutions and organisations

CEPS	Centre for European Policy Studies
CERA	Cambridge Energy Research Associates
CIEP	Clingendael International Energy Programme
CSIS	Centre for Strategic and International Studies
ECT	Energy Charter Treaty
EIA	Energy Information Administration
EIU	Economist Intelligence Unit
IEA	International Energy Agency
MEES	Middle East Economic Survey
NGMR	Natural Gas Market Review
RIA	Russian Information Agency
OME	*Obervatoire Mediterraneen de l'Energie*
UNIDO	United Nations Industrial Development Organisation

Energy companies

Agip KCO	Agip Kazakhstan North Caspian Operating Company
BASF	*Badische Anilin- und Soda-Fabrik*
BHP Billiton	Broken Hill Proprietary Billiton
BP	British Petroleum
BG	British Gas
CNOOC	China National Offshore Oil Corporation
CNPC	China National Petroleum Corporation
DEPA	Public Gas Corporation of Greece
DESFA	Hellenic Gas Transmission System Operator
EDF	*Electricité de France*
EGL	*Elektrizitats-Gesellschaft Laufenburg AG*
Enagás	*Empresa Nacional del Gas*
ENI	*Ente Nazionale Idrocarburi*
GDF Suez	Gaz de France Suez
GMT	Gazprom Marketing and Trading
INGC	Indian Oil and Gas Corporation
KPO	Karachanak Petroleum
MOL	*Magyar Olaj és Gázipari Részvénytársaság*
NES	National Energy Services
NIOC	National Iranian Oil Company
NIGC	National Iranian Gas Company
NIGEC	National Iranian Gas Export Company
NIORDC	National Iranian Oil Refining and Distribution Company
NNPC	Nigerian National Petroleum Corporation
NPC	National Petrochemical Company
OAO	*Otkrytoe Aktsionernoe Obschestvo* (Russian open joint-stock company)
OMV	*Österreichische Mineralölverwaltung*
PGNiG	Polish Petroleum and Gas Mining
POGC	Pars Oil and Gas Company
RAO	Russian joint-stock company
RasGas	Ras Laffan LNG Company
RWE	*Rheinisch-Westfälisches Elektrizitätswerk*
SNAM	*Società Nazionale Metanodotti*
SOCAR	State Oil Company of Azerbaijan Republic
SODECO	Sakhalin Oil and Gas Development Co
Sonatrach	*Société Nationale pour le Transport et la Commercialasation des Hydrcarbu--res*
Sonelgaz	*Socièté Nationale de l'Electricité et du Gaz*
Statoil	*Norske Stats Oljeselskap AS*
TPAO	Turkish State Petroleum Company
UES	Unified Energy System
QP	Qatar Petroleum

QGPC	Qatar General Petroleum Company
Qatargas	Qatar LNG Company

Gas Pipelines

AGP	Arab Gas Pipeline
BBL	Balgzand Bacton Line
BTC	Baku Tbilisi Ceyhan (pipeline)
CAC/SAT	Central Asia-Centre (pipeline system)
Cepsa	*Compañía Española de Petróleos SA*
GALSI	*Gasdotto Algeria Sardegna Italia* (pipeline)
GUEU	Georgia-Ukraine-European Union (pipeline)
IGAT	Iranian Gas Trunkline (pipeline series)
IGI	Interconnector Greece Italy (pipeline)
IPI	Iran-Pakistan-India (pipeline)
SCP	South Caucasus Pipeline
TAP	Trans-Adriatic Pipeline
TAPI	Turkmenistan-Afghanistan-Pakistan-India (pipeline)
TCGP	Trans-Caspian Gas Pipeline
TGI	Turkey-Greece-Italy (pipeline)
TGII	Turkey-Greece-Italy Interconnector (pipeline)
TIT	Turkmen-Iranian-Turkish (pipeline)
TSGP	Trans Sahara Gas pipeline

Miscellaneous

ABM	Anti Ballistic Missile
ACG	Azeri-Chirag-Gunashli (associated gas fields)
ACQ	Annual Contracted Quantities
AGC	Argus Gas Connections
BRIC	Brazil, Russia, India and China
CAPEX	Capital Expenditures
CAPM	Capital Asset Pricing Model
CCGT	Combined Cycle Gas Turbines
CCS	Carbon Capture and Storage
CDC	Caspian Development Corporation
CEE	Central and East European
CEGH	Central European Gas Hub
CO_2	Carbon Dioxide
DCF	Discounted Cash Flow
EIB	European Investment Bank
ENP	European Neighbourhood Policy
FDI	Foreign Direct Investment
FOB	Free on Board
GATE	Gas Access To Europe

GDP	Gross Domestic Product
GIE	Gas Infrastructure Europe
GtL	Gas-to-Liquids
HoA	Heads of Agreement
IEF(s)	International Energy Firm(s)[2]
IGP(s)	Independent Gas Producer(s)
IMEX	International Mercantile Exchange
INOGATE	Interstate Oil and Gas Transport to Europe
IPAP	Individual Partnership Action Plan
IPE	International Political Economy
IPO(s)	Initial Public Offering(s)
IRNA	Islamic Republic News Agency
ISA	Iranian Sanction Act
ILSA	Iran-Libya Sanction Act
ISO	Independent Systems Operator
ITSO(s)	Independent Transport Service Operator(s)
JBIC	Japan Bank for International Cooperation
JCC	Japan Crude Cocktail
J-EXIM	Export-Import Bank of Japan
LNG	Liquefied Natural Gas
LtG	Liquid-to-Gas
LRMC	Long-Run Marginal Costs
M&A(s)	Mergers and Acquisition(s)
MEES	Middle East Economic Survey
MITI	Ministry of International Trade and Industry
MoU	Memorandum of Understanding
NBP	National Balancing Point
NCS	Norwegian Continental Shelf
IEF(s)	International Energy Firm(s)
NGMR	Natural Gas Market Review
NIMBY	Not In My Back Yard
NNE	Northeastern Europe
NYMEX	New York Mercantile Exchange
NPT	Nadym-Pur-Taz

[2] In much of the modern literature on energy companies, and the energy industry in general, e.g., Van der Linde [1991; 1999], Yergin [1991], CIEP [2004], amongst others, the distinction is made between International Oil Companies (IOCs), which are often fully privately owned and controlled, and National Oil Companies (NOCs), which are often partially or fully state-owned. Because this study concerns itself with natural gas, the word 'energy' is preferable to the sole use of the word 'oil' in such references to companies in the gas industry, which often also produce oil. Because not all national energy firms are always fully government-owned and controlled, but nevertheless invariably exhibit strong government involvement, they are considered in this study to be *quasi* government-controlled energy firms, to be abbreviated as National Energy Firms (NEFs). The fully or mostly private firms in the industry are referred to as *private* international energy firms, to be abbreviated as International Energy Firms (IEFs). See Chapter 3 in Smeenk [2010] for an overview of consumer and producer country interests in the gas industry.

NPV	Net present value
NPV*	Overall net project value
NWE	Northwestern Europe
NNEE	North and Northeastern Europe
OGEC	Organisation of Gas Exporting Countries
OGPP	Orenberg Gas Processing Plant
OPEX	Operational Expenditures
PIGR	Platts International Gas Review
PSA(s)	Production Sharing Agreement(s)
PSO	Public Service Obligation
PSV	*Punto di Scambio Virtuale*
PPP	Public-Private Partnership
RFE/RL	Radio Free Europe/Radio Liberty
SACE	*Servizi Assicurativi del Commercio Estero*
SDFI	State Direct Financial Interest
SRMC	Short-Run Marginal Costs
SPA	Sales and Purchase Agreement
SSE	Southeastern Europe
SSEE	South Southeastern Europe
SWF(s)	Sovereign Wealth Fund(s)
TACIS	Technical Assistance to the Commonwealth of Independent States
TEN-E	Trans-European Network
TNOC(s)	Transnational Oil Companies
TRACECA	Transport Corridor Europe-Caucasus-Asia
TTF	Title Transfer Facility
TOGI	Troll Oseberg Gas Re-injection
TPA	Third-party access
TSO	Transport Service Operator
UGS	Underground Gas Storage
UGTS	United Gas Transmission System
WACC	Weighted Average Cost of Capital
WEO	World Energy Outlook
WGI	World Gas Intelligence
WTI	West Texas Intermediate

Chapter 1
Introduction

1.1 Research background

Cooperation with other gas-exporting countries could help Russia play an important role in safeguarding Russia's economic security, and by extension, its role in a changing international political system. The overall international political and economic context in which Russia finds itself has changed significantly since the end of the Cold War. Today, as the toll of the 2008-2009 international financial and economic crisis becomes increasingly visible, the important international political powers affected by it are discovering that it has, arguably perhaps, marked the beginning of a new chapter in post-Cold War history.

To be sure, great power nationalism and the clashing of interests and ambitions are now again producing alliances and counter-alliances, elaborate dances and shifting partnerships, that as Kagan notes, "a nineteenth-century diplomat would recognise instantly" [Kagan 2008a, p. 12]. The emerging general, global consensus is that, with the onset of the crisis' aftermath, the United States (US) is no longer capable of acting as the world's sole superpower. Past are the days when the US could act, much on the basis of its own agenda, in its ability to shape the world around it, especially when it came to globalisation and free trade. Barely a decade ago, as the 1990s drew to a close, the world seemed very different, when with the collapse of the Soviet Union, and the apparent embrace of democracy by Russia ushered in an era of global convergence [Kagan 2008a].

Then, the US was seen as the centre of a globalising world, characterised by the paradigm of free trade and free market capitalism. This paradigm was embodied by the Washington consensus, which set the rules of the game in the international political and economic system on the basis of US interests and institutions. The notion of a post-Cold War world governed by the rules of the victor of the Cold War appeared warranted with the onset of the further globalisation of economic growth during the 1990s and the revolution in new communication technologies. It would also be too early to claim that the US has entered a period of decline, and that one can now perceive it as an apologetic power in decline, that seeks to abandon its role as a global power [Laïdi 2009].

Since the collapse of the Soviet Union, the geopolitical make-up of the Eurasian continent, where the bulk of the world's resources and population is located, has very much been in flux.

Flanked by the rapid economic rise of China on the one hand, and an expanding Euro-Atlantic community[3] on the other, Russia is striving to form its own identity. If this view of the world is a canvas, then the picture of Russia drawn upon it is that of a rapidly emerging and important regional actor in Eurasia. Russia aims to become a pole between the growing economies of Asia, primarily China, and the Euro-Atlantic community [Le Monde Diplomatique 2009b].

Russia is unlikely to be able to become a power in the same manner as the US and China, powers with truly–and in the case of China potentially–global reach [Laïdi 2009]. Because of its geographic location, Russia's positioning and self-perception is inherently shaped by geopolitical calculations. This perception of the world has returned to shape Russia's foreign policies and those of other countries. During the early 1990s, such calculations were assumed to have vanished with the disappearance of Cold War geopolitical competition between the two superpowers. Defeated, and badly weakened in the wake of the Soviet collapse, Russia retreated unto itself during much of the 1990s, leaving a geopolitical vacuum.

Having recovered from the economic abyss of the 1990s and resentful of the crumbling of its former spheres of influence, Russia now aims to go beyond merely protecting its own integrity. Since 2000, Russia's leadership, bent on modernising Russia and protecting its spheres of *interest* rather than spheres of *influence* per se, has also sought to reassert Russia's role on the international arena [Trenin 2009]. It is in Russia's perception that much has changed has during the two decades since the end of the Cold War. Russia's perception of the international political system either as a geopolitical zero-sum game or a world of economic interdependence is bound to affect its course. Ultimately, the course it takes in global politics willd, through Gazprom, affects a globalising gas market. Russia and the US at times act as rivals and at others as partners, while the true global economic and geopolitical 'critical mass' in the international political system is coalescing around the US and China, followed by the European Union (EU) and other emerging countries.

In Russia's perception, gas may hold the promise for consolidation of its position as a geostrategic power in this changing international political system as it re-balances and aligns its relations with the West. The rising economic and strategic importance of gas lends salience to this perception. In addition, the revenues from these resources offer the means to modernise Russia's military and industrial complex and provide social stability and wellbeing for the Rus-

[3] The 'Euro-Atlantic' community consists of the US and the EU as well as NATO member states. This term is used to refer to transatlantic relations between the US and its European allies, most which are also NATO members, but not all NATO countries are EU member states and vice versa. Hence the term 'Euro-Atlantic' refers to values and institutions shared by all these countries, also used interchangeably with the 'West', especially when it comes to relations between Russia and the US and Europe.

sian population [Balzer 2005]. For the Russian state, gas export revenues offer economic security during the decades to come, just as oil has been up to today.[4] Oil, as a resource that Russia possesses in smaller amounts than in the case of gas, will play an important role throughout the coming decades.

Energy is an asset that has kept Russia and its Soviet predecessor in the top ranking of most powerful nations on the globe [Laïdi 2009]. However, the Russian leadership appears aware of the limitations of this asset. Indeed, Russia also desires economic diversification and modernisation, in an effort to shift away from a resource-dependent economy, as Russian President Dmitri Medvedev's late 2009 speech reflects: "the nation's prestige and welfare can't depend forever on the achievements of the past, all that has kept the country afloat, but is rapidly ageing" [Financial Times 2009b]. Hence Russia struggles with the notion of making economic diversification a reality. In economic terms, Russia's Gross Domestic Product (GDP) contribution to global GDP is only 1 percent, compared with the US' 22 percent GDP contribution [Laïdi 2009].

Accountable to the Russian government, as a semi- or quasi-state owned national energy firm, Gazprom is the caretaker of Russia's gas endowments.[5] As in many gas-producing and exporting countries, Gazprom is tasked with the maximisation of the value of the country's gas resources. Gazprom is–as Russia itself has been and still is–undergoing a fundamental transition away from its Soviet past. While Russia is the leading actor in international relations at the state level, it is Gazprom, as an important actor for the Russian state at the firm level[6] that must deal with uncertainties and competition in the interregional gas market. Since the 1960s, the domestic gas market also expanded, and for Russia the main question is *when* to develop and export the resources to satisfy both domestic and foreign needs for gas; while also serving socio-economic priorities.

The company aims to shift away from its origin as a regional gas exporter to Europe towards a truly global one, which can have an impact on interregional gas flows. At the same time, the

[4] Increasingly, Russia is focusing on the development of a gas-based industry in order to export (semi-)products for fuelling and diversifying its economy. However, this study concentrates on gas as a basic feed-in product.
[5] Against the backdrop of record-breaking energy prices over the four years leading up to August 2008, the Russian State began a process of restoring majority government control and ownership over the Russian gas (and energy) sector through Gazprom [Åslund 2007a].
[6] In the context of this study, while the 'state' as an entity pertains to an entire nation, including the government, population and its natural resources, the term 'government' is employed here and in other chapters to refer to the decision-making power of the government itself, often as a stakeholder in firm-level affairs, i.e., as a decision-making body responsible for state affairs, particularly in gas producer countries. The firm is ultimately accountable to a government rather than the state as a whole. The government takes up a special role in this regard, distinct from the state as such. Though the state plays an important overarching role for both governments and firms, the terms 'state-owned' and 'government-owned' will be used inter-changeably, even though in effect it is the government of gas-producing and exporting countries which owns and controls quasi- or state-owned companies.

adequate supply of the domestic Russian gas market is a major political priority for Moscow. Gazprom must therefore live up to its public service obligation (PSO), supplying gas at (current) domestic prices below (current) costs of delivery to market [Stern 2009b]. Since the early 2000s Russia itself has been confronted with a complex chess game to regain control of the gas value chain in Russia's 'backyard', control over which was lost with the collapse of the Soviet Union and the ensuing politico-economic chaos of the 1990s.[7]

As it seeks to become a more global player, Gazprom must also take into account the challenges posed by an increasingly interregional gas market, where it faces uncertainty in terms of demand and potential competition from other gas-exporting countries. The term 'interregional' is used to refer to the idea that, while gas is still largely traded on a regional basis, the increasing amounts of liquefied natural gas (LNG), made available over the last decade, flow between these regional markets and between the regional gas markets and more distant suppliers. In the mean time, while LNG trade increasingly takes place between regions, hence the term *inter*regional, the gas market is in that regard far from entirely *global*, especially when compared with the world oil market; hence the term 'interregional' is preferable over 'global'.[8] This market, actually composed of several, previously isolated regional gas markets, has steadily become more interregional in nature, owing to the continued advent of LNG. Russia has the geographical advantage of being located between the world's largest energy consuming regions: Europe to the west and East Asia to its east [Bahgat 2009]. The gas market is still in an early phase of its evolution and the industry's development has a long road still ahead of it.[9]

A number of gas-exporting countries play important roles as regional gas suppliers. These include not only Russia and Qatar, but also Canada, Norway, the Netherlands, Algeria, Turkmenistan, Qatar and Indonesia. Structural changes within the regional gas markets, in the US, Europe and Asian-Pacific regions have precipitated the rise in LNG flows during the 1990s and 2000s. In addition, Asia, which includes mature gas markets such as Japan and emerging gas markets, such as China and India, will offer most of the growth opportunities in relative terms. More flexible forms of LNG (and pipeline) trade are changing the geography of the

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[7] Gazprom faces this situation even as the geopolitical makeup of the Eurasian continent continues to change (in this context, the term 'regional' refers specifically to Russia's post-Soviet space, and its place within Eurasia). When the Soviet Union collapsed in 1991, so did the centralised system of oil and gas production and exports of the Soviet empire [Victor et al. 2006; CIEP 2008]. Combined with this general collapse, the partial privatisation of the Russian gas sector during the 1990s effectively further reduced the government's grip on the sector's windfall profits [Åslund 2007].

[8] There are also important differences within regional markets, at a sub-regional level, i.e., between the regional and country levels. Because of important sub-regional discrepancies, the term intra-regional is also used to highlight developments that occur within or separately from the regional level.

[9] In gas market terms, the short-run generally refers to a number of years, up to 2015 at this writing. Short-term trading also occurs on a daily basis in some gas markets. From a gas industry investment perspective, however, the short-term is in the order of several years, the medium-term is set roughly between 2015 and 2025. The long-term can be considered to be in the order of several decades, i.e., beyond 2025. The same roughly holds for other contexts in which the words short-, medium- and long-term are used in this study.

interregional gas market, even as they continue to exhibit diverging regional pricing and trade patterns. As the projected import-dependency of various regional gas markets increases, so too will additional export opportunities for gas-exporting countries at large, including of course Russia.

Russia, Iran and Qatar together hold over half the world's proven conventional gasreserves [BP 2009]. The concentration of gas resources in so few countries predisposes the interregional gas market to an oligopolistic market structure. What most gas-exporting countries have in common is that they seek to become more global, securing access to and tapping new gas markets. However, all these countries have evolved at uneven paces and differ extensively along the lines of their levels of economic diversification as well as in terms of economic absorption capacities and export strategies. Currently, Russia, Algeria and Norway export gas mainly to Europe by pipeline, Canada exports gas exclusively to the US, while Indonesia, Malaysia and Brunei export mostly to Japan. As a newcomer, Australia exports gas to a number of Pacific markets, as well. With its recent meteoric rise as the largest LNG exporter in the world, Qatar has embarked on an LNG export campaign. Qatari LNG now flows to almost every corner of the globe. By sharp contrast, Iran's gas is largely consumed domestically, while gas from Central Asian countries[10] is forcibly landlocked.

The trend of gas market oversupply, against the background of the financial and economic crisis of 2008-2009, fundamentally changes the picture held during the mid-2000s of scarcity in a seller's market. The crisis has caused a significant amount of regional gas demand destruction. Because during the preceding years interregional LNG trade has become more flexible and versatile in the seller's market, regional supply patterns in Europe, for example, are increasingly affected by developments in the US and elsewhere. With unconventional gas in the US affecting the interregional LNG balance, supplies and prices in Europe are affected because of flexible LNG volumes.

[10] Although Russia and Iran are Caspian Sea littoral states, in this study the 'Caspian region' is used to cover Kazakhstan, Uzbekistan, Turkmenistan, and Azerbaijan. Central Asia is defined here as the region consisting of Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan and Tajikistan. For the purpose of this research, gas issues regarding Kyrgyzstan and Tajikistan will not be addressed. These countries are very minor gas producers and consumers, smaller than 1 bcm/y. Since the 1990s, Uzbekistan was the main exporter to these countries. From 2003 onwards, contracts have been signed with Gazprom. Moreover, Kyrgyzstan and Tajikistan play a very minor role in gas transit, only possibly for Caspian exports to China [Stern 2005; Pirani *et al.* 2009]. The three main exporters east from the Caspian Sea are all landlocked producers, encapsulated in the North by Russia, in the West by the Caspian Sea and the Caucasus, Iran and Afghanistan to the south and their Tajik and Kyrgyz neighbours to the East, and beyond these lie the emerging gas-importing economies, China and India. The Caucasus region includes parts of southern Russia, Azerbaijan, Georgia, Armenia, Turkey and north-western Iran.

From a seller's market during the period of 2004-2008, we therefore now witness the opposite.[11] These developments demonstrate that a seller's market and times of scarcity can never be taken for granted by suppliers and convey the considerable amount of downside risk involved in the gas market. The level of interregional integration amongst major regional gas markets is now such that price effects are felt between regional gas markets in the short run with day-to-day prices in the US affecting developments in Europe and vice versa. The context in which investment decisions are made has therefore fundamentally changed with the aftermath of the 2008-2009 financial and economic crisis. The crisis has primarily caused an adverse demand-side shock, calling into question whether the supply side cannot somehow be better managed or coordinated by gas-exporting countries to prevent such oversupplies in the future.

It is remarkable to note that, during the seller's market years of 2006-2008, especially in the aftermath of the Russia-Ukraine gas row of early 2006, and Russo-Algerian gas talks later that year, politically sensitised talk about cartelisation in the gas market was rife, especially in Europe. The topic even gained attention in the mainstream media, with the appearance, for example, of an article on cartelisation in the gas market in *The Economist* in April 2007. This article summarily noted that, with the prevalence in the gas market(s) of long-term gas contracts and the lack of a global price for gas, a Organisation of the Petroleum Exporting Countries (OPEC) for gas, or a 'gas OPEC', would be difficult to achieve [The Economist 2007].

Indeed, this brings us to the direct comparison between OPEC and the Gas Exporting Countries Forum (GECF). With gas market cartelisation being the 'talk of the town' during the seller's market years of 2006-2008, the GECF received quite some spotlight at the time, being alluded to as an OPEC in the making. For many, a 'gas OPEC' therefore loomed on the horizon for Western economies. The appearance in late 2006 of a confidential North Atlantic Treaty Organisation (NATO) report (which was 'leaked' to the press) warning European NATO member states of Russia's imminent attempt at orchestrating the formation of a 'gas cartel' that threatened European energy security [Financial Times 2006] fuelled this ongoing debate. These fears are largely the result of security of gas supply concerns. Curiously, during the aftermath of the 2008-2009 global economic and financial crisis, the debate over and fear of gas market cartelisation melted away from the agenda.

Nonetheless, member states of the GECF, including Russia, publicly expressed greater commitment to cooperation, and Russia, Iran and Qatar formed the so-called Gas Troika in late 2008. How does the nature and functioning of gas trade, especially in its rigidity through

[11] A large part of this study has been written in the context of a seller's market for oil and natural gas. This period lasted from the mid-2000s to the autumn of 2008, while from the subsequent year onwards a buyer's market has resulted. Account is taken of buyer's market conditions throughout the study, even though the reader may encounter streams of thought pertaining to the prevalence of a seller's market.

long-term contracts and the evolutionary phase of the interregional gas market, impact the shape and form of a potential 'gas OPEC'? The motive for gas-exporting countries to cooperate is obvious: oversupply, in whatever way or form, is always undesirable. In addition, the interregional LNG industry, and to a limited extent also in the case of pipeline gas, the rise of new business models is precipitating more flexible LNG trade, and thus more uncertainties.

In light of the increased flow of LNG to Europe and the 2008-2009 financial and economic crisis, Gazprom must take into account the impact of new gas flows in its current main European gas export market(s), both in the short and long term. Through its position as a pipeline gas supplier to Europe, Russia is able to affect the interregional gas balance. While Russia could compete with other gas-exporting countries to secure market share, this approach could also backfire, leading to regional gas oversupplies if other gas-exporting countries pursue similar ambitions. Demand may always collapse, thus dampening export earnings. This in turn underlines the importance of a wait-and-see strategy, i.e., delaying investment decisions.

In this particular context, the use of a so-called real-option game approach, such as the one in Smit and Trigeorgis [2004], which will be pursued in this study, offers intuitive insights about the value of Gazprom's investments under conditions involving both uncertain future gas demand and possible decisions of rival gas exporters. According to the model, which will be developed in Chapter 8, the decision to whether or not to invest leads to certain outcomes. These results may involve competition or cooperation, partially as a function of various market outcomes. An important aspect of the model therefore is that uncertainty in demand *and* dynamic gas market developments (in terms of competition) can be taken into account. Thus the model is not a product of thinking under conditions of scarcity *per se*, when no need for cooperation appears necessary. The model also incorporates the thinking that would prevail under conditions of a possible demand cave-in, such as is being witnessed in the aftermath of the 2008-2009 financial and economic crisis. The real-option game approach lends itself well to the post-2008 air of uncertainty across regional gas markets.

Because of the complexity of the interregional gas market and the fact that gas has yet to experience a further evolution in its product lifecycle, in this study we focus primarily on Cournot-type quantity competition, where suppliers are assumed to compete in quantities, or gas volumes, rather than in gas prices.[12] That firms compete in the first instance on the basis of capacities, before way is given to price competition, coincides with a widely held view in industrial organisation [Tirole 1988; Jacquemain 1987]. Indeed, this study is not only about the economic-strategic aspects of cooperation between gas-exporting countries. It is also concerned

[12] However, the issues of pricing and trade patterns have also a fundamental impact on the development of the interregional gas market, and will therefore be discussed in a qualitative manner.

with the political dimension that is inevitably involved. Russia's abstention from full OPEC membership hints at its desire to protect its policy independence. Even so, in the world gas, Russia possesses roughly a quarter of global reserves, while it possesses only 6 percent of global oil reserves [BP 2009]. If feasible, cooperation, collusion[13] or other forms of coordination in the interregional gas market must also suit Russia's interests, in light of its self-perception as a great power.

An important issue is Russia's perception. How it perceives the outside world and what kind of world order it desires, profoundly affects its choices. The role of the US is important insofar as Russia's ambitions are concerned in the gas market(s). US perceptions of the (monopolistic) control of the natural resources by other powers in Eurasia, such as Russia, underpin the US drive to counterbalance such powers. Such control is seen by the US as a long-run threat to its own global power base, and contravenes the US ideals of free, open trade and access to resources.[14] Despite the relative decline of absolute advantages in the post-Cold War world, America's geo-strategic imperatives remain [Blank 2007]. The geo-strategic implications of this US view directly also constrain Russia's room for maneuver in influencing the size and direction of gas flows. The US and NATO effort to establish a long-run presence in Afghanistan epitomises Western concerns over long-run access to energy flows in and from Eurasia.[15]

1.2 Research objective and research questions

As the pursuing chapters will illustrate, an integrated political and economic approach to Russia's potential cooperation with other gas-exporting countries, that takes into account the discussion above, is currently lacking. From a political as well as an economic point of view, and in the interest of academic thought, a proper investigation as to whether Russia is able to collude with other gas-exporting countries and in what way, is a topic that merits further academic analysis. Research on this topic helps us better understand international gas market developments. Little research has been done on the boundary solutions for cooperation between Russia and other gas-exporting countries, particularly in light of the geopolitical complexities involved. This study can help shed some light on the economic and political dimensions of such cooperation. The central research objective for this study is:

[13] Collusion is an agreement, usually but not always covert, which arises between firms (and in this case, quasi- or fully state-owned firms) where markets are divided or where prices and/or supplies are in some way coordinated upon in the interest of suppliers. See Chapter 4 for an overview of the theory, definitions and types of collusion and cooperation in this regard.
[14] Claims made in 2008 by US officials such as Matthew Bryza, former US Deputy Assistant Secretary of State for European and Eurasian Affairs, typify US concerns over Russia's potential ability to cooperate with other gas-exporting countries: "the concept of a [gas] cartel that involves Russia and Iran is deeply troubling. It moves against our hopes of realising a market-based partnership on energy that is mutually beneficial. We hope a cartel is not realisable" [AGC 2008b].
[15] Energy security at large and the control of oil and gas transport routes have become important focal points for US strategy and its desire to maintain the status quo in the global balance of power [Le Monde Diplomatique 2009a]. Indeed, the US exerts considerable pressure on Afghanistan and Pakistan (referred by the late 2000s as the 'Afpak' region) to remain in the pro-US sphere of influence, primarily in order to ensure a US sphere of influence in the entire region [OSCE 2006].

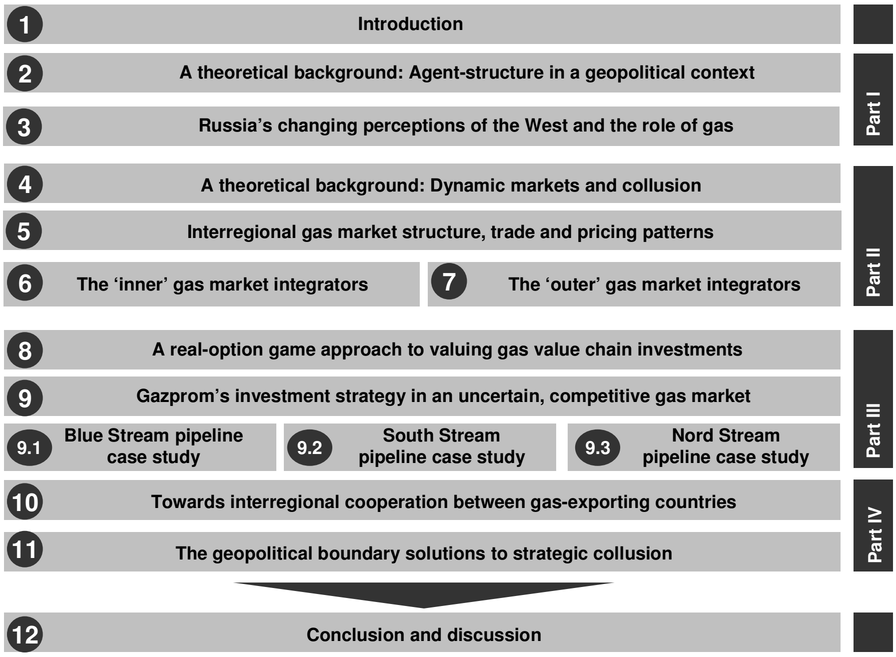
Research objective

To identify what shape and form of cooperation with other gas-exporting countries is feasible from a Russian vantage point, as well as to what extent and how it can strengthen Russia as a geo-strategic player in the structure of the post-Cold War international system.

In order to pursue this objective, the following research questions are specified to disentangle the complexity of the politico-economic nature of Russia's potential cooperation with other gas-exporting countries:

1) In a globalising world with interdependent actors, does Russia seek to become a geo-strategic player in the structure of the international political system? What is Russia's perception of this structure and interdependence and how does this perception affect its dealings with the outside world?
2) If gas is to play an important role in Russia's post-Cold War ambitions, how is the gas market evolving and where, at the company level, i.e., Gazprom, does Russia stand? Which are the most important gas-exporting countries in a dynamic interregional gas market?
3) Based on the empirical analysis of a number of case studies, what factors influence Gazprom's gas investments? What are the main uncertainties and complexities Gazprom must deal with at the firm level?
4) Given Gazprom's and Russia's investment strategy, how and to what extent can collusion take place in an interregional gas market? How does Russia's perception of the international political system affect the desire for and feasibility of collusion or cartelisation?

Figure 1.1 Schematic chapter overview



The answers to these sub-questions will help us to determine to what extent and in what form collusion amongst gas-exporting countries is possible, given Russia's post-Cold War perceptions of the system it inhabits. This study is organised into four parts, aiming in this manner to provide an answer to the different sub-questions, see Figure 1.1 for a schematic chapter overview.

Russia's tendency towards cooperation or competition in an interregional gas market hinges to a large extent on its gas export strategy. Within the context of this gas export strategy, gas export infrastructural projects play an important role. In order to understand the project-level evaluation within Russia's–and Gazprom's–gas export strategy and the relevant geo-economic and geopolitical developments, it is necessary to integrate macro-level aspects into project-level evaluations. In order to understand macro-level aspects, it is necessary to look at regional project-level evaluations, because of the regional, rigid character of gas transport. A substantial part of this study has been conducted in cooperation with a fellow PhD researcher, Mr. Tom Smeenk. His study, see Smeenk [2010], deals with Russia's–and Gazprom's–gas infrastructure investments in light of its gas export strategy, which goes hand-in-hand with developments at the level of market structure. Conversely, the present study deals with the market structure-level in the interest of discovering the boundary solutions for cooperation between gas-exporting countries, with Russia as a focal point. In this research, gas export infrastructure at a project level plays a key role. Therefore, cooperation with Tom Smeenk has been extensive on the empirical front as well as on the theoretical one. Cooperation has resulted in chapters 4, 5, 6 and 10 being similar with respect to major elements to the corresponding part of Smeenk's [2010] study. Chapters 8 and 9 are identical to one another in both studies. The remaining chapters have been written independently, although the reader may unavoidably encounter similar lines of reasoning on various issues.

1.3 Overview of the study

This is not a study solely about collusion in the interregional gas market from an economic perspective, but also one taking into account the politico-economic context surrounding this issue; in particular from a Russian perspective. Since the end of the Cold War, this context has changed enormously, in both political and economic terms. Hence Part I, which contains two chapters, is designed to provide such an overall context, within which Russia is to form its integrated gas strategy, particularly with regard to some of the challenges it faces in this respect. Chapter 2 begins with a set-up of the theoretical instruments, designed to act as a theoretical toolbox for understanding what factors should be taken into account when analysing Russia's post-Cold War ambitions, perceptions and position in the international political system. This framework is inter-disciplinary given the nature of the research problem (involving natural resources and geo-strategic developments), it will be based above all on a geographic construct. As a field of study, geopolitics has an important place in this theoretical framework.

Within this framework, the behaviour of the various actors is based on different paradigms, consisting of utilitarian and constructivist theories. Links will be made to the notion of natural resource endowment of nations and the competitive advantages these offer. Also, the increasingly important role gas plays in international relations as a commodity of economic and strategic value is briefly explained. Chapter 3 then dives into the nature of the international political system as it has now evolved from the immediate post-Cold War years to the 2000s, and where Russia stands in this system and, most importantly, how it perceives the system and the role of gas. Hence Part I is designed to provide an answer to the first set of research questions mentioned in Section 1.2.

Designed largely to answer the second set of research questions, Part II addresses interregional gas market developments. Russia's gas strategy cannot be crafted in a vacuum without taking into account market developments. Therefore, at the level of the firm, Gazprom must take into account developments in a dynamic interregional gas market. Part II of this study is an overview of the functioning and structure of the interregional gas market and the most important gas-exporting countries. Chapter 4 deals with the current theoretical approaches on market developments, especially as far as the dynamic nature of markets is concerned. This chapter also addresses the theoretical background to and preconditions for collusion as well as types of collusion (including cartels).

Chapter 5 is an overview of interregional gas flows and markets. Attention is paid in particular to regional gas markets, their structure and the nature of pricing in those markets. Chapters 6 and 7 collectively act as an overview of the so-called ‘inner’ and ‘outer’ integrators, respectively. The inner integrators are gas-exporting countries on the Eurasian continent which act as gas market integrators from within the Eurasian continent, mostly by pipeline. These include Russia and the Caspian Sea countries (former-Soviet republics in the Caspian region). The outer integrators are gas-exporting countries which are oriented more towards LNG exports. Together, the inner and outer gas market integrators will decisively shape the interregional gas market. Both chapters include an overview of institutionalisation issues, historical background and the production potential of the most important gas-exporting countries and their resulting gas export strategies in a dynamic gas market. This helps us better understand the gas-exporting suppliers which Russia must take into account. Chapter 7 also examines the market power of the various gas-exporting countries in an interregional dimension and the existing instutitions for cooperation between gas-exporting countries. With this discussion complete, Part II will have answered the second category of sub-questions.

Part III is then an assessment of Gazprom’s investment strategy and how this strategy at the firm level may be linked to Russia as a state. The possibilities for cooperation in the interregional gas market are subsequently analysed. In other words, whether Gazprom may wish to compete or cooperate with other gas-exporting countries. The feasibility of collusion in the gas market(s) is to be assessed at this stage. This is done in light of the current and future possible (midstream)[16] investment strategy of Gazprom for its growing export markets. Chapter 8 is an explanation of the real-option game model, by which the sequence of gas value chain projects should be assessed, in a quantitative framework. The model is preceded in Chapter 8 by a qualitative conceptual framework, which includes a discussion on the role of strategic investments, using what one knows from the practical conceptual perspective, such as Victor et al. [2006] have done.[17] The conceptual framework concentrates mainly on midstream projects, in the sense that they may create an advantageous strategic position by expanding economies of scale both in gas transport infrastructure and in the value chain at large.[18] These strategic in-

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[16] The term ‘midstream’ is used to describe mainly the segments of the gas value chain pertaining to the assets used to transport and distribute natural gas, such as pipelines and LNG tankers. Correspondingly, the up- and downstream segments of the gas value chain respectively pertain to the production and sale of natural gas.

[17] Victor et al. [2006] have developed a conceptual framework in which they critically evaluate all the factors which come into play with regard to gas infrastructure investments, including transit risks, geo-economic and geopolitical factors, etc.

[18] Economies of scale can be found either in the mid-stream (e.g., large diameter pipelines) or along the entire chain (e.g., large fields), taking into account that the associated costs of midstream infrastructures are capital intensive and sunk when the investment is made.

vestments feed back into the process of strategy-making as far as Russia's position in a dynamic interregional gas market is concerned.

In order to use the model to ascertain Russia's position vis-à-vis other gas exporters, the model is applied to three specific cases concerning midstream (pipeline) investment. Chapter 9 applies the real option game model in a duopolistic setting, combined with the conceptual framework to a number of cases, and aims to answer the third set of research questions. Since the international gas market is in fact still very (sub)regional, it is useful to break down the problem into separate case studies. The chapter is opened with a historical case, in order to provide an ex-post evaluation of strategic investments with the benefit of hindsight. Account is taken of growth markets, the level of competition, transit and other (politico-economic) uncertainties. This is done by examining Gazprom's plausible strategy first through a country-level lens, then through a sub-regional level lens. European (sub-regional) markets will be given specific attention in all three cases, because Europe is Russia's (and by extension Gazprom's) most important market.

Part IV, which contains two chapters, uses the analyses, lines of argumentation and empirically gathered information of all chapters in parts I through III to come up with an economic and geopolitical approach to cooperation amongst gas-exporting countries from a Russian perspective. Chapter 10 aggregates the analysis from a partially quantitative and sub-regional assessment of gas markets and Gazprom's investment strategy herein to a regional level; this will be done through a qualitative assessment. Chapter 10 will then proceed with a review of the scope for cooperation between gas-exporting countries in the interregional gas market. It will assess the implications of the model's applicatory outcomes for collusion between gas-exporting countries and what form this could take, given the theory discussed in Chapter 4.

Chapter 11 is designed to enable the reader to finally come full circle. Here the political and economic analyses, made in the first two parts and also in part III, are brought to together to answer the fourth set of research questions regarding the feasibility of collusion from Russia's perspective (see Section 1.2). This will also be partially based on the analysis made in Chapter 10. In Chapter 11, however, the geopolitical boundary solutions to collusion are reviewed from a Russian vantage point. This chapter takes into account the possible geo-strategic challenges posed by the Euro-Atlantic community with regard to Russia's emerging gas strategy, which is important ultimately in determining to what extent collusion can be challenged, whatever its form. Chapter 12 summarises the main findings and tries to evaluate the research objective of the study. Additionally, it provides a discussion and recommendations and suggests further research.

1.4 Research methodology

The methodology applied in this study consists of a two-fold, multi-disciplinary approach. In Chapter 2, international relations theories are described, which are applied in chapters 3 and 11. Chapter 2 is in fact a review of the various international relations theories necessary to provide a complete analysis of Russia's position in international relations, which is done in chapters 3 and 11. This is a fully qualitative approach. Part II sees the use of a descriptive method, designed to bring together all the required facts, figures and other required information through reviews of literature and statistical information. Chapters 8 and 9 in Part III see the description and application of a quantitative model to analyse strategic interaction and to value investments in a real-option game setting, combined with an analysis nased on a conceptual framework. In the form of a collection of three case studies, Chapter 9 applies the real-option game model quantitatively as well as within the conceptual, qualitative framework.

The previous explanation implies that the *empirical* research in this study has two main orientations. An important part is of a descriptive institutional nature. The part that concerns the evaluation of infrastructural investments is based on case-study analysis and is of an explorative nature. The multi-disciplinary nature of the research is highlighted by a combination of the use of different disciplines of both an economic and a political nature.

Among other issues, our analysis reveals that strategic capacity expansion projects typically include the option to postpone (wait-and-see). Therefore, a crucial element of strategic infrastructural planning in gas markets involves the timing of strategic investments, i.e., committing now vis-à-vis postponing to a later period. This timing aspect gains even more importance when uncertainty of future demand is considered simultaneously with competitive behaviour of (potential) rival suppliers in the market. This revelation has important implications for the analysis of potential cooperation amongst gas-exporting countries in an increasingly interregional gas market. The findings regarding the political dimension of this study also have important implications for the economic one.

PART I

Chapter 2

A theoretical background: Agent-structure in a geopolitical context

2.1 Introduction

The first step in determining the boundary solutions for cooperation between Russia and other gas-exporting countries is to determine Russia's position in and perception of the international political system. In other words, it is important to lay out the theoretical and analytical tools necessary to analyse the international political context. This context pertains to both structures of the international political system in which agents (such as states) operate as well as the nature of the agents themselves. An essential point of departure is that Russia's geography matters, both in terms of Russia's behaviour in the international political system, as well as in terms of Russia's gas reserves and their proximity to export markets.

Since the end of the Cold War, the system of international relations and power is based more on relative *economic* advantages rather than absolute *military* ones involving zero-sum games [Waltz 2006; Strange 1994; Gilpin 2001]. There are now types of power different from those important during the Cold War, such as hard military power. Within this changing international political system, Russia wishes to improve its status to that of a great power, that is, to become one of the important poles in the system rather than merely living on its fringes. It no longer has hard military power at its disposal. For Russia, among other things, such as oil, gold and other minerals and resources, its gas wealth offers a means to develop important relative economic advantages, which, in turn, make it possible for Russia to regain and carve out for itself a respected position in the international political system.

The structure of the international political system in terms of polarity is more dynamic, as is the shift from absolute to relative advantages. With the collapse of the Soviet Union, a structural realist theory is an important starting point, because it helps us understand the implications of such a major change in the international political system. Since Russia's perception also plays a role in motivating its actions, the distribution of ideas and perceptions is also an important factor to take into account. Russia's continuing evolution, its self-perception and its view of gas as a means to safeguard its economic power, and its projection of political power can be best understood using a multi-pronged theoretical framework.[19] Moreover, for Russia geography plays an important role, with geography being a permanent factor in international relations. Particularly given the fact that natural resources are distributed in certain concentrations across the globe implies that a geopolitical approach is warranted in this study. The modern variant of international political economy covers the overarching theoretical background to the relationship between states and markets and its role in creating relative advantages [Gilpin 2001; Strange 1994].

The relationship between agents and structure is thus set in a geopolitical context, where geography and the perception of geography play an important role. This is a more advanced theoretical lens through which to perceive the world than in zero-sum terms, implicitly incorporating the material, immaterial and geographic dimensions.

Section 2.2 discusses the importance of an agent-structure relationship, involving a material dimension. Section 2.3 will follow with a discussion on new forms of power which have emerged since the end of the Cold War, which includes a description of the rising importance of gas as an economic and strategic resource. Section 2.4 moves on with an immaterial approach, from which a geopolitical approach is developed as well, since perception and immaterial desires must precede geopolitical action. Section 2.5 then makes the case that actors' perceptions impact actions are taken with regard to natural resources such as gas.

2.2 The structure of the international political system

While factors such as geography permanently influence politics, the structure of the international political system influences the behaviour of the agents in it. The first of these dynamic factors is the structure of the international political system and the degrees of interdependence. Paradigms in international relations implicitly capture such dynamic factors.[20] The various paradigms of international relations, realism, liberalism, etc., are composed of theories which have been developed over the course of the twentieth century. Most theorising about world politics concentrates on power and national interest; of the material paradigms, realism and neo-realism are the most commonly used as well neo-liberalism.[21] The basic building blocks for

[19] State power can be conceived of a few components: resources or capabilities, or power-in-being, how that power is converted through national processes and power in outcomes, or which state prevails in particular circumstances [Treverton and Jones 2005].

[20] A paradigm is a pattern, model or perspective that acts as a guide in conducting research and organise thoughts. Paradigms in international relations, often referred to as 'schools of thought', 'traditions' and/or 'discourses' [Donnelly 2001], help explain the laws of international politics or recurrent patterns of national behaviour [Waltz 1979] and attempt either to explain and predict behaviour or to understand the world 'inside the heads' of actors [Hollis and Smith 1990]. Amongst other purposes, they also aid in explaining relations between states and how they struggle for power [Wight 1991].

[21] Realism, the oldest school of thought on international relations and rooted in the thinking of Hobbes, Morgenthau, Carr, Niebuhr and others, assumes constitutive actors in the international political system are states, where other actors such as international organisations such as firms and institutions are subordinate to states.

neo-realism (i.e., structural realism) consist of power and national interest, with power being understood as military capability and interest as self-centred desire for power, security and wealth. Neo-realism is an effort at finding a theoretical approach which makes it possible to explain how international relations come about on the basis of the conditions determined by the structure of the international political system [Waltz 1979].

Two assumptions characterise neo-realist thinking: (1) the international system is anarchical[22] and (2) that states are primarily interested in their own survival, which they must ensure by maximising their power,[23] most likely by military means and/or constrained by the structure of the international political system in doing so [Donnelly 2001; Viotti and Kauppi 1999]. Another fundamental claim of neo-realism is that the structure of the international political system influences the behaviour of the actors involved in the system.[24] Generally, Waltz's model of structural realism is conceptualised along three main dimensions: 1) the ordering principles amongst units, 2) the character of the units and 3) the distribution of capabilities [Baylis and Smith 2001].[25] Neo-realists approach the polarity in the international system as micro-economists approach market structure: a uni-polar world will induce competition from would-be poles, bi-polarity is stable, and systems with one, two, three or a few great powers are deemed monopolistic or oligopolistic [Donnelly 2001].

States create spheres of influence through their foreign policies to advance their national interests and exercise military power whenever and wherever necessary. Historically, as has been succinctly argued by Paul Kennedy, economic growth has often allowed states to increase their global influence, essentially because they could use their surpluses to build up their military forces, which in turn allowed them to reinforce and further their global influence [Kennedy 1987]. In the immediate post-Cold War period, in 1993, Waltz pondered how the bi-polar setting would evolve in terms of structure and what the effects would be of this structural change (as a result of the collapse of the Soviet Union) [Waltz 1993]. He would later claim

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[22] Anarchy prevails in the international system, meaning that there is no accepted global political authority, compelling states to engage in self-help behaviour.

[23] Power is defined in this context as dynamic, focussing on the interaction of states. "A state's influence (or capacity to influence or coerce) is not only determined by its capabilities (or relative capabilities) but also by (1) its willingness (and perceptions by other states of its willingness) to use these capabilities and (2) its control or influence over other states. Power can thus be inferred by observing the behaviour of states as they interact. The relative power of states is most clearly revealed by the outcomes of their interactions" [Viotti and Kauppi 1999, pp. 64 - 65].

[24] Seen through the prism of this theory of international politics, states are akin to billiard balls, which determine the structure of as they collide and send one another into different direction. The larger billiard balls, or more powerful states with abilities, economic and military, to affect the international political system in its entirety are 'great' powers and act as 'poles' in the system.

[25] Ordering principles are those by which the elements of structure are organised. The distribution of capabilities corresponds with the distribution of material resources amongst countries or states, especially military and economic ones, corresponds with the distribution of capabilities throughout the system. Other international relations' scholars differ on that point, for example, according to Gilpin [1981], the distribution of power is largely driven by unit-level factors that have little to do with the international structure [Gilpin 1981].

that changes are occurring both *in* the system while the system itself was also in motion, i.e. a change *of* the system itself [Waltz 2000].

2.3 Post-Cold War sources of power

The most important difference between the Cold War era and its aftermath is the manner in which the balance of power is determined by the great powers in the international political system. To look at power from a Russian perspective, we need to acknowledge the existence of other source of power, other than traditional hard power, since this is no longer a form of power Russia abundantly possesses.

2.3.1 Absolute versus relative advantage

With the existence of nuclear weapons, conventional military power has become almost redundant amongst the great powers. In the post-Cold War environment, it is economic and financial power that has become comparatively more important. The collapse of the Soviet Union via economic, rather than purely military forces, demonstrates the increasing relevance of relative advantages [Waltz 2006; Strange 1994; Gilpin 2001]. With the existence of economic factors and non-state actors, neo-liberalism assumes that because of interdependence, states also maintain relative advantages rather than absolute. States are acknowledged as being the principal actors in global politics, but pervasive interdependence was thought to alter the nature and effectiveness of state power [Keohane and Nye 1977]. Within the structure of the international political system non-state actors and markets also play an important role. Gilpin reasons that “the parallel existence and mutual interaction of ‘state’ and ‘market’ in the modern world create ‘political economy’; without both state and market there could be no political economy […] Although neither world can ever exist in a pure form, the relative influence of the state or market changes over time and in different circumstances” [Gilpin 2001, p. 8]. The modern variant of international political economy (IPE)[26] argues that it is essential to synthesise international relations and (political) economy in order to explain complex issues in the world [Strange 1989], such as in the gas market.

Particularly in the gas industry the state is always present, either on the sidelines or at the centre.[27] These powers in the international system have an interlocking effect on one another. In

[26] International Political Economy (IPE) is concerned with the political determinants of international economic relations. The mainstream of IPE built further on the Liberal vision on international relations. The core problem, which is studied by IPE, is the mismatch between two organisation principles: territorial organised state systems and de-territorial organised market systems [Viotti and Kauppi 1999]. Thucydides and Aristotle already studied the interaction between economy and politics. The classic variant of the IPE refers to the ‘political economists’ of the 18th and 19th century, such as Ricardo and Smith [Viotti and Kauppi 1999].

[27] National energy firms in energy-producing and exporting countries have a crucial part in formulating export strategies, which often hinge on the national interests of those countries. After all, the incomes these firms accrue underpin much of these countries’ economic development. Major international financial institutions such as the World Bank and the IMF as

today's international system states compete not so much for absolute advantages by military means but for relative, more economically-driven ones. Strange accepts low politics[28] as a realm of influence on international relations and therefore accepts economic forces as determinants of relative economic gains [Strange 1994; 1989]. So for example, the translation of economic power into long-run military power and financial power leads to relative advantages between states [Strange 1994]. Economic and financial power may lead to abilities to influence the economic development and politics of other states. States do so not only directly, on their own account, but also through proxies such as government-owned, or quasi government-owned and controlled enterprises.[29] In essence, countries with great endowments in energy resources have a natural absolute advantage in the international economic sense [Smith 1991].

Room is therefore made in the theoretical framework for neo-liberal thought as prescribed by Strange [1989; 1994] who uses a concept of structural power to explain how state power can vary in relative terms through financial, military and production means, as well as through intellectual capital (knowledge): "Structural power is the power to shape and determine the structures of the global political economy within other states, their political institutions, their economic enterprises and (not least) their scientists and other professional people have to operate" [Strange 1989, pp. 24-25]. Increases or decreases in terms of the ability to wield power in each of these four different dimensions, thus influences a state's relative power position vis-à-vis other states. Non-governmental actors can play important roles too, but they do not have a monopoly over force like governments do [Burchill 2005].

A country's knowledge and production can lead to financial wealth, which can be used to further boost production, develop the intellectual capital base and (further) develop the means to defend itself. In principle, as such, a state's abundant possession of natural resources should also be included as a source of potential, structural financial, economic power.[30] Strange sees the possession of energy as part of a secondary power structure [Strange 1994] because energy is the lifeline of modern economies and can be translated into the forms of power described above. Porter [1998] argued on the basis of an extensive case-by-case study of economically

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well as international banks also have a pivotal impact on the ability of energy firms to finance and realise large energy projects.

[28] Neo-realists and realists alike make a distinction between 'high' and 'low' politics; 'politics' and 'economy'; and state, and respectively market.

[29] The thinking of Ricardo and Hecksher-Ohlin in international economics shows how comparative advantage plays an important role in international economic relations, based on international differences of factor endowments [Nielsen et al. 1995].

[30] Countries are endowed with certain resources, in terms of labour, capital, resources and they employ it to develop competitive advantages in the international economic arena. Given the concentration of natural gas in only a handful of countries (which also holds for many other natural resources), the balance of power is skewed in favour of those countries with excess resources for valuable exports. States rich in natural resources, upon which others depend for economic development, have a strong comparative advantage.

well-developed countries that a combination of factors is important in the development of a country's economy: availability and skill of labour, resources, etc [Porter 1998].

These forms of power (in terms of building a competitive advantage), which should be seen as a relative concept between states, primarily relates to states' abilities to influence the international political system to their own advantage using economic instruments. As mentioned above, one of the hypotheses is that states are more concerned about relative advantages than absolute gains because over time, relative advantages may develop into strategic ones, perhaps involving military power.[31] A power with all forms of structural power or a strong combination thereof is capable to act as rule-setter rather than a rule-follower.

Illustratively speaking, for Russia, gas may well present it with an opportunity to develop a relative advantage, but the significance of gas for Russia goes further: it provides Russia room to develop as an important energy hub in a rapidly developing gas industry, for example. However, gas alone cannot provide structural financial power in the sense of Strange. In order for this to happen, the Russian government must pursue a number of successful economic policies that wean itself off over-dependence on oil and gas export earnings, and enable it to translate that wealth into other forms of power.

The overall resulting theoretical framework, thus far, is one in which the international political system is driven my material and immaterial factors, where states act as a function of these factors, also using the natural resources and other factors at their disposal to create a relative advantage. This relative advantage is concerned more with increasing a state's options for influence in the international political system and the economic means to exert power, more so than gaining a military superiority per se. Relative advantage is more about long-run economic power where states are increasingly interdependent, effectively having offset traditional military power. However, it is important to remember that military power nevertheless remains important in shaping some of the boundary solutions and the playing field for geo-economic and relative advantages to take shape. Especially in a globalising world economy, such advantage may translate into political influence, in particular through structural dependency and the ability to set the rules of engagement to one's advantage [Grieco 1988; Strange 1994].

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[31] Next to structural power, Strange [1988] distinguishes relational power, which is "the power of A to get B to do something they would not otherwise do" [Strange 1988, pp. 24-25]. The most direct form of relational power is a military action, where a state is forced to act according to the other. Relative economic advantages can be translated into other forms of power in the long run [Strange 1988]. Advantages in economic terms may one day lead to the capacity to fund an advanced weapons programme. This is in essence also part of Strange's concept of power dimensions [Strange 1994].

In today's world, these economic powers may also translate into abilities to gain ownership of economically and strategically pivotal assets in an economically interdependent world. Ultimately, these economic powers rest on geopolitical and geo-economic boundary solutions.

2.3.2 The rising, economic and strategic importance of gas

Conventional gas is gradually becoming an important factor in international relations, particularly but not exclusively at a European level. Though gas does not enjoy the same status as oil does in modern economies (with crude oil being indispensable in a number of sectors such as transport), it is fast becoming a fuel of choice for a gradual transition towards a more sustainable energy mix in many countries. Gas is a cleaner-burning fuel than oil, and its applications are becoming more numerous (e.g., not just power generation, heating and cooking, but also gas-based industries, pharmaceuticals and high value liquids). In a world where the reduction of carbon emissions are becoming a pressing issue, the potential contribution of gas as a more sustainable energy source lends it strategic significance. Given the amount of years of production remaining for the various fossil fuels, which is 122 years for coal, 42 years for oil and 60.4 years for gas, according to British Petroleum (BP) [2009], gas is well placed as a comparatively clean fuel with regard to its more carbon intense sister fuels.

Since the mid-2000s, the geopolitical complexity of gas trade, the rigidity of gas transport and the rise in oil–and therefore also–gas prices has made gas more a 'fuel of consequence'. Its popularity as a transition fuel has since been dampened in Europe because of perceived security of supply concerns. In addition, the 2008-2009 international economic and financial crisis has caused the market value of gas to become comparatively lower relative to the market value of oil [Stern 2009a]. While conventional gas is found in certain concentrations (see below), the import-dependency especially of Organisation for Economic Co-operation and Development (OECD) countries[32] is rising, as will be shown in Chapter 5. Gas must be transported over ever greater distances in the form of LNG, while pipeline gas tends to be accompanied by transit issues (due to transit of gas through pipeline running over third party territories). Unconventional[33] gas discoveries and development have had their impact on prospects for further import-dependency; particularly in the US (also refer to Chapter 5).

[32] The Organisation for Economic Cooperation and Development (OECD) member countries are referred to as a group uniting countries with common economic but not necessarily common political interests, which include mostly the rich and industrialized nations and exclude the developing and emerging economies such as China (non-OECD countries).

[33] Conventional gas consists of methane. Sources of unconventional gas, however, consist of tight gas, deep gas, geo•pressurized zones, shale gas, coal bed methane and methane hydrates [IEA 2008c]. Non-conventional gas embraces a set of gas resources that are generally contiguous in nature, sometimes referred to as 'resource plays' in the industry, requiring special drilling and stimulation techniques to release the gas from the formations in which they can be found. The combination of improved technology and higher gas prices has stimulated production of deepwater and non-conventional resources, which have previously been too difficult and costly to extract [IEA 2008a].

The rigid nature of gas transport (because pipelines, once built, cannot be re-routed) and transit through third countries, attaches to gas, as a commodity, a certain *geo*-strategic significance and exposes gas trade to additional geopolitical forces, because of the risk to pipelines and the gas flowing through them. In this regard, bottlenecks such as troublesome transit countries and narrow straits (for LNG), add an additional complication to gas transport and trade. The predominance of pipeline gas trade is important, especially in Europe (also see Chapter 5). Gas traded by pipeline brings with it fixed dependency relationships due to the rigid nature of these gas pipelines. This inherently has an impact on international relations between countries along the gas value chain. Control of access to infrastructure (and its capacity) is essential for extracting the economic rents. The perception of agents in the political and economic system of the role of pipelines in the gas value chain is also important, as will be described below.

Indeed, in the case of natural gas, a geopolitical and also geo-economic approach is warranted because of the nature of gas pipelines and transit issues. Gas pipelines are important because they consist of fixed infrastructural investments for gas transport, and lead to fixed political relations with countries in and between various geographical areas. In addition, these pipelines enable the flow of gas in the first place, on a large scale, which endows them with a certain strategic value in and of themselves. Pipelines can be seen as geo-economic tools to control the flow of resources vital for economic growth and security in both gas-consuming and gas-producing countries. The location of existing and potential gas markets for Russia (e.g., Europe and China) and other gas-exporting countries, the location of existing and potential gas-exporting countries themselves and the goals, behaviour and strategies of existing, and potential geo-strategic competitors, all warrant a geographical approach. Here, geopolitics and geo-economic come into play for gas-consuming and gas-producing countries alike (refer to Section 2.5 for a definitional overview of geopolitics and geo-economics).

2.4 Agents' perceptions of the material world

While the material dimension of international relations acknowledges such things as power and wealth, it does not account for how agents' behaviour can change. For example, while the Soviet Union collapsed in 1991, it began behaving differently as early as the mid-1980s, as a result of its leaders' changing perceptions of the Cold War balance of power. Social relations between the US and the Soviet Union gradually change during the second half of the 1980s, while true material polarity only changed in 1991 with the collapse of the Soviet Union. So, how agents in the international political and economic system perceive that structure, and others in it, helps shape their views of the world and underpins their actions.

Also dynamic and subject to change is the notion that powers may have ideas and perceptions about the world around them; this is the immaterial dimension of international relations. The social science underpinning the immaterial dimension of international relations arose during the 1980s, as a counterweight to rationalist, materially oriented paradigms such as those described above.[34] Neo-realists such as Gilpin also recognize the notion of social interaction in international relations and their link to material and immaterial interests: "an international system is established for the same reason that any social or political system is created; actors enter social relations and create social structures in order to advance particular sets of political, economic, or other types of interests" [Gilpin 1981, p. 9]. According to Wendt [1992; 1999], states are social beings, whose perceptions lead to desires, or goals, which leads to action, or policy: this is Wendt's 'desires + beliefs = action' equation. This equation simply states that policies arise from the pursuit of certain goals, and these goals in turn are born of perceptions and desires. Desires may include aspiring to become a great power, for example, or to return to such a status in the international political system, this lies rooted in concepts such as Wendt's identities (see below).

Without refuting Waltz's structural theory, Wendt, for example, argues that the structural realist approach is in need of some modification in order to take into account the *full* range of factors influencing actors' behaviour in the international political system, such as ideas. The international political system is as much *social* as it is *material*.[35] These ideas are constituted by beliefs and desires, which leads to action and then reaction, i.e., they imply a more dynamic, social process than is the case under structural realism. Actors may have desires and beliefs about how to pursue those desires. As Kagan notes, "when one horizon has been crossed, a new horizon always beckons. What was once unimaginable becomes imaginable. Desire becomes ambition, and ambition becomes interest" [Kagan 2008a, pp. 17 - 18]. The concept of structural change in Wendt terms refers to changes in social relations amongst countries rather than simply material ones when poles 'phase in or out' of the international political system.

Seen through a social prism, the national interest of a state can consist of a number of immaterial factors in relation to national interests. To start with, the national interests of a state may consist of physical survival, autonomy, self-determination and preservation,[36] economic well-

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[34] Critical theory calls for interpretive understanding of time and space, an insight drawn from Max Weber's work in social science, being especially critical of objective knowledge and the rigid vision between normative and empirical theory [Viotti and Kauppi 1999].

[35] This was mainly developed in critical theory, a separate paradigm which underlines the role of normative factors which may be at play in the international political system. Thus other observers contended that the pursuit of material factors and a physical, international political system consisting of simple, colliding billiard balls was an insufficient explanation for the behaviour of states. Wendt's work is of the systemic category, centring on the notion that a state is informed by its interests and in turn its actions. Social constructivism "is characterised by an emphasis on the importance of normative as well as material structures, on the role of identity in shaping political action and on the mutually constitutive relationship between agents and structures" [Reus-Smit 2001]. In other, less abstract words, rather than being units acting as a set of colliding billiard balls on the prowl for glory and power, there may be ideas at work which go beyond such pursuits of material wealth and power.

[36] Self-determination is tightly linked to sovereignty and autonomy, including the freedom to choose the model of political control and government, and on the distribution of economic wealth.

being, while Wendt adds 'collective self-esteem.'[37] Wendt recognises what effects material forces have on life in the international system: 1) the distribution of actors' material capabilities affects the possibility and likelihood of certain outcomes, 2) the composition of material capabilities has similar constraining and enabling effects and 3) geography and the distribution of natural resources have a major bearing on states' behaviour. Thus states have to deal with certain material givens, such as their geographic location and their resources while on the basis of their desires and beliefs, they take certain actions. A state's national interest may thus hinge not only on material factors but also on the inter-locking components of actors' identities, as described below.

2.4.1 Agents and their identities

Identities refer to whom or what actors *are*, designating social kinds of being while interests refer to what actors *want*. Together these identity components shape the 'belief' component of the so-called intentional equation already mentioned above: desire + belief = action, while interests belong to the 'desire' component. The bottom line is that without interests, identities have no motivational force, without identities interests have no direction [Wendt 1999]. These are constituted by both internal and external identity components. Internal ones include type and personal identities, while external ones include role and collective identities:

1) Type identities pertain to how states constitute themselves domestically, such as choosing a certain regime type: a capitalist democracy versus state-centred capitalism, for example;
2) Personal identities pertain to the need of a state to maintain its sovereignty as a separate actor in the international political system: European acting as countries separate from the EU;
3) Role identities relate to how state perceive themselves and are perceived by other actors in the international political system and also how they *desire* to be perceived (i.e., a role identity more an object of desire then a strategy) and
4) Collective identities point to those external actors with which states may seek to form alliances and with which they identify themselves most closely for reasons either related to internal factors or to geopolitical and/or other material factors.

2.4.2 Different forms of anarchy

While the Waltzian school of thought claims that states live in an anarchic world, Wendt argues that it is states' own perceptions of this anarchy that, to a large extent, shapes the anarchic situation around them. Wendt's notion of cultures comes into play, shared ideas which make up a subset of social structures in which states 'live', anarchy takes up various forms in states'

[37] Self-esteem, a very human sentiment, is one that a state may have as well and pertains to the overall 'human' or psychological condition of the state.

perceptions [Wendt 1992]. There are three types of culture or forms of anarchy: Hobbesian, Lockean and/or Kantian:

1) The Hobbesian culture of anarchy: The motto of a Hobbesian culture is "if you want peace, prepare for war." States perceive the world as a battle for survival and are stuck in an eternal prisoner's dilemma, they must fight to survive, and war often results. States often think in zero-sum terms.
2) The Lockean culture of anarchy: The motto of the Lockean culture of anarchy is "live and let live." States respect one another's existence and interests, and merely act as rivals or adversaries, offsetting each other's power by relative means. There is also room for cooperation whenever it suits states' interests.
3) The Kantian culture of anarchy: The motto of the Kantian culture is "all for one, one for all." States see the world in terms of partnership with other states, cooperating within an alliance or acting cooperatively with regard to most external agents.

For example, one power may perceive the world around it in zero-sum terms, while another merely seeks to enhance its relative advantages. The former is likely to resort military means, if it feels its survival is at stake as a result of actions taken by the latter. Whether one agent or another sees the world through a Hobbesian or Kantian lens largely depends on its perception of the outside world and its immaterial beliefs and desires.

2.5 Perception, geography and natural resources

While perceptions play an important role in how agents in the structure come to new ideas and actions, they are also vital at the politico-strategic level, since only at this level decisions materialise with regard to how resources are used and exploited. Many observers foresee that fossil fuels and their transport will be the single dominant factor in international politics in the years to come [Rahr 2006]. States' traditional national security objectives–gaining control over territory and expanding sphere of influence, in Waltzian terms–are no longer concerned with military aspects (military capacities are still key aspects of state power) [Gagné 2007]. National security objectives are now more complex, and involve new considerations such as control of and access to scarce energy resources [Schweller 1999].

By partial extension of the above, geography as such is an important factor to take into account. While in an interdependent and globalising world geography no longer plays the same role in terms of opportunities and constraints as in the past, it still has a regional impact. Geography affects nations' perceptions of the world and offers them resources and capabilities, if they are at all able to employ them. In addition, natural resources are found in a certain three-dimensional space under the surface of the globe (in the case of natural gas). It is agents' perception of geography, natural resources (as described above) and their combined importance that leads to the subsequent 'perception' of geopolitics. The concentration of certain resources in certain areas can affect actors' perceptions as well.

Wendt's theory of social constructivism also explicitly underlines the importance both of natural resources and the geography in which they are found, as part of its assumption that so-called "brute material forces" have independent effects on international life: "[t]here are geography and natural resources. The distribution of certain [natural resources] in a given area makes possible the technological development of primitive societies living there" [Wendt 1999, pp. 110-111]. Wendt's point is that agents in the structure of international political system must first perceive its geographical reality, which ultimately leads to the perception of the world in spatial terms. Much as only the perception of the outside world by agents in the system can lead to action, and dynamic change, so too only their perception of geography as such can lead to geopolitical action, i.e., geopolitics.

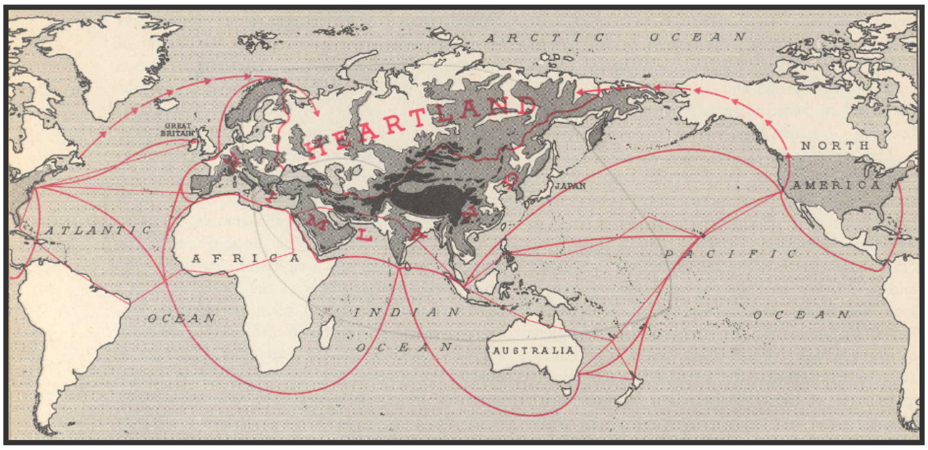
The frame of analysis used above sketches the geographical chessboard upon which great powers' strategies take shape, given their perceptions of geographical factors and natural resources. These strategies, when a function of the geography surrounding the great powers, become *geo-strategies*, and geographic features or the control of geographical features become *geo-strategic*. Hence the desire to affect a certain geopolitical or geo-economic outcome may be pursued by geo-strategic means, with the ends being the immaterial desires of states. First, these states perceive certain interests and desires, they then they translate these into policies, always doing so by default in a geopolitical context; particularly when it comes to natural resources.

Geopolitics is "the scientific field of study belonging to both political geography as well as international relations, which seeks to investigate the relationship between political behaviour of man and his territorial surroundings [Criekemans 2007].[38] Geopolitical insights were present in the thinking of Aristotle, Montesquieu and Kant [Cohen 2003]. Classical geopolitics pertains to the thinking of Kjellén and Ratzel, who both argued in the 19th century that conditions and problems of the state find their origin in its geographical characteristics, where Ratzel emphasised that the state was akin to a biological organism in search of new territory and resources in order to grow [Criekemans 2007]. Geopolitical perceptions of the balance of power amongst states arose with the Anglo-American line of geopolitical reasoning of MacKinder and Spykman. MacKinder then argued that the British Empire faced a lasting threat from the physical or geographical characteristics which offered advantages to the efficient movement of

[38] At the epistemological level, geopolitics is partially a debate between 'territoriality' and 'politics' [Criekemans 2007, p. 585]. As Napoleon once said, to know a nation's geography is to know its foreign policy: "la politique de toutes les puissances est dans leur géographie". Napoleon's statement, made more than a century before international relations became an official field of study within the social sciences, reflects a certain 'geographical consciousness', an awareness that states behave within a geographical context, as Criekemans [2007] notes.

people, ideas and goods across Eurasia that arose after the industrial revolution [MacKinder 1904]. He saw the US and Russia as great powers merely because their potential ability to centralise large amounts of natural resources [Criekemans 2007]. According to MacKinder [1904], the 'Heartland area' or 'Pivot region' (corresponding of all of Russia and much of Central Asia and Eastern Europe) in Eurasia was the key to the balance of power in the world. The power which successfully controlled the heartland and its resources could dominate the world.

Figure 2.1 Spykman's heartland and rimland concept



Source: Spykman [1944].

Spykman [1938] developed his 'Heartland-Rimland' thesis, based largely on Mackinder's concepts [Spykman 1938]. Spykman believed that although the heartland was an important region, the 'Rimland' was at least as important if not more important from a political and military point of view [Spykman 1944]. Spykman was thus in favour of a Cold War strategy in which the US used the rimland to keep in check and contain powers in the heartland, by establishing alliances with key states in the rimland and perhaps even establish a direct security presence, a strategy that is illustrated in Figure 2.1 above. Spykman reasoned that, from a US perspective, no one single power or coalition of powers was to dominate Eurasia, and powers in its core, i.e., the heartland, must be kept in check if the US is to safeguard its long-run power base. In other words, the balance of power in Eurasia directly affected US national security [Spykman 1944]. According to later geopolitical thinking of Brzezinski [1997],Eurasia as a whole remains the all-important 'chessboard' upon which a battle for the global balance of power takes place, even in a post-Cold War environment.

2.5.1 Russia's perception of the outside world and natural gas

Russia's perception is strongly driven by a sense of space. It is a power whose historical development has been underpinned by the perception of its geography, and the forces exerting pressure and influence on it. The approach of combining structural realist theory with a constructivist approach, with regard to Russia as an actor in the international political system, is not entirely new [Suny 2007; Tsygankov 2006]. LeDonne, for example, argues that Russian behaviour over four centuries reflected, without divergence, the drive of a "core area" to expand to the edges of the Eurasian Heartland [LeDonne 1997]. Using Mackinder's initial work on heartland-rimland thinking (see also below, especially box 2.1),[39] LeDonne recognises how Russia as a 'core' area, i.e., the heartland, was bound by other core areas (e.g., Sweden, Poland, the Habsburg and Ottoman empires, the Persian Empire and China, etc.) as well as coastlands controlled by the British Empire and Japan.[40]

Russia's foreign policy has subsequently been driven by an urge to expand outward towards these other core areas and to defend Russia against external threats. Geopolitics has to a certain extent always been present in Russian thinking and strongly influences the national psyche, possibly forming a basis also for future great power aspirations [Kerr 1995]. This was not the result of any preconceived plan of the various consecutive Russian governments; it was rather a natural product of a 'state' building process [Legvold 2007b]. In this process, Russia faced challenges such as unrests in neighbouring territories, threats of external invasion and difficulties in preserving internal state integrity [Tsygankov 2006].

From a Russian perspective and within the context of this study, the additional factor to take into account, besides the role of geography in and of itself, is the distribution of natural gas and the pipelines necessary to transport it. While Russia already perceives the international political system and the outside world in geopolitical rather than merely political terms, as will be shown in Chapter 3, it must also deal with the spatial complexities of the gas value chain (for an in-depth description of the gas value chain and gas infrastructural projects, see Smeenk [2010]). Russia's perception of the outside world not only pertains to purely geopolitical issues such as territory and identity, but also to geo-economic[41] issues. As will be shown in more detail below and in Chapter 3, in terms of oil, Russia has neither the reserves to be an important actor, nor is oil interesting in the long-term for Russia, as far as developing a position of

[39] Referring to Mackinder's 'pivot' area versus marginal crescent thesis [MacKinder 1904].

[40] Later on these coastlands would gradually be controlled or influenced at least partially by the US, a relative newcomer to the Eurasian landmass and as a successor to the British Empire.

[41] Geo-economics pertains to the relationship between territory or spatial relationships and economics. Certain decisions based on economic factors can have geographical constraints and underpinnings and vice versa. Geopolitics is about boundaries, identities and territories while geo-economics is about flows and exchanges and the constraints set by national borders to those flows. Though traditional geopolitical conflicts did not disappear, geo-economic competition has become an important element in the distribution of power in particular among the most industrialised nations [Csurgai 2002].

strength is concerned. In the oil market the OPEC countries are and will continue to be dominant exporters, where Russia has no real place as a price setter, while in gas terms Russia may perhaps be able to develop its own dominance. This is a crucial point: Russia's initial perception of its position in a world of asymmetrically distributed gas reserves potentially plays into its actions.

The world's conventional gas resources are located in a 'strategic' ellipse,[42] or better said, a *Eurasian* gas ellipse.[43] The remainder of the world's proven conventional gasreserves is located randomly outside this ellipse, the latter containing more than 70 percent of the world's conventional proven natural gas reserves, and more than 70 percent of the world's conventional oil reserves. Important in recent years has been the development of unconventional gas resources, production of which has become economic at relatively low prices in the US.[44]

This all adds to the future strategic value of gas, particularly in Russia's perception of the outside world as well as its own resources. The world's gas reserves are more concentrated than is the case for the world's oil reserves: three countries, Russia, Iran and Qatar dominate the reserve skyline, possessing the vast bulk of the world's natural gas reserves: 43.3 trillion cubic meters (tcm) (23.4 percent), 29.6 tcm (16.0 percent) and 25.46 tcm (13.8 percent), respectively; meaning some 53.2 percent of global gas reserves are in the hands of just three countries [BP 2009].[45] The next largest gas reserve holders, which are also major oil producers, pale in comparison, none exceeding 8 tcm worth of reserves, or some 4 percent of the total.[46] The concentration of the world's gas resources in one comparatively small area of the world and in so few countries bestows upon gas, given its economic and strategic importance, an additional

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[42] Some of these countries (especially Turkmenistan and Russia in the arctic region) likely possess more reserves yet to be found. A facet which has gained recent interest in the industry is the likelihood of a large resource potential in the Arctic regions: according to an assessment by the USGS, the mean undiscovered gas resources are about 46 trillion cubic meters (tcm), of which 70 percent of the overall undiscovered gas potential is located in three provinces: the West Siberian basin, 18 tcm, East Barents Basins, 9 tcm and Arctic Alaska, 6 tcm [USGS 2008].

[43] This region stretches from West and Northern Siberia (e.g., Yamal) and parts of the Arctic down to and around the Persian Gulf region (e.g., Iran, Qatar) across Central Eurasia (e.g., Kazakhstan, Turkmenistan). Gas reserve statistics changed substantially over time: between 1988 and year's end 2008, for example, the world's total proven conventional gas reserves rose from 109.72 tcm to 185.02 tcm, an increase of almost 70 percent in only 20 years [BP 2009]. New exploration technologies and the collapse of the Soviet Union have helped contribute to this revision in global gas reserves throughout the 1990s.

[44] These resources have not only boosted gas reserve accounts as such, but also led to increased production of gas in the US, lessening required US gas imports, also refer to Chapter 5.

[45] In the case of oil, five countries are needed to reach the 60 percent mark for the world's oil reserves.

[46] The next largest reserve holders include: Turkmenistan at 7.94 tcm (4.3 percent); Saudi Arabia at 7.67 tcm (4.1 percent); the US, 6.73 tcm (3.6 percent); the United Arab Emirates, 6.43 tcm (3.5 percent); Nigeria 5.22 tcm (2.8 percent); Venezuela, 4.84 tcm (2.6 percent); Algeria, 4.50 tcm (2.4 percent); Indonesia, 3.18 tcm (1.7 percent); Iraq 3.17 tcm (1.7 percent); Norway, 2.91 tcm (1.6 percent); Australia, 2.51 (1.4 percent); China, 2.46 tcm (1.3 percent); Malaysia, 2.39 tcm (1.3 percent); Egypt, 2.17 tcm (1.3 percent); Kazakhstan, 1.82 tcm (1.0 percent); and Kuwait, 1.78 tcm (1.0 percent). Noteworthy is the fact that of the world's gas reserves, 9 percent (16.63 tcm) are located in OECD countries, while roughly 50 percent are located in OPEC countries (non-OECD), next to Russia's non-OPEC 23.4 percent [BP 2009].

geopolitical and geo-strategic value. For Russia, this geographical fact underpins the importance of Eurasia, as well as the importance of potential US designs for accessing this region.

2.5.2 The US perception of the outside world: Geo-strategic logic

Russia is not the only agent in the international political system that perceives the outside world through a geopolitical lens and sees herein the importance of natural resources, including gas. The US is also a power that perceives the outside world in spatial terms. However, in the case of the US, the origin of such thinking is more geo-strategic than geopolitical, in the sense that it is not inherently part of its identity to do so. In contrast to Russia, the US is bordered on either side by huge oceans, and has never faced a territorial threat emanating from a rival state in its direct neighbourhood. The US is not lodged in a 'core' area, where it is surrounded by territories from which other powers may seek to attack or conquer it.

The US never had to defend itself against an invasion on its soil, which partially explains th traumatic and galvanising events of Pearl Harbor and the September 11, 2001 attacks. Yet nonetheless, particularly throughout the Cold War, the US has sought to ensure its power base on the Eurasian continent, either directly through its own security presence, or indirectly through its alliances. This strategy has not changed since the end of the Cold War: NATO still exists and US spheres of influence have only expanded. The underlying reasons for such a US presence in Eurasia lie rooted in geo-strategic logic rather than national psyche, as in Russia's case, that may underpin certain perceptions of the world. The perception of the US of the world is based on the geo-strategic reasoning developed by MacKinder [1904], Spykman [1944] and scholars not mentioned above such as Cohen [1963].

The centrality of the Eurasian continent owes its economic and strategic value to the fact that it is home to 1) the bulk of the world's population, 2) the bulk of the world's natural resource and 3) all of the great powers except for the US and Brazil [Brzezinski 1997]. On the basis of the thinking of Spykman [1944] and Brzezinski [1997], the concentration of the bulk of the world's conventional gas resources in a small area in Eurasia compels the US to seek headways in ensuring that no single geopolitical force holds sway over this concentration of resources.

While containment thinking would rise to underpin such geo-strategic logic during the late 1940s and early 1950s, it was to play a key role in shaping most US foreign policies and strategies during the remainder of the Cold War. The main difference between Cold War containment thinking and today's US strategies lies mainly in the changing nature of power, from absolute to relative advantages. While the geo-strategic thinking of the Cold War pertained mostly to the direct control of territory and security issues, in today's world the relevance is more of a geo-economic nature. In a post-Cold War environment involving the interdependence of nations and the importance of trade and economic security, it is the control of geo-economic flows that has become comparatively more important.[47]

As such, the notion of maintaining spheres of influence in the rimland, with the aim of keeping in check the heartland, can be seen in the context of gaining access to its resources. By extension of Spykman's thinking, if the Eurasian powers can be kept from dominating Eurasia, and the flow of its resources to the outside world maintained, the position of the US can be secured from a geo-economic point of view. The concentration of such economically vital strategic resources such as oil and gas in Eurasia further emphasises the need for the US, as a non-Eurasian power, to establish 'gateways' in Eurasia (see the definitions below). The dominance of Eurasia by other powers would lead to the direct control of natural resources vital to the economic survival and prosperity of the world's great powers, including the US and its allies. Here the role of natural gas pipelines, and those who control them, plays a critical role in the US perception, as much as it could from a Russian perspective.

In order to ensure the division of the Eurasian continent and the flow of resources from it, the US relies on alliances such as NATO, as well as on pivot states and gateway regions. 'Gateway states' or 'gateway regions' play an important role in linking together the various parts of the world through geo-economic forces, including the flow of goods, ideas and people [Cohen 2003].[48] Often located in areas of political instability[49] along ethnic or other geopolitical lines, gateway regions or 'shatterbelts' consist of or encompass 'geopolitical pivots,' countries "whose importance is derived not from their power and motivation but rather from their sensitive location" [Brzezinski 1997]. As will be shown in chapters 3 and 11, these states would become an important concept in US foreign policy, as and when the Soviet Union unravelled during the late 1980s and 1990s,

2.6 Conclusion

An international relations framework is needed to analyse the position of Russia in and its perception of the international political system which it inhabits. Such an analytical framework will enable us to better understand the role of gas for Russia as a state. A structural framework

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[47] Nonetheless, military action or intervention as hard power tools can be employed to affect the geo-economic playing field (i.e., geo-strategies affecting geo-economic flows).

[48] Cohen argued that, from 1991 onwards, Central and Eastern Europe formed potential gateway states, linking the geo-strategic regions of the Western maritime and the continental powers, mainly Russia. As post-Soviet regions, Central Asia and the Caucasus could collectively develop in the post-Cold War period either as a gateway regions or disintegrate further into 'shatterbelts'. Shatterbelts are those areas with internally divided border areas in and between the various spheres of influence of the world's great powers. These areas are trapped in between the geopolitical forces emanating from these major geo-strategic players and do not exhibit any cohesion towards the outside world. Examples of shatterbelts in Cohen's thinking include the Middle East and South East Asia as well as Central Asia.

[49] Barnett identifies such regions as being part of a so-called 'non-integrated gap', regions of the world that are largely disconnected from the global economy and the rule sets that define its stability [Barnett 2009].

allows us to grasp the material factors involved in determining the behaviour of agents in the structure of international relations. In addition, the post-Cold War era has seen the rise of new forms of power, determined by relative economic advantages rather than purely absolute military advantages. An immaterial dimension is also involved, namely how agents perceive the international political system, and the fact that they are driven to actions on the basis of desires and beliefs. Different identities shape the nature of actors involved, while the latter may also perceive the world around them in varying forms of anarchy, including the Hobbesian, Lockean and Kantian cultures of anarchy.

While states' perceptions of the international political structure involve perceiving material aspects, such as wealth and power, they also pertain to perceiving geography. A crucial aspect of the agent-structure theoretical framework used here is that it is set in a geopolitical context. Particularly when it comes to natural resources, which can generate wealth and power, a geographic perception of the outside world becomes necessary because natural resources, such as gas, are asymmetrically distributed in the world. Gas plays an increasingly economic and strategic role in international relations. Russia has historically always been an actor whose inclination has been to perceive the world in geopolitical terms, with a deep awareness of its periphery in spatial terms. The result has become a geopolitical underpinning of Russian foreign policy, which spills over into its policies and behaviour, as will be shown in the next chapter. For Russia, the distribution of gas resources in its own territory and a limited number of other countries, as well as aspects of gas transport infrastructure, further buttress a geographically conscious approach to Russia's position in the international political system.

Indeed, the concentration of some two thirds of the world's conventional gas resources within the Eurasian gas ellipse heavily skews the playing field for gas flows. That said, an important consideration for the US has always been its own perception of the international political system in geo-strategic terms. An important aspect of geo-strategic thought has resulted from this perception, namely that the power base of the US rests on a strong position in Eurasia, primarily through the maintenance of spheres of influence in the rimland. In a post-Cold War setting, where relative economic and–in geographic terms–geo-economic forces are at play, the most important consideration for US power, from a geo-strategic point of view, is maintaining the flow of resources from Eurasia. It is important for the US that no single power dominates Eurasia's resources, including natural gas. Conclusively, for Russia the converse holds. Russia must seek to aggregate and guide natural gas flows in Eurasia to its geo-economic advantage, which involves anything but a diversification of export flows from the Eurasian gas ellipse. US designs on controlling geo-economic flows of resources, e.g., gas, has important implications for the course Russia chooses to pursue in the international political system.

Chapter 3

Russia's changing perceptions of the West and the role of gas

3.1 Introduction

Since the break-up of the Soviet Union, profound changes have occurred in Russia and the surrounding politico-economic system. It is against the backdrop of a dynamic and ever-changing post-Cold War context, that Russia's role and place in the international political system and its resulting gas interests and strategy should be perceived. The purpose of this chapter is to set the political and economic scene in which Russia finds itself today. In particular, attention will be paid to Russia's perception of the West and how it has changed since the collapse of the Soviet Union. While China plays an important factor in Russia's perception of the structure of the international political system, the West in general and the US in particular play a unique role in Russia's perception. Russia's perception of these actors has oscillated between enmity and partnership over the course of time, and they exert influence in many of Russia's traditional spheres of influence. Many of Russia's economic and political interests, including access to gas markets, also lie in Europe. Therefore, the focus in this chapter is on Russia's perception of the West.

During the 1990s, Russia underwent profound changes in economic and political terms and experienced numerous economic crises as it recovered from the collapse of the Soviet Union. As the Soviet Union was undone, Russia's political and economic fabric had to be reshaped. Meanwhile the US sought to expand its spheres of influence into the post-Soviet space, which deeply affected Russia's perception of Western intentions in general. Instead of being drawn into the Western community of nations, Russia witnessed the steady dismantling of its former spheres of influence and was given the cold shoulder when it came to its efforts at economic and financial reform. During this period, the US aimed to draw energy flows (pertaining first to oil and then to gas) into the international markets, with an emphasis on privatisation and de-nationalisation of these flows from the countries in question.

An important question in determining Russia's overall position in the international political system, and ultimately its impact on the potential shape and form of collusion between gas-exporting countries is: how does Russia perceive the outside world? Can it continue to compete with the US in geo-strategic terms, by using its gas resources in a world characterised by interdependence? Ultimately, if Russia seeks to become an important broker in international affairs, it must take into account the fact that it is (increasingly) dependent on gas export earnings for its economic security even as it may seek to develop a position of geo-strategic strength. Russia's perception, in this regard, ultimately also impacts its gas strategy, which it must develop to secure the long-run value of its gas resources. Russia's strategy must also take into account the geo-strategic ambitions of the US, as these can impact Russia's ability to harness gas resources in Eurasia.

3.2 A changing international political and economic context

During the Cold War, two ideological camps, the US-led Western world and the Soviet Union faced off with one another across the globe in a contest for the geopolitical high ground. During this period, international political and economic forces coalesced largely around these two poles, creating a bi-polar system and freezing international frontiers in an East-West confrontation centred on the interests and strategies of the two superpowers [Gagné 2007]. The collapse of the Soviet Union, hailed by the West as a victory over communism, created a vast geopolitical vacuum on the Eurasian continent and caused the granulation of the former Soviet empire into newly independent states, including the Russian Federation itself.

These developments gave way from the early 1990s onwards to a period during which the US remained the world's only superpower in military, financial and economic terms. It was left alone to act as the world's only superpower and 'policeman' [Waltz 2006, p. 96].[50] The 1991 Gulf War demonstrated that militarily, the US and its allies stood supreme in the security arena, and there was little in the way of resistance to American initiatives. During the 1990s, the US assumed a leading role in shaping the international financial and economic make-up of the international political system. With the removal of geopolitical rivalry and the demise of communism, the expectation at the time was that the world economic order would shift towards free market economics in a process of free trade and globalisation.[51]

From energy to capital flows, trade was to be subject to the free laisser-faire functioning of the 'market' in what was to come to be known as free market globalisation. The OECD economies

[50] The features of the American system itself include: (1) a collective security system (including integrated command and forces (e.g., NATO, the US-Japan Security Treaty, etc.); (2) regional economic cooperation (e.g., APEC, NAFTA, etc.) and specialized global cooperative institutions (e.g., the World Bank, the IMF, the WTO); (3) procedures that emphasize consensual decision-making, even if dominated by the US and (4) a preference for democratic membership within key alliances [Brzezinski 1997].

[51] Some observers such as Francis Fukuyama were quick to coin the end of the Cold War with the notion of 'the end of history', the end of great power rivalry and conflict as it has existed since the dawn of human civilization: "At the end of history, there are no serious ideological competitors left to liberal democracy" [Fukuyama 1989]. The collapse of the Soviet Union and the apparent embrace of democracy by Russia augured an era of global convergence [Kagan 2008a].

fared well throughout the 1990s, and many emerging economies appeared to do well too.[52] Economic growth in areas such as South East Asia (i.e., the 'tiger' economies), the internet or 'dot com' boom on Wall Street, and low oil prices helped fuel the free market protagonists' views. Across the globe, major economies, developed and developing ones, were expected to take part in the liberalisation agenda that was largely set by Washington.[53] Through the Bretton Woods institutions, the US under Clinton continued to prescribe structural adjustments policies[54] to a range of countries. These organisations formed the spearhead of US international economic and financial policies towards other countries, under the 'Washington Consensus'. These policies embodied the American faith in free markets and conveyed a deeply held belief that the US was in position to lead the world economy. It facilitated for the US in its ascendancy towards becoming the central hub of global economic and financial activity, developing structural financial power. To put it bluntly in Strange [1994] terms, the US employed the World Trade Organisation (WTO), the International Monetary Fund (IMF) and the World Bank as tools to advance its economic and financial agenda in the new global economic order. These institutions have enabled the US to advance a free trade agenda in which resources in Central Asia and the Caucasus were opened up to foreign (Western) investors during the 1990s.

The US approach to globalisation has long relied on the preponderant power of the US Treasury and of private US firms to strike bilateral deals directly with other countries [Abdelal and Segal 2007]. The US expanded its spheres of influence through both the Bretton Woods institutions, i.e., the IMF and the World Bank, on the international financial and economic front and NATO from within the Euro-Atlantic community [Brzezinski 1997]. On the one hand NATO enlargement served to expand and consolidate the US security presence on the Eurasian continent. On the other, the US had the influence of its Bretton Woods institutions, served to further break up national resistance to free trade and compel sovereign nations to participate in the newly emerging vision that globalised free trade was the way forward [Abdelal and Segal 2007]. The brief period of US supremacy was characterised by advancing

[52] Many third-world developing economies that were non-aligned in the immediate post-Second World War years later were integrated into the international capital market (dominated by the US) through more export-oriented development strategies [CIEP 2005].
[53] The US has since offered modest support for international organisations but never at the expense of its own prominent role in the world economy [Abdelal and Segal 2007]. The military superiority of the US in terms of its war-fighting capacity and the high-performance combat troops, weapon systems, aircraft, armour, and ships associated with all-out war against traditionally define opponents (i.e., great power militaries) has made of the US a leviathan in international political system [Barnett 2009].
[54] Its unparalleled financial power and ability to mobilise vast amounts of capital provided the US with other Strange-type powers, economic and security-based ones. The underlying objective has invariably been to obtain investment guarantees and securing property rights for US firms operating in unstable regions [OSCE 2006]. The World Bank and the IMF would discipline those countries straying from the pack as far as fiscal and monetary policies were concerned, prescribing privatisation and financial liberalisation as part of so-called Structural Adjustment Policies under the Washington Consensus.

market liberalisation, which was supposed to change the state's role from direct stakeholder to more or less neutral market facilitator.

The financial crises in Mexico and South East Asia in the second half of the 1990s, the rise in oil prices in 1999, the end of the 'dot com' bubble in 2000, and finally the September 11, 2001 attacks all marked the end of the free market 'business as usual' scenario prevalent during the first half of the 1990s. Of course, the September 11, 2001 attacks stand in a class of their own as far as the impact on international relations is concerned. While these events betrayed the weaknesses of a market-led system of economic growth, September 11, 2001 served to re-militarise the foreign policies of the US and its allies. The ideological veneer of the new G.W. Bush Administration,[55] and the shift from a multi-lateral stance of the US to a uni-lateral one, set a new tone in global politics. From 2001 onwards, US policies would be characterised by unapologetic and unrestrained unilateralism, creating much irritation with the manner in which it treated its European NATO allies. It also helped Putin to centralise power as a result and vindicated the Russian view that militant Islamists had to be dealt with by military means (e.g., Chechnya).

During the early 2000s, it was still widely believed that the US and its allies would maintain a uni-polar state of affairs against the backdrop of US supremacy, forming the centre of a globalising world (see below).[56] While the global economic system continued on a path toward further economic integration, the wars in Afghanistan and Iraq further re-securitised US and Western policies. The subsequent instability in the Persian Gulf region, the growing resistance of Iran to US dominance in the that region, and the overall rise in oil prices throughout subsequent years helped put energy security back on the agenda and ushered in a new era of uncertainty. The Iraq war of 2003 helped mark the beginning of a new period of re-balancing by other great powers against US uni-lateralism, hence also undermining Western-led free market globalisation.

The rise of resource nationalism in many oil and gas producing and exporting countries and the failure of free trade talks (e.g., Seattle and Doha rounds), the resilience of dictatorial regimes in various regions of the world, all challenged the widely held faith in free market global-

[55] American ideologues felt that "[w]ith the decline of communism, the advancement of democracy should become the touchstone of a new ideological American foreign policy" [Krauthammer 1989, Winter, p. 47]. Preserving the uni-polar moment in world politics became tempting, particularly because of the prevailing American belief that US power does not threaten anyone and that a US-led international order provides sufficient benefits so that it is unnecessary for other states to seek to undermine it [Mastanduno 1997].

[56] In 1997, Brzezinski summarised this American supremacy as follows: "America stands supreme in the four decisive domains of global power: militarily, is has unmatched global reach; economically, it remains the main locomotive of global growth […] technologically, it retains the overall lead in the cutting-edge areas of innovation; and culturally […] all of which gives the United States political clout that no other state comes close to matching" [Brzezinski 1997, p. 24].

isation. Resource nationalism gave way to a 'weaker' form of globalisation, only became accepted in a number of emerging economies at the conceptual level [Van der Linde 2005a]. Indeed, the institutional foundations of globalisation, such as the rules which dictate that government keep their markets open and the domestic and international politics that allow policy-makers to liberalise their economies have weakened substantially in recent years [Abdelal and Segal 2007]. [57]

The economic and geopolitical rise of China and the economic resurgence of Russia during the first half of the 2000s, though by no means decisive in halting America's uni-polar momentum, certainly changed the context in which US policies were to be formed. Their alliance, arguably a marriage of convenience, institutionalised in the Shanghai Cooperation Organisation (SCO) acts as a considerable long-run potential threat to US hegemony on the Eurasian continent.[58] The rise of Europe as an independent and influential economic entity throughout the 2000s also underscored a changing trans-Atlantic relationship. The 2006 and 2008 gas rows between Russia and the Ukraine, the former superpower's cooling relationship with the US, and Russia's reassertion in the post-Soviet space, served as reminders that geopolitical forces could return to further challenge the free market paradigm in general and more specifically the EU as a political entity. The 2008 conflict between Russia and Georgia is a case in point here. Many of these developments mentioned above find their origin in the changing geopolitical make-up of the Eurasian continent, involving EU and NATO expansion as well as Russia's security reorientation.

By the late 2000s, new players were making their presence felt, slowly but surely, in the global arena. The economic growth of powers such as China, Russia, India and to a lesser extent Brazil (Brazil, Russia, India and China (BRIC) countries), is helping them become more influential in shaping the functioning of the international political system.[59] As recently as the early

[57] One of the most important explanations for the failure of market-driven globalisation to take hold is that the costs of reform were too high for many non-OECD countries, the shift to stronger regulatory and supervisory too politically arduous to carry out [Van der Linde 2008b]. A further complication was that elites in these countries feared the erosion of their power base as a result of reform-driven socio-economic unrest and upheaval, rendering them less receptive to any reforms [Van der Linde 2005a]. US and European intransigence in the face of adverse WTO decisions has weakened overall faith in multilateral trade regimes, essential prerequisites for globalisation [Abdelal and Segal 2007].

[58] China and Russia have an interest and a desire to reduce the scale of US predominance and seek more relative powers themselves [Kagan 2008b]. In the mid 1990s, both countries established the SCO in a bid to institutionalise their mutual interests in countries in Central Asia and the Eurasian continent more broadly. Though this tactical alliance does not have a clear geopolitical goal, Russia and China have together voiced their concerns over the US presence in Central Asia from within the SCO and have requested the US to establish a timetable for withdrawal of its forces from the region [Blank 2007].

[59] The heads of state of the four BRIC countries held their First official summit in Yekaterinburg, Russia, at the of which they claimed "a more democratic and just multi-polar world order." In economic terms, the BRIC countries accumulated 7 percent of global GDP in 1995, while in 2009 their share was rising up to 15.5 percent of global GDP, although they already represent over 20 percent of GDP at Purchasing Power Parity. Between 2000 and 2007, BRIC countries contributed 27 percent to global economic growth, which exceeds that of the US [Renard 2009].

2000s, these countries were notable merely on the basis of their collective acronym as 'BRIC' countries, a term coined by a Goldman Sachs economist. China's growing power is of both an economic nature as well as a military one, and it uses its "soft power" to achieve various geo-strategic goals. China is becoming a "multi-dimensional power" and therefore posing a "singular threat" to the US.[60] Under the late Bush Administration, China was seen as a 'strategic competitor', and the US saw close relations with India as an important counterweight to China's rise in Asia [Le Monde Diplomatique 2006](which fits well in the heartland-rimland theory). Both China and Russia have permanent seats on the UN Security Council, making both powers important stakeholder in truly global affairs.

While the US enjoyed important uni-lateral options in international monetary terms during the mid-1980s, the years since then and the 2008-2009 financial and economic crisis have reduced virtually to nil America's ability to exert such influence [Burrows and Harris 2009].[61] With the onset of a tenuous global economic recovery in 2009, the US (under President Obama) is turning to China in a show of acknowledgment that the US can no longer act as the world's only pole in a global re-organisation of economic (and geopolitical) affairs. Between 1989, when China was still relatively secluded and internally oriented, and late 2009, China has rapidly come to be seen as near equal partner of the US since the dying days of the Cold War.[62] China's role in the international financial system cannot be understated, having amassed immense foreign reserves and acting as a de facto financier of the US national debt [Ferdinand 2007]. China's structural financial power, as well as productive and economic power have sharply risen relative to the US and OECD countries.

These powers now provide China with the opportunity to solidify and expand its strategic advantages while the US and Europe struggle to recover from the crisis, notwithstanding a further erosion of the value of the dollar as a reserve currency. These developments have led observers of the international political system, such as Brzezinski, to label the relationship between the US and China as well as their collective role in the international political system as a

[60] As Harry Harding of the Eurasia Group put it in 2006, quoted in [Newsweek 2006]. China, which had become an importer of crude in 1993, did not make its impact felt until later but by the late 1990s this change was certainly significant in and of itself from a geopolitical point of view. Having increased its interest in Persian Gulf, and in particular Iraqi oil, a steadily awakening China (whose economic growth has attained much attention since 2004) became deeply concerned about American goals and objectives, in addition to an already frosty Chinese stance on Taiwan and disputed oil and gas resources in seas it shares with Japan, a long time US ally [Noreng 2006]. China appears to prepare for days when oil may be more arduous to attain on the open market, and so its expanding its spheres of influence overseas [Abdelal and Segal 2007].

[61] Ironically, the financial crisis would seem to have further heightened the role of the state, potentially even more so where governments in the West are, for now at least, funding bailouts and coordinating stimulus packages [Burrows and Harris 2009]. The financial and economic crisis of 2008-2009 will weaken US and European states such that they will have neither the resources nor the credibility to play the role in global affairs that they otherwise would have played [Altman 2009].

[62] As of this writing, observers increasingly toy with the notion of a G2 led by the US and China, although both powers appear reluctant to label their potential cooperation as such.

'G2'[63] in-the-making [Brzezinski 2009]. The establishment of the G20, during the aftermath of the 2008-2009 financial and economic crisis, underscores the increasingly multi-polar nature of global economic affairs.[64] On the security front, the on-the-ground military draw the US has achieved in Afghanistan (and Iraq) reflects the limits of military–and especially conventional military–power of the US and its NATO allies [Le Monde Diplomatique 2009a].[65] In structural power terms, the US military power has been made redundant in a world with unconventional warfare.

Russia's open conflict with Georgia and the financial and economic crisis which rapidly unfolded merely weeks later in 2008, heralded a new era. The world is likely to continue to become increasingly interdependent and inter-polar rather than strictly multi-polar [Renard 2009].[66] This new era sees politico-economic and strategic forces return to the foreground, paving the way for a world in which relative economic advantages are harnessed by states rather than purely by markets.[67] As for the changing nature of the international political system, it currently still has only one true hegemon, but especially China is rapidly rising as new pole in the system, particularly in structural power terms (i.e., productive and financial power).

Under Obama, the US will face the dangers of climate change (together with other states), oil supply security issues, military checkmate in Afghanistan, an uncertain presence in Iraq, the rising power of Iran and the growing relative powers of China and Russia [Holbrooke 2008]. The late 2008 US National Intelligence Council's report, *Global Trends 2025: A Transformed World*, indeed points to a more multi-polar world where the US, though still pre-eminent, would be less dominant even as others would still look to it to shoulder many of the global

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[63] The term 'G2' was proposed by Brzezinski, who advocated a regular dialogue between the US and China, which he sees as the two strongest and most influential powers in the international political system.

[64] The US and China are in that regard mutually dependent: the US on Chinese savings and China on US consumption. A combination of technological prowess, capital and labour has enabled China to develop important structural power in productive terms, especially because it created an export surplus. Indeed, the financial and economic crisis of 2008-2009 may well improve China's relative economic position since its economy is more insulated from the international financial crisis, even though its exports have slowed [Altman 2009].

[65] These military conflicts epitomise the America's position as only remaining superpower. In many ways, the military failure of the US and a limited number of its NATO allies (in terms of troop deployments) thus far of establishing military control at least in Afghanistan, an important lynch-pin in the geopolitical high ground of Eurasia, is emblematic of 'imperial overstretch'..

[66] In an assessment of multi-polarity and the BRIC countries, Renard distinguishes between inter- and multi-polarity since the former acknowledges the notion of interference. The 21st century according to Renard is likely o be shaped by asymmetrical multi-polarity, with a distinction between dominant or central powers, major powers, regional powers and local powers [Renard 2009].

[67] National champions were once mere exercises in job creation for countries such as Russia and China, now they are increasingly aggressive, and in many cases are expanding beyond national borders to become influential in Western economies [National Intelligence Council 2008]. Geopolitical factors are returning as a result of state-driven calculations, as opposed to market-driven ones. Indeed, geography appears to be very much back in vogue as powers such as Russia, China, Iran and the US itself seek to create their own classical spheres of influence [Kaplan 2009].[67] As one Swedish analyst has remarked, "we're in an era of geopolitics. You can't pretend otherwise" [International Herald Tribune 2007d].

burdens [National Intelligence Council 2008].[68] While Russia does not have the potential to achieve the status of true global powers such as the US and, in the future, China [Laïdi 2009], it can continue to build on its relative economic advantages nonetheless and still build an important position in the international political system.

3.3 The difficult post-Soviet politico-economic transition during the 1990s

In the immediate aftermath of the collapse of the Soviet Union, the newly established Russian Federation stood on the precipice of an economic abyss.[69] Yeltsin's overall post-Cold War policies were characterised by de-centralisation of the Soviet system. He attempted an overnight re-orientation of Russia's economy through mass privatisation, which was seen as the only way of achieving a fully market-based economy [Åslund 2007].[70] During the mid-1990s, the Russian state was incapable of adequately collecting taxes, primarily because none of the institutional instruments were in place [Tompson 2005]. In order for the government to attain at least some form of income, debt-for-equity swaps[71] were organised, centred on the privatisation of important state assets [Goldman 2008; Tompson 2005]. The lack of any form of clear property rights compounded the prevailing situation when it came to natural resources [Shleifer and Treisman 2000].

The oligarchs managed to become a major driving force in Russian politics as they chose their own political allies, gaining access to policy-making in the process [Freeland 2000]. With the privatisation process, Yeltsin had, if inadvertently, created new political elites with overwhelming financial clout, and the lack of clearly defined property rights certainly contributed to this development. Throughout the 1990s, the mass privatisation of Russia's energy resources led to capital outflows, with earnings on oil and gas sales going to private accounts rather than the Russian treasury, in a process of mass capital flight [Shleifer and Treisman 2000]. This meant that Russia suffered from a state of permanent bankruptcy, ultimately leading to its dependence on IMF-prescribed loans and US benevolence. Russia's gas sector entered a period of

[68] Kagan foresees a world where the US remains a superpower and the other powers merely act as great powers [Kagan 2008b].

[69] Capital markets had to be set up overnight, banking, financial and monetary systems also had to be created as well as meaningful accounting systems so that firms could be valued and their performance judged [Milgrom and Roberts 1992].

[70] Russian reformers such as Gaidar and Chubais became the chief architects of the privatisation effort, deciding to accelerate it by selling state resources and enterprises at little or no charge [Goldman 2004].

[71] The loans-for-share proposal was made by Vladimir Potanin, deputy prime minister under Prime Minister Chernomyrdin, forming the Consortium of Russian Commercial Banks in 1995, which included six leading oligarchic banks (in part also because foreign investors were barred for political reasons). Potanin himself benefits [Goldman 2008]. The banks offered the government $2 billion for one year against collateral of big stakes in some of the country's best companies. The banks could then manage the companies in trust, and if the state did not repay the loan a year later, the bankers would be entitled to sell their collateral, also to themselves [Åslund 2007].

chaos with the rise of opaque gas trading schemes (devised by agents with private interests) and defaulting payments (also see Smeenk [2010]).[72]

What the great depression was to the western world during the 1930s, the economic collapse of the Russian economy was to the Soviet Union during the 1990s [Ferdinand 2007]. Russia's self-esteem during this period dove to a low point, similar to that prevailing in post-First World War Germany [Wendt 1999]. Between 1990 and 1999, Russia lost 45 percent of its GDP and about 50 percent of its consumption [Åslund 2007b]. Russia was now weak, its morale low, its domestic politics and economy in turmoil and its military power in sharp decline [Kagan 2008a]. In structural power terms, Russia's military and financial power, two key structural powers in the international political system, had both been in decline during the 1980s. During the 1990s, these two forms of power evaporated. This only made an economic recovery vastly more complicated for Russia, especially without extensive external support.

Russia was thus precluded from partaking in the process of globalisation and integration into the world economy. These economic and financial woes would greatly shape Russia's initial post-Cold War perception of the outside world. Combined with the government's unsuccessful attempts at collecting taxes and reducing spending (see above), Russia's debt mushroomed. In August of 1998, the Russian government abandoned its exchange rate target, simultaneously devaluing and defaulting on its debts and freezing all international payments, resulting in the Russian financial crisis of 1998 [Åslund 2007]. The Russian 1998 financial crisis, which was partially the result of speculative capital in- and outflows, devastated individual savings and further eroded public confidence in Russia [Ferdinand 2007].

3.4 Relations with the West during the 1990s

While Russia struggled to make an internal economic recovery during the early 1990s, external factors also affected Russia's perception. In Waltzian terms, Russia's position as the centre of one of the poles of power during the Cold War evaporated to leave a uni-polar world led by the US. In the immediate aftermath of the Cold War, Yeltsin appeared convinced that, since Russia was no longer communist, it could no longer be an enemy of the US and its European allies and hoped that swift integration with the West would ensue.[73] Russia's perception of the US and its NATO allies as friendly nations began during the mid-1980s, under Gorbachev. The mutual stand-off between the two superpowers, the ever-present threat of nuclear war,

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[72] Chernomyrdin had ensured that the gas sector remained centrally institutionalised in Gazprom, which was a partially state-owned company, inherited the old Soviet Ministry of Gas [Stern 2005].

[73] It was in this atmosphere of immediate post-Cold War peace that the idea arose of integrating Russia into the Western bloc as a fully-fledged member, inspiring Russian democrats and their partners in Europe and America [Trenin 2007]. Because Yeltsin was as pro-Western in his thinking on economic policies and his initial desire to join the Western bloc, the West was all too happy to see him stay in power [Talbott 2002].

and the Soviet Union's economic weaknesses compelled the Soviet Union to seek an opening to the West. In the Soviet perception, the Cold War was effectively lost, and thus in that perception came the shift from an atmosphere of mutual animosity to mutual reconciliation. Throughout this period, Russia can be said to have transitioned from a Hobbesian anarchy to a Kantian one. In the initial months and years after the Soviet collapse Russia merely sought to belong to the West [Trenin 2007].[74] In Wendt's terms, Russia sought a collective security identity to belong to, also to sooth its humiliating Cold War defeat [Moïsi 2008].

Gorbachev's notion of a common 'European home' in 1987 was the precursor to this idea, when Gorbachev espoused reconciliation and unity within Europe and between the two superpowers.[75] During the early 1990s, Russia jumped on the apparent opportunity to subscribe to Western treaties such as the Energy Charter Treaty (ECT).[76] Nonetheless, the West remained apprehensive about embracing Russia in the period stretching from the late 1980s to the early 1990s. Even though openings towards Russia were made on some fronts, there was no open-armed embrace to draw Russia into the West. In addition, Western lenders took a tough position in the so-called Paris Club, which was to negotiate Russia's debt service. Ultimately the absence of full scale Western political and economic support contributed to the fall of the Russian reform government in 1990 [Åslund 2007].

As Russia's spheres of influence crumbled in its Eurasian periphery (in the post-Soviet space) Russia's presence as an actor on the global stage also receded sharply. The process of globalisation as it was envisioned during the 1990s (and encouraged primarily by the US), prescribed a de-nationalisation of national interests. It was expected that Russia would proceed in leaving entirely to market forces its national interest, whether or not this was at the expense of the Russian government and at the expense of Russia's perceived public interests at large. Globalisation for Russia thus prescribed leaving to market forces issues such as the distribution of economic wealth, a 'de-territorialisation' of Russia's national interest, and the marginalisation

[74] The idea, popular at the time, was that Russia would be drawn into the Western community inspired by Russian democrats and their partners in Europe and the US and backed by some type of Marshall Plan, early NATO membership and a tighter association with the EU [Trenin 2007].

[75] Gorbachev first presented his idea of "our common European home" or the all "all-European house" when visiting Czechoslovakia in April 1987, declaring in his main address: "We assign an overriding significance to the European course of our foreign policy.... We are resolutely against the division of the continent into military blocs facing each other, against the accumulation of military arsenals in Europe, against everything that is the source of the threat of war. In the spirit of the new thinking we introduced the idea of the "all-European house"... [which] signifies, above all, the acknowledgment of a certain integral whole, although the states in question belong to different social systems and are members of opposing military-political blocs standing against each other. This term includes both current problems and real possibilities for their solution" [Svec 1988, p. 990].

[76] In 1990, the Dutch Prime Minister, Lubbers, proposed the creation of a common European Energy House in response to Gorbachev's Perestroika and his own proposal of a European House, which eventually led to the European Energy Charter. The collapse of the Soviet Union and the US fear that the EU would gain preferential access to Caspian Sea and Russia's energy resources, resulted in US diplomatic pressure to open up the charter discussions for every government interested [CIEP 2004].

of sovereignty in determining the shape and form of government. Russia's perception of the Washington Consensus, in this regard, was that of a semi-colonial programme aimed at undermining Russia's ability to determine its own course in the international political system.

By 1994, the seemingly priceless window of opportunity to integrate Russia into the Euro-Atlantic community, and particular the opportunity to integrate Russia into the European community of nations, had passed. According to Trenin [2006], the West deserves some blame for the fact that Russia never joined the West during the early 1990s and decided to pursue its own course, with all the consequences hereof [Trenin 2006]. During the mid- to late 1990s, the insurrection in the breakaway republic of Chechnya was seen as a grave geopolitical threat to the territorial integrity of the entire post-Soviet Russian Federation. It was feared early on during and after the Soviet Union's collapse that these types of independence movements would lead to further similar, ethnically motivated secessions elsewhere [Pantin 2007].[77] At the same time, post-Soviet states in Central Asia and the Caucasus began pursuing a multi-vector policy, seeking to take their distance from Moscow. Russia's influence in the now post-Soviet space of Central Asia receded sharply as a result.

The collapse of the Soviet Union also led to a de-integration of economic relations between Russia and its former Soviet republics. This development also had a major impact on gas flows, in that it de-integrated Russia's Soviet-era gas production and distribution system as Soviet republics gained their independence (see Smeenk [2010] for a more detailed account of this transition). It was believed in Moscow that the dissolution of the Warsaw Pact and the Community for Mutual Economic Assistance (CMEA) would not be followed automatically by the gravitation of their former members either toward NATO, or even only toward the EU, let alone both [Brzezinski 1997]. In 1997, the 'Final Act' was signed, in which Russia accepted the accession of Poland, the Czech Republic and Hungary to NATO, in exchange for a so-called makeshift agreement intended to imply Moscow's own special relationship with NATO [Legvold 2007b].

The US became an important factor in the Central Asia region, aiming to break up what it perceived as Russia's monopoly of influence in the region, even under Clinton [Blank 2001]. During the 1990s, the US pressed for NATO expansion[78] into Central and Eastern Europe,

[77] Chechnya lay at the heart of a region between oil and gas producing areas in and around Astrakhan on the Caspian Sea coast and other important areas in the Caucasus, its independence and secession would spell disaster for Russian geopolitical integrity in the entire region. This in turn could lead to further granulation of Russia's sphere of influence in the post-Soviet space and worse yet, even its own territorial integrity.

[78] The US then pursued NATO expansion into the ex-Warsaw Pact space, i.e., Central and Eastern Europe. In 1999, NATO expanded to Hungary, the Czech Republic and Poland.[78] NATO further expanded in 2004 (as a follow-up to agreements to expand the alliance in 2002) to encompass seven states in Eastern Europe.The expansion of the EU followed suit later on, with the European powers acting more as independent economic powers rather than as true security presence

helping transform the geopolitical make-up of the Black Sea region and Eastern Europe, i.e., an important focal area in the rimland between Europe and the Middle East.[79] For the US, such a scenario involving the dismantlement of Russia's sphere of influence and the break-up to the outside world and to foreign investment of a zone rich in natural resources would lead to an 'optimal' organisation of the heartland. Such a scenario would precipitate the de-nationalisation and diversification of oil and gas flows the US sought as part and parcel of its vision of the new rules of the game of globalisation. Indeed, US policy vis-à-vis oil and gas flows has in general always been centred on the notion of opening up such (free) flows to a global markets [CIEP 2004]. This pertains not only to Eurasia (Central Asia and the Middle East) but also, in recent years, to energy-rich areas in Africa.

3.5 Politico-economic stabilisation during the 2000s

After the collapse of the Soviet Union, no one in Russia really had any clear idea as to what Russia belonged to and by extension, what Russia's national interests were. Initially, the most important concern consisted of joining Western institutions and subscribing to Western market democratic values. This is part of what Putin and his political allies sought to change by securing for Russia a new place in global politics, first by securing her national interests. With the post-1998 financial and economic stabilisation and post-1999 rise in oil prices, a sense of cautious confidence arose in the Russian leadership as the state budget saw an inflow of larger, and more stable revenues. From a macro-economic point of view, the 1998 crash had broken the overwhelming resistance to economic reforms which were held at bay since 1994 [Drazen and Grilli 1993].

Russian economic activity was given new impetus and the demand for a range of commodities and goods began to rise while Russia's foreign account was brought back in order [Åslund 2007]. When he came to power in 2000, Putin's objective was to restore domestic stability in economic and political terms and to protect gains made and rebuild Russia's strategic position in international economic and political terms [Åslund 2007]. Putin's notion of 'real sovereignty', i.e., state-guided economic prosperity backed by scientific and technologic innovation, reflects the importance Russia attaches to the right to self-determination in internal, domestic politico-economic matters [Ferdinand 2007]. Domestically, the lack of control exercised during the politico-economic crisis of the 1990s led Putin to restore some measure of order

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in the Caspian Sea region. The involvement on the part of the European powers was less than expected, except for a few initiatives such as INOGATE, TRACECA and TACIS programmes [Bossuyt 2008]. These did not result in any concrete steps in the region.

[79] These included Estonia, Latvia, Lithuania, Slovenia, Slovakia, Bulgaria and Romania. Croatia, Macedonia and Albania already take part in a NATO cooperation program, a first step to possible membership of the alliance. At the same time, Serbia, Montenegro and Bosnia-Herzegovina were invited to join the program in 2006.

through state-centred reforms, returning Russian society to a state of relative stability. In Wendt's type identity terms, the role of state was seen as crucial to achieving this goal.

Internally, Putin's objective was to restore domestic stability in economic, political terms and protect gains made during the early 2000s and, ultimately, rebuild Russia's strategic position in international economic and political terms [Åslund 2007].[80] The role of the state is central to Putin's plan to strengthen Russia from within, where democracy and free markets take a back seat to stability and predictability [Gaddy and Kuchins 2008]. The belief as to how to proceed consisted of combining market-based capitalism with a strong role of the state, where the state would retain an influential position on key economic and strategic matters. Putin seemed determined that the Russian state should have a decisive voice in major decisions about energy and natural resources [Balzer 2005]. Other concerns of the Russian leadership under Putin included protecting and maintaining the territorial integrity of the Russian state and halting the further granulation of Russia's sphere of influence within the CIS.[81] Essentially, this boiled down to re-organising the heartland through new relationships (where gas flows were one channel through which this can be achieved).

During the 1990s, Russia's oil resources and production assets were broken up and fell mostly into private hands, with a number of private companies now active in the Russian oil industry. This deprived the Russian government of access to information and allowed Russia's income to be funnelled into private hands. Under Putin, these results of Yeltsin-era policies would be reversed. The belief that greater state control over the ownership and exploitation of Russia's energy resources was enacted upon first by tackling the oligarchs, during Putin's first and the beginning of his second term. Putin argued during the 1990s that there should be some type of 'embedded autonomy' for the state's economic decision-makers [Evans 1995]. The loss of control over domestic natural resources is and has been seen as a major threat to Russia's economic security [Xinhua 2009].

The events which occurred throughout the 'freewheeling' 1990s on the part of politico-economic 'agents' such as the oligarchs, is what helped shape the views of the current Russian leadership [Trenin 2007].[82] The oligarchs made control of the state over matters of national

[80] The subsequent political reforms carried out by Putin in the form of re-centralisation throughout the early to mid-2000s were sustained by a steadily improving economic environment, resulting in a strictly centralized system because all the ambiguities of federal-regional rights were eliminated [Shevtsova 2005].

[81] The war against Georgia in 2008 further underlined the importance of Russia's perception of its territorial integrity in the post-Soviet space in ethnic terms and projected its power in the region. The war was seen as necessary to for Russia's self-preservation.

[82] The oligarchs contributed to Russian economic growth after 1995, and that while they stripped assets from state-controlled companies, more often than not they did so to buy more companies when they were for sale [Shleifer and Treisman 2004].

interests problematic, especially from the moment they began meddling with political affairs. While Khordokovskiy went too far in meddling in Russian politics, his plans to sell a major stake in Yukos to ExxonMobil would have constrained the Russian state's ability to exert dominant influence in Russia's oil industry [Balzer 2005].[83] According to expert interviews, because of the massive outflows of capital, to the detriment of Russia's state coffer, high level discussions began in 2003-2004 on the matter of channelling Russia's oil and gas export earnings back towards Russia's economy and into state hands.

3.6 Russia's post-2000 perceptions of and policies towards the West

Energy revenues and structural financial power

The rediscovery of a renewed role for Russia as a great power is not solely based on military force and political influence as such, but mainly underpinned by economic factors [Trenin 2007]. Oil prices had provided valuable revenues to the Russian government budget from 2004 onwards, enabling Russia to eliminate its foreign debts, making Russia more financially independent as far as state finances are concerned. Oil and gas export earnings and Russia's role in the oil and gas markets (primarily in its relation with Europe as far as gas is concerned) buoyed its spirits.[84] The collection of sizeable foreign currency reserves in its Sovereign Wealth Fund (SWF) has provided Russia, in a way similar to China, with greater structural financial power in Strange terms.[85] This financial power provides Russia with the means to develop other forms of structural power.

In classical Waltzian terms, energy as such offers Russia the means to re-balance the power of the US in Eurasia and elsewhere, particularly in the geopolitical terms. It is important to remember that, in the post-Cold War world, Russia is much aware of its inability to "shape even its most immediate external environment" due to a limited array of tools [Legvold 2007b, p. 102].[86] Putin has sought to draw Europe and the US into Russia's energy orbit precisely be-

[83] It would appear that Khordokovskiy also planned to buy a stake in Gazprom, where he might have formed an important bottleneck in Russian state policy-making with regard to that national champion. Rosneft and TransNeft opposed Yukos' plans to build its own pipelines on the basis of economic rather than political or strategic considerations [Balzer 2005].

[84] The steep rise in 2004-2006 oil prices freed Russia of any need for funds from the IMF, the WB or the EBRD, dramatically easing its debt repayment and also enabling it to repay its debt to the Paris Club [Legvold 2007a].

[85] Oil and gas revenues are vital to the Russian state budget, as in all oil and gas producing and exporting countries. According to Stern [2009] the contribution of the gas industry to Russian GDP was 8-9 percent in 2006 [Stern 2009b]. Energy rents in the days of the Soviet Union peaked in 1981 at 40 percent of GDP, sinking to an all time low throughout the 1990s due to low oil and gas prices, the privatisation process, the lack of a stable tax regime and reduced production volumes after the collapse of the economy [Gaddy and Ickes 2005].

[86] At the same time, the Russian leadership sees the West's criticism of Russia's heavy-handed use of its energy wealth as disingenuous, a shroud for the Western leaders' real unwillingness to accept a self-assured Russia once more attentive to its national interests and insisting on being taken seriously [Legvold 2007a]. Conversely, Russia's leadership sees it as merely natural for Russia to make use of its natural competitive advantages [Lavrov 2007]. Russia nevertheless still lacks the military wherewithal to be accounted for as a strong military power and is still over-reliant on oil and gas export earnings.

cause he saw gas and oil as his country's most potent foreign policy instrument, which in no small measure explains Russia's moves in gaining greater state control over these resources [Legvold 2007b]. The Russian government remains keenly aware of the imperative to modernise the oil and gas sector and to make progress with other parts of the energy sector such as developing alternative fuels such as clean coal and internationally competitive nuclear energy [Trenin 2008b]. As briefly mentioned in Chapter 1, Russia also remains mindful of its over-dependence on oil and gas revenues,[87] which hints at its interdependence with other geo-strategic players.

Russia's regional perceptions in the post-Soviet space

Even before the advent of Putin, Russia's perception of NATO expansion and the sidelining of Russia's interests, amongst other factors referred to above (e.g., the lack of Western initiatives to integrate Russia) became tainted by the return of a geopolitical view of the outside world. Geopolitics as a lens through which to perceive the world leads Russia to the idea or notion of a strategic space in Eurasia that it occupies and needs to protect. This notion, though it arose in Russia's psyche as early as the mid-1990s [Kerr 1995], it was acted upon by the mid-2000s as Russia grew stronger. This development has much to do with Russia's shapeless borders and its sometimes agonising quest for identity [Legvold 2007a], in which these perceived borders play a key role. For Russia, NATO expansion from the end of the 1990s onwards was seen as a direct intervention into its own sphere of influence, which also holds for US influence in other post-Soviet countries. Indeed, the role of NATO is particularly poignant from a Russian perspective, further shifting Russia's perception of the US and its European allies.[88]

From the Cold War-era border between NATO and the Soviet Union, running through the centre of Germany, NATO expanded to absorb many Central and Eastern European countries. Now the alliance borders the post-Soviet space directly (with the Ukraine, Moldova, Georgia and Azerbaijan in the Caucasus). Seen from Moscow, NATO's official military force projection now extends across the Black Sea region. The US established GUAM in 1997 as a further Euro-Atlantic sphere of influence in the region, as a means of integrating these coun-

[87] The 2008–2009 global financial and economic crisis, which was accompanied by a sharp drop in oil and gas prices, and dealt a major blow to Russia's earnings. These earnings enabled Russia to weather the impact of the crisis thanks to the stabilisation fund it had set up in 2004 (in part to amass foreign currency reserves). The crisis also served as a reminder that Russia's state finances are still heavily dependent on oil and gas revenues, and that its banking sector still needs profound reforms [The Economist 2009b].

[88] As Russian Foreign Minister Sergei Lavrov claimed in a 2007 article published by the Russian Ministry of Foreign Affairs: "various attempts are being made to contain Russia, including through the eastward expansion of NATO in violation of previous assurances given to Moscow. Today, supporters of NATO enlargement harp on the organisation's supposed role in the promotion of democracy. How is democracy furthered by a military-political alliance that is producing scenarios for the use of force? Meanwhile, some are promoting the extension of NATO membership to the countries that comprise the Commonwealth of Independent States (CIS) as some sort of pass providing admittance to the club of democratic states whether these countries meet the democratic test or not. One cannot help wondering whether this initiative is being pursued for the sake of moral satisfaction or again to contain Russia" [Lavrov 2007].

tries into the US sphere of influence without having to draw them into NATO directly, at least not yet.[89] Two of the GUAM countries, Georgia and Azerbaijan now enjoy close relationship with the US as outposts of US influence in the post-Soviet space. Now the alliance aims to become a major guarantor of security for countries in Central Asia and the Caucasus, an aim which was formally articulated in 2004 in Istanbul, with the announcements of plans to place emphasis on engagement in both regions [Berman 2004].

In Russia's view, NATO expansion is an especially sensitive issue in view of earlier US guarantees upon the eve of the dissolution of the Soviet Union not to expand the alliance [Cohen 2005]. Russia increasingly sees the ceding of independence to the Baltic states, the Ukraine and Georgia, the acceptance of growing Euro-Atlantic influence in Central Europe, the Caucasus and Central Asia, as nothing more than a surrender imposed by the US and Europe during a period of Russian weakness [Kagan 2008a].[90] This evidences Russia's geopolitical perception. As early as 1995, Yeltsin made clear his desire for creating a CIS economic, political and defence union, reflecting the determination to integrate CIS territory, including the Central Asians states, as evidenced also by the founding of the Collective Security Treaty Organisation (CSTO) [Jonson 2001].[91]

The colour revolutions[92] in Georgia, Ukraine and Kyrgyzstan, in the early 2000s, were seen in Moscow as part of a broader Western geopolitical campaign to help displace incumbent, ex-Soviet or pro-Russian leaders through popular support. They formed a further encroachment of Euro-Atlantic influence on Russia's own position within the post-Soviet space. In the mean time, military ties with these countries were either established or expanded through both bilateral relations with the US, or special NATO-based programmes. The Euro-Atlantic engagement in the Caucasus and Central Asia in plans to develop new energy corridors, and in security cooperation with states of the region, reflected a drastic change of the strategic scene, with

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[89] The four GUAM countries were given prospects for NATO membership themselves, ostensibly aimed at gaining influence for the US and NATO in the Black Sea region. The GUAM is actually an Organisation for Democracy and Economic Development within the post-Soviet space, its charter having been signed in 2001 by its members and founded in 1997. It is a classic example of the creation of post-Cold War US spheres of influence in the post-Soviet space. Turkey and Latvia are observers.

[90] Andrei Kokoshin, head of the State Duma's Committee on CIS Affairs claimed in 2006 that "the policy of eastward expansion is counterproductive and will significantly complicate relations between the alliance and Russia" [Eurasia Insight 2006]. In 2006, Russia saw the Ukraine as a likely border area between the Euro-Atlantic community and its won borders, due in large part to a manifestly strong Russian influence there not only because of gas exports but also aggregate capital flows and trade relations [OSCE 2006].

[91] The Collective Security Treaty Organisation (CSTO) was established in 1994 in an effort to re-integrate Russian multilateral interests within the post-Soviet space, though in its initial conception, not necessarily as a counterweight to NATO.

[92] According to McFaul, the crucial conditions for the three coloured revolution consisted of: (1) a semi-autocratic regime, (2) an unpopular leader of the *ancient régime*, (3) a strong and well-organized opposition, (4) an ability to put up the perception quickly that election results were falsified, (5) enough independent media to inform citizens about the falsified vote, (6) a political opposition capable of setting demonstration in motion to protest against electoral fraud and (7) a division between intelligence forces, the military and the police [McFaul 2006].

direct consequences for Russia [Jonson 2001]. In Russia's perception, it now faced the long-run prospect of further US and NATO influence in Central Asia and the Caucasus, well beyond the Black Sea (and well into the heartland).

The granulation of the Soviet Union into separate states is still deeply resented in the Russian leadership. Putin, like many in his circle of political allies, sees the collapse of the Soviet Union, and the loss of empire for Russia, as the "greatest geopolitical catastrophe" of the 20th century [Eurasia Insight 2008]. In addition, with the expansion of the EU to 27 members by early 2007, the EU's expanding neighbourhood policy began overlapping influence with Russia's near-abroad.[93] The role of the US and its policies, reflected in part by NATO expansion and its actions as a uni-polar power, are central to the Russia's fear of being driven into a corner; much of Russia's geopolitical concerns thus stem from the 'geopolitics of emotion' [Moïsi 2008]. A statement from Putin in 2007 on NATO expansion to and training in Eastern Europe attests to this Russian perception: "Our partners [NATO] are stuffing Eastern Europe with new weapons. What are we supposed to do? We cannot just sit by and watch all this" [Russia Profile 2007].

Russia thus made the shift from a Kantian culture of anarchy to a more Lockean or perhaps even Hobbesian one in a relatively short period, and the trigger for this shift has been the US geo-strategic posture in Eurasia at large, and in the post-Soviet space in particular. "Russian foreign policy had gone from the naively optimistic expectation that Russia's future lay with the West, a comfortable refuge while the country built democracy and a market economy in a world increasingly shaped by Wilsonian values, to a hard-bitten, touchy, power-seeking enterprise, at arm's length from the US and Europe, committed to rebuilding the country's military power, determined to maximise Russian influence in the post-Soviet space, an arena regarded as Russia's sphere of influence, and driven by a Hobbesian view of the world" [Legvold 2007a, p. 10]. Long-run interests for the US and Russia in Central Asia and the Caucasus are simply incompatible [Berman 2004].

Energy, especially in Central Asia, has certainly played an important role in influencing Russia's security perceptions [Jalalzai 2003]. The security establishment in Russia also appears

[93] With the expansion of the EU in 2004 (and 2007) came the expansion of scope of the EU neighbourhood policy, which, as far as ex-Soviet countries are concerned, now includes the newest neighbour countries of the EU: Belarus, Ukraine, Moldova, Georgia and Azerbaijan. "The European Neighbourhood Policy (ENP) was developed in 2004, with the objective of avoiding the emergence of new dividing lines between the enlarged EU and our neighbours and instead strengthening the prosperity, stability and security of all concerned. In this way, it also addresses the strategic objectives set out in the December 2003" See: http://ec.europa.eu/world/enp/policy_en.htm and http://ec.europa.eu/world/enp/pdf/com03_104_en.pdf.

well-aware of the potential for conflict over access to energy resources in the entire region.[94] The developments described above encouraged a more active Russian role in Central Asia and the Caucasus regions during the early 2000-2001, after Putin's advent to power [Cummings 2001]. Putin reinforced the importance of the CIS generally for Russia, with the region playing not only a role of political prestige for Russia but also involving economic interests [Berman 2004]. In a statement that captures both Russia's geopolitical perception of the outside world and underlines the importance Russia attaches to the post-Soviet space, Putin claimed in 2004 that Russia is "facing an alternative–either we'll achieve a qualitative strengthening of the CIS and create on its basis an effectively functioning and influential regional organisation, or else we'll inevitably see the erosion of this geopolitical space, [which] should not be allowed to happen" [Torbakov 2004].[95]

It is a region of 'privileged interest' for Russia, where in the latter's view the Euro-Atlantic community has begun to impinge upon Russia's interests. Putin already undertook financial and diplomatic initiatives once he came to power, in 1999, to re-establish close links with the region's post-Soviet leaders. Of the various Caspian Sea countries, Turkmenistan is still seen by Russia as part of its exclusive sphere of influence [Olcott 2006], and plays an important role in Russia's gas strategy (also refer to Chapter 6). From the very beginning, Russia's renewed proactive posture in Central Asia since 1999 was to set to compel both the US and China to become involved in the region as well [Cummings 2001].

Russia pursues the re-integration of relations with post-Soviet countries in Central Asia both through security platforms and by committing to long-term economic interests in the region, in a way that competes with the Euro-Atlantic bid for greater influence. The CSTO has now become a platform for the reintegration of Russia's security interests with the Central Asian countries, as a counterweight to NATO as well as to US influence in Central Asia. Russia has initiated the formation of a CSTO rapid reaction force, for possible deployment in the post-Soviet space and to be based in Russia with a contribution of military units from the various signatories [RIA Novosti 2009]. This is a counter-challenge to what Russia sees as US influence indirectly through NATO and directly through the establishment of military bases throughout the region in 2001, though it is doubtful whether the CSTO can achieve the same

[94] The 2009 Russian National Security Strategy recognises that increased competition for resources is likely and Russia must act accordingly: "in a competition for resources, problems that involve the use of military force cannot be ruled out, which would destroy the balance of forces close to the borders of the Russian Federation and her allies" [Xinhua 2009].

[95] When it comes to the post-Soviet space, especially Central Asia, the Security Council of the Russian Federation proceeds from the premise that "the scale of Russia's interests on the Caspian direction determines the necessity of its comprehensive presence in the region and of the pursuit of a more vigorous political line there… We intend to firmly uphold and promote our lawful interests in the Caspian that no one has the right to impinge upon" [Jalalzai 2003, p. 30].

level of effectiveness as NATO.[96] In 2005, the US was evicted from Uzbekistan but maintained the leasing of bases elsewhere in the region and was also evicted form Kyrgyzstan in 2009.

Russia's 2008 invasion of Georgia was largely the result of Russia's determination to show, by military means, that its geopolitical sphere of influence in the post-Soviet space could no longer be trifled with.[97] Regionally, Russia perceives a Hobbesian anarchy in its periphery, where the US has been a key instigator of rivalry between Russia and what it sees as US pawns designed to undermine its geopolitical position (as explained above). Even so, "as far as the CIS is concerned, Russia has the capacity to maintain social, economic, and other forms of stability in the region. Moscow's rejection of politicised trade and economic relations and its adoption of market-based principles testify to its determination to have normalcy in interstate relations. Russia and the West can cooperate in this region but only by forsaking zero-sum power games" [Lavrov 2007].

The de-stabilising effect of the 2008–2009 financial and economic crisis offered Russia an opportunity to become the dominant force again in Central Asia. Moscow has offered former Soviet republics billions of dollars in bilateral loans, and is setting up an emergency fund to lend billions more to countries within the Eurasian Economic Community (EEC).[98] This development is a direct result of Russian structural financial power, now greatly enhanced by the crisis, even though it has suffered its own financial losses. It has enabled Russia to play an important economic role again in the post-Soviet space, and to turn the table on the US in the region in terms of financial, economic and military influence.

Russia's relations with Europe

From Russia's perspective, Europe is an area of economic and political activity with which Russia has had ties for centuries, and today it is Russia's major regional gas export market. Europe, as both an entity and locus of independent activity, therefore merits attention in a review of Russia's relations with the Euro-Atlantic community. Since the early 1990s, the traditional western European powers have become more independent of US policy, and have

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[96] Indeed, Russia's military policy in Central Asia acts as a counterweight to the US strategy [Blank 2007]. In 2009, the US agreed with Turkmenistan to allow for the refuelling of NATO planes in Ashgabat and to open a land corridor for supplies to Afghanistan [Eurasia Insight 2009a]. In early 2009, Russia offered Kyrgyzstan a $2 billion loan in exchange for taking over the Manas air base there, a vital re-supply base for the US war effort in Afghanistan; the US was asked to leave the base within 180 days [Financial Times 2009e].

[97] It demonstrated how far Russia was willing to go to protect its territorial integrity, given especially the issue of ethnic Russians living within Georgia and in other countries in the post-Soviet space. Also of important from a Russian point of view has been the process of the West's effort to wean Kosovo away from Serbia and its support for the province's independence from Serbia, a long time Russian ally in the Balkan and one that Russia perceives as part of its sphere of influence.

[98] The Eurasian Economic Community is a formerly dormant organisation that comprises six former Soviet republics including Russia. It is set to have much greater flexibility than either the International Monetary Fund, which imposes conditions on its lending, or the European Union, which is preoccupied by the impact of the crisis.

evolved in different foreign policy directions within NATO and as part of a steadily more expansive and independent EU, seeking a role for itself, flowing forth from the Lisbon agenda. At a governmental level, Russia pursues close ties with Germany and France[99] as well as Italy, primarily in the sphere of energy cooperation, which also fits into its overall company-level gas strategy (also refer to the term 'vertical energy diplomacy' in chapters 8 and 9). At the EU level, Russian policy-makers and Gazprom officials are puzzled by Europe's concern about functioning internal gas markets and security of supply and a parallel, ostensible desire to wean the EU off of its dependence on Russian gas [Handelsblatt 2010].

Interdependence, rivalry and cooperation

Within its own periphery, Russia perceives international affairs in zero-sum hard security terms. In global terms, Russia's idea is that it must have an active role in international affairs. Russia's perception of the outside world also pertains to uni-lateral US behaviour, which Russia greatly resents.[100] The world, Putin said at a 2007 security conference in Munich, is now uni-polar: "One single centre of power. One single centre of force. One single centre of decision-making. This is the world of one master, one sovereign [...] Today we are witnessing an almost uncontained hyper use of force in international relations – military force [...] Primarily the US has overstepped its national borders, and in every area" [International Herald Tribune 2007e].[101]

Putin meekly yielded when the Bush Administration backed out of the Anti Ballistic Missile (ABM) Treaty in 2001, and in 2002, he treated as a minor triumph the signing of a strategic arms treaty that did little more than codify the decline of Russia's nuclear forces and sanction US modernisation plans [Legvold 2007b]. The abrupt abandonment of the 1972 Anti-Ballistic Missile Treaty (a symbol of true Cold War era cooperation between the Soviet Union and the US) by the Bush Administration in late 2001 was a silent blow to US-Russian relations. From a Russian perspective, there was little in the way of immediate, concrete concessions on the US

[99] Russia's post-Cold War relationship with France and Germany did improve, especially in their common disagreement with US unilateralist approach to Iraq in 2003.

[100] Andrei Kokoshin, head of the State Duma's Committee on CIS Affairs claimed in 2006 that "the policy of eastward expansion is counterproductive and will significantly complicate relations between the alliance and Russia" [Eurasia Insight 2006]. In 2006, Russia saw the Ukraine as a likely border area between the Euro-Atlantic community and its won borders, due in large part to a manifestly strong Russian influence there not only because of gas exports but also aggregate capital flows and trade relations [OSCE 2006].

[101] Russia began to resent US uni-lateral behaviour when earlier Russian efforts to cooperate with the US, particularly in the immediate aftermath of the September 11, 2001 attacks, when Russia remained relatively mute over US intervention in Central Asia. Russia seized the opportunity in the direct aftermath of the 9/11 attacks to show solidarity with the US over the issue of Islamic terrorism in an effort also to legitimise its stance on and actions in Chechnya. In a show of goodwill to the US, Russia allowed the transit of US equipment over its territory for use in the American war effort in Afghanistan.

side in the form of economic and political cooperation, with little room for Russia as a partner.[102]

At a regional level, Russia perceives the structure of international political system in Hobbesian terms and competes accordingly with the US. The behaviour of the US as a geopolitical adversary is seen regionally by Moscow in Hobbesian terms, but in more Lockean terms at a global level, where Russia knows it cannot yet challenge US in structural financial power. The US perceives Russian attempts to defend its regional interests as a futile zero-sum game. US Secretary of State Rice's statement about Russia's perception typifies post-Cold War US views: "we want a 21st Century with Russia, but at times, Russia seems to think and act in the zero-sum terms of another" [Russia Profile 2007]. David Kramer, Deputy Assistant Secretary of State for European and Eurasian affairs, said that U.S. policy toward Russia can be described as "cooperate wherever we can, push back whenever we have to" [Russia Profile 2007]. The energy dependence of its allies on a *potential* geo-strategic competitor, and the notion of a resurgent Russia in and of itself challenges US power in Eurasia. Indeed, even now Gazprom is seen as a major obstacle to the ability of the US to exercise influence in both newly admitted NATO countries and across much of the post-Soviet space, perceiving Gazprom as an extension of the Russian State and therefore as a source of *political* concern [OSCE 2006].

Whether Russia can move beyond what it sees as "the 'real' business of security and geopolitics" [Lo 2003, p. 51] is a key determinant for its ultimate ability to become an important broker in global international affairs. Can Russia move beyond its perception in terms of Hobbesian power politics? In the longer run and at a global level, Russia cannot hope to rival or challenge the US and its NATO allies, or even China [Laïdi 2009]. While Russia perceives the world partially in Hobbesian terms, on a global level it must take into account a Lockean culture based on interdependence, involving rivalry and cooperation as well as diplomacy.

Arguably, Russia may well perceive this interdependence in Lockean terms. Despite the stark image of US-Russia relations presented above, Russia and the US also cooperates on a number of issues. Russia appears open and willing to cooperate with US on a range of issues, and acts as a rival when it comes to others. Even though US military and financial power greatly exceeds that of Russia, the US still needs Russia on a number of international economic and security matters. These include containing Iran's nuclear ambitions, efforts to limit competition

[102] Cohen succinctly comments that "[i]nstead of embracing post-Soviet Russia as an equal partner in ending the cold war and the arms race, both the Clinton and the George W. Bush administrations undertook a triumphalist winner-take-all policy of extracting unilateral concessions first from Yeltsin and then from Putin. They have included the eastward expansion of NATO (thereby breaking a promise the first President Bush made to Gorbachev); the withdrawal from the Anti-Ballistic Missile Treaty, which had discouraged a new nuclear arms race; the bogus nuclear weapons reduction treaty of 2002; and the ongoing military encirclement of Russia with US and NATO bases in former Soviet territories" [Cohen 2005].

in the area of curbing strategic arms, etc.[103] Russia is dependent on foreign markets for its gas export earnings, which currently includes mostly European gas markets, i.e., Russia is also dependent on the Euro-Atlantic community. There are limits to the extent to which it can act as a geo-strategic competitor with the US by expanding its influence in Europe, for example. Russia seeks to be its own Waltzian pole between the Euro-Atlantic community and a rising China, where its gas relations with China offer it a relative advantage with regard to European powers.

Russia seeks a position of sufficient strength, indeed of its own rightful sphere of interest, at the very least in the post-Soviet space, and perhaps beyond. While Russia no longer recognises US and European moral authority [Trenin 2007], it must still deal with the West and other powers in an interdependent world. In such a Lockean world, relative economic advantages consist of developing one's structural powers by reducing or limiting those of rivals. The difference between absolute and relative advantages, i.e., between a Hobbesian and a Lockean world is similar to the comparison between chess and "go", one that Henry Kissinger made in 2004:

"Chess has only two outcomes: draw and checkmate. The objective of the game is absolute advantage – that is to say, its outcome is total victory or defeat – and the battle is conducted head-on, in the centre of the board. The aim of go is relative advantage; the game is played all over the board, and the objective is to increase one's options and reduce those of the adversary. The goal is less victory than persistent strategic objectives."[104]

Economic and strategic positioning involving energy as such, and energy diplomacy, can provide Russia with the means to create for itself a niche from which it can consolidate its position as an important broker in the international political system. Advantages in the gas sphere provide Russia with bargaining chips in other economic and strategic dossiers and geopolitical matters.

3.7 Russia's periphery and its gas interests

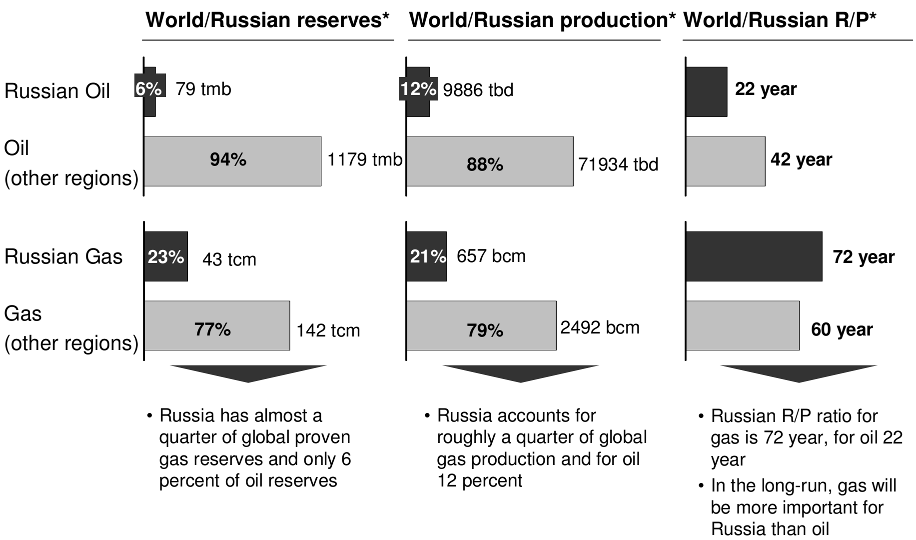
The perceived importance to Russia of its gas reserves

As was mentioned in Chapter 2, gas is increasingly a commodity of economic and strategic importance. At the state level, Russia's perception of its position as a major gas reserve-holder is an important, providing Russia with a sense of potential dominance in interregional gas

[103] The US is currently renegotiating the follow-up to the 1991 START Treaty.
[104] Henry Kissinger quoted in [Newsweek 2004].

market developments [Goldman 2008].[105] Gas as a resource provides Russia with the means to shape the economic and political boundary solutions of energy transition to more a more sustainable energy mix. Oil can in the mean time serve as a 'cash cow'. Having said that, of the few major gas suppliers in the world, Russia is the largest, holding some 43.3 tcm of gas reserves [BP 2009]. Russia produced 657 billion cubic meters (bcm) in 2008, which is more than 20 percent of the world's total [IEA 2009a].[106] Given Russia's expected future decline in oil production in the coming decades, oil can be seen as Russia's current cash cow, whereas gas could have major market growth potential replacing, in time, oil as the cash cow.[107] During the last years, Gazprom accounts for almost a third of overall government revenues [Goldthau 2010]. In this regard, see Figure 3.1, which provides a numerical overview of Russian oil and gas reserves and production.[108]

Figure 3.1 Russian oil and gas reserves and production in 2008



* Conventional reserves at end 2008. Conventional production over 2008.
Source: IEA [2009] for gas production; BP [2009] for other data.

[105] Putin emphasised in his doctoral thesis (dating 1997) the importance of the resource sector for Russia's economic and geo-strategic revival, noting the need for mixed forms of property without specifying the optimal mix; asserting the primacy of state interests [Balzer 2005].

[106] In terms of oil versus gas reserves, Russia's relative position differs: while it has almost a quarter of global proven conventional gas reserves, it has only 6 percent of the world's conventional oil reserves [BP 2009]. In terms of production levels, Russia accounts for roughly 12 percent of global oil production, producing 9.9 mb/d in 2008 and is an observer to OPEC [BP 2009].[106]

[107] The largest (state-controlled) Russian oil company, Rosneft, expects roughly the same level of output by 2020 compared to 2008. The arm's length cooperation with OPEC and speculation premiums enables Russia to free ride on rising oil prices and to cooperate with OPEC, in the case of declining oil prices [Åslund 2007].

[108] Chapter 6 will cover the Russian gas industry in greater detail.

In Chapter 2, the case was already made that gas rather than oil is likely to provide Russia with long-term economic security and relative advantages. In gas reserves, Russia has a dominant position (holding some 27 percent of the world's gas reserves), while in oil it possesses merely 6 percent, meaning Russia has more prospects in positioning itself as an important price-setting gas exporter than an oil exporter in the long run. Because gas is fast becoming an indispensable fuel in order to achieve a low-carbon world, Russia is hence also well-positioned to build a position of strength and relative advantage (see below) with gas rather oil in reserve terms.

Russia can use gas dependence and flows to further its influence, even if only economic rather than political influence and power, or soft power [Hill 2004]. This attaches strategic importance for Russia to the Eurasian gas ellipse at large as well as other gas-exporting countries. Russia must take into account the rise of China,[109] in this regard, as well as the regional impact of Iran in the post-Soviet space and the Caucasus (for a more detailed over of Russia's relationship with Iran, see Chapter 6). Indeed, Russia's perception and relations with these two powers (which is beyond the scope of this study), is of equal importance as have important implications for Russia's relations with the West and for the international political system in general. For Russia, its perception of itself and the outside world is shaped in part by its perception of itself as the largest gas reserve-holder, at the centre of what is a small group of countries, endowed with the bulk of the world's natural gas reserves. Indeed, perhaps most importantly in the long run is the issue of conventional gas reserve concentration.

This geo-strategic value becomes very real when the importance of gas as a fuel is perceived and when pipelines are required to transport that fuel; this further warrants a geopolitical dimension within Wendt's theory (as described above). The perception of gas as a steadily more important factor in international relations is also an idea, as is the notion that through the relative advantages offered by gas, Russia is able to take its place in a steadily more multi-polar world. As was mentioned above, pipelines create fixed geopolitical relationships. In this sense, pipelines can be seen as geo-economic tools to gain access to gas markets, since without them gas cannot travel over land. As such, they are designed to bring gas molecules from 'point A to

[109] China and Russia both share three elements in their industrial strategies: state-directed long-term economic development, state mobilization of resources to achieve these goals within the framework of a market economy, in part through ownership of key market-players (or national champions) and political authoritarianism. Both China and Russia look to the state to play a key role in adapting their economies to the challenges with the rest of the world and they appear to be converging on views as to how to develop their economies in general and their bilateral relations in particular [Ferdinand 2007]. The Chinese-Russian relationship is in a way an 'axis of convenience', an inherently limited partnership conditioned on its ability to advance both parties' interests [Lo 2008]. Kotkin argues that the relationship may allow China to extract strategically important natural resources from Russia and extend China's regional influence, but it afford Russia little more than the pretence of a multi-polar world in which Moscow enjoys a central role [Kotkin 2009]. The SCO is ostensibly part of Russia's persistent efforts to integrate its foreign policy within the post-Soviet space outwards, including realignment with respect to China and at the same time Central Asia. Indeed, the functions as a consolidating factor in the Russian-Chinese relationship by offering a vehicle to manage their affairs, acting as a forum for compromise and agreement either through official programs or tacitly [Aris 2008].

point B', but it is agents' perceptions of these steel structures as political tools that changes their role as simple gas conduits to political 'integrators'.

Institutionalisation of Russia's gas resources

Gas, its production and the institutionalisation of its use, both for domestic purposes and foreign, has always remained largely in state hands under a centralised decision-making structure. It is the perception of gas as an important strategic resource that motivated Russia to reorganise its institutionalisation (also see Smeenk [2010]). The state's objective would be to ensure as far as possible that strategic sectors are occupied by powerful Russian companies that are internationally competitive [Ferdinand 2007]. These state-controlled companies are to be used by the state as an instrument of internal and external policies [Russian Ministry of Industry and Energy 2003], capable of competing with Western multinationals. Putin believed such a strategy would bolster Russia's position in the global economy and provide it with the necessary economic growth to achieve this position [Balzer 2005]. This champions have been coined as 'Russia Inc.', new flagships for Russia's economic and strategic presence abroad and in foreign markets [Trenin 2008b].

The political importance of Russia's domestic gas market

After the Russian financial crisis of 1998, gas demand in Russia began to increase, thanks in part also to the fact that gas was still heavily subsidised and still is as of this writing. Prices in the Russian domestic gas market and markets in most CIS gas markets are regulated at relatively low price-levels, perhaps reaching export parity by 2011-2012.[110] The domestic Russian gas market remains a key political priority for Moscow. In the 2008-2009 period of oversupply in European gas markets, Gazprom is simultaneously under pressure from Russia's energy ministry to allow Russia's Independent Gas Producers (IGPs) access to its pipeline system, even as the ministry is encouraging competition between the IGPs and Gazprom [Financial Times 2010b]. This goes to show that despite the institutionalisation described above, Gazprom's interests are not necessarily always identical to that of the Russian state. In addition, rivalry also exists between the national champions themselves as well.

The (geo)political importance of European gas markets

With the current uncertainty in gas demand, especially because of the 2008-2009 global economic and financial crisis, Russia's relative European gas export earnings should be seen against the background of greater uncertainty. For the time being, the European gas markets will remain Russia's most important source of gas revenues. As was noted above, Europe plays

[110] Gazprom's sales and revenues differ immensely by export market sold, with European exports yielding 68 percent of its actual revenues in 2008, while these volumes themselves only account for a disproportional 32 percent of the total volumes sold. Conversely, domestic Russian sales accounted for a mere 18 percent, while these volumes account for the remaining 51 percent of exported volumes.

a special role in Russia's perception of the outside world. Currently, Russia is dependent on Europe for its gas exports, from which it earns hard currency income. At the same time, gaining greater influence in Europe and deepening its dependence on Russian gas, could offer Russia the means to counterbalance the US in the rimland, and challenge the latter power base in Eurasia. While gas was once used to substitute oil within the Soviet Union to free up oil for export (also see Smeenk [2010] for a more detailed account), gas holds the key to both long-run economic security and more stable spheres of 'interest'. Herein gas pipelines could play an important role in solidifying these spheres of interest, not only with post-Soviet countries but also with European countries. The approach in this regard would be more economic-strategic than political, in a manner not entirely unlike in the days of the Soviet Union. The export monopoly accorded to Gazprom by the Russian Duma in 2006 points to a realisation on Russia's part that Gazprom could serve as a geo-economic tool for economic-strategic purposes.

Simultaneously, if Russia wishes to protect its gas interests in European markets, then it must take into account the potential impact of other gas-exporting countries. Russia's energy diplomacy with these countries through international forums or bilateral relations is a key determinant in its gas export strategy (also see chapters 7, 10 and 11). The geopolitical considerations stated above, from an international relations perspective, also have their bearing on Russia's considerations, as does Russia's self-perception as the biggest gas-reserve holder (and gas pipeline builder) within the interregional gas market. Such national awareness of national resources and capabilities, and the desire to be a powerful player in international economic terms, resembles the psychology underpinning national champions such as Boeing or Airbus in the airline industry, for example.

The newly perceived importance of the post-Soviet space in the gas sphere

As will be shown in detail in Chapter 6, Azerbaijan, Uzbekistan, Kazakhstan and Turkmenistan went on to play an important strategic role in Russia's domestic and export gas balance after the late 1990s. After a period of comparative chaos in gas trade throughout the former Soviet Union during the 1990s, Russia sought to normalise relations with post-Soviet gas exporting countries in Central Asia, not least by recently agreeing to pay these countries higher prices for their gas exports to Russia (also see Chapter 6). Indeed, gas reserves and flows as well as the export infrastructure in the region tie the Central Asian countries to Russia from the days of the Soviet Union, when the region became an initial driving force in the Soviet Union's gasification during the 1970s and 1980s (also refer to Smeenk [2010]).

A combination of different developments moved the Caspian Sea countries back up Russia's foreign policy agenda, namely: the evolving partnership between the US and pivotally geo-strategic countries such as Kazakhstan and Azerbaijan[111] throughout the second half of the 1990s, the construction of the Baku Tbilisi Ceyhan (BTC) pipeline (and the possible construction of the Trans-Caspian Gas Pipeline (TCGP), also see Case study 1 in Chapter 9), and rising domestic Russian gas demand (as well as rising gas demand in Russia's gas export markets). Specifically also, they imply a zero-sum type loss to Russia when it is taken into consideration that gas volumes travelling through these routes (primarily from Turkmenistan, Kazakhstan and Azerbaijan) will not travel via Russia. Russia relies on Central Asian gas for its own consumption and for its ability to maintain exports to Europe.[112]

While NATO expansion in Central and Eastern Europe comes as a perceived security challenge for Russia, it is also accompanied by the complication for the latter that the Soviet-era pipeline network in would-be NATO members would fall under a rival political and economic regime that would exclude Russian influence altogether [Van der Linde 2008a]. The post-Soviet countries of Belarus and Ukraine hold the gateways for Russian gas to European markets whilst themselves being important markets. The large Soviet-era sunk costs made for the building of gas export and transit pipelines through strategic bottlenecks such as the Ukraine and also other post-Soviet, near-abroad countries, endows these countries with a special geo-strategic importance for Russia (also see Smeenk [2010]). The European ECT,[113] first welcomed by Russia in the early 1990s, was later seen in much the same light, namely as a geo-economic instrument devised by the Euro-Atlantic community.[114]

3.8 Conclusion

The uni-lateral policies of the G. W. Bush Administration in the early 2000s helped usher in the rise of the BRIC countries, especially after 2003. This development has fundamentally changed the face of global politics, setting the scene for a newly emerging politico-economic context to which Russia must adapt. Diversifying energy flows from Eurasia, and thus breaking up Russia's geo-economic monopoly over energy flows from Central Asia became an implicit

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[111] Through the NATO Partnership for Peace programme, the US increasingly participated during the late 2000s in exercises with the Central Asian militaries.

[112] As a result of this realisation, in April 2003, for example, Russia committed to buying long-term gas volumes from Turkmenistan, reflecting Russia's renewed commitment in energy terms to the region's biggest gas producer, also refer to Chapter 6.

[113] A political declaration on international energy cooperation, the ECT was adopted in December 1991, followed by the legally binding ECT, which was signed in December 1994 and entered into force in April 1998 [Konoplyanik 2008b]. Being a complex legal matter, in basic terms the ECT is about non-discriminatory access to pipelines and energy resources, transit and transparency, borne of the idea that energy was an important focal point for post-Cold War East-West relations. The ECT is a legal package parallel to EU competition and liberalisation guidelines, which are embodied by liberalisation and re-regulation of the gas sector, encouraging competition by separating the control and ownership of pipelines from production, etc. The ECT is legacy of the 'mores' building of the 1990s, in line with other multi-lateral trade initiatives such as the Doha and Seattle rounds under the General Agreement on Tariffs and Trade (GATT) and its successor, the WTO.

[114] As Russia saw it, if ratified the ECT could undermine Russia's economic interest by usurping away the economic rent in extracted from flows through these infrastructures.

US goal with the collapse of the Soviet Union as a monolithic geopolitical force in Eurasia. Meanwhile, thanks to rising energy export earnings, Russia was able to reinvigorate itself as an actor in the international political system and develop greater structural financial power. During the early to mid-2000s, a key change in Russia's perception was that energy could make Russia a great power again in a world of economically valuable and scarce resources and interdependence.

Russia's geopolitical perception of important economic interests in the region, and the perceived threat to Russia's standing in what it sees as an area of 'privileged interest', has led Russia to view the world in its direct surroundings in zero-sum terms. The changing geopolitical role of the US in Eurasia, particularly in the post-Soviet space, has fundamentally impacted Russia's perception of the US. In Russia's perception, the colour revolutions in the post-Soviet space bear witness to the geo*political* dimension of US strategy in the rimland (and the heartland), while US policies which made possible the construction of the BTC reflect the geo-*economic* nature of US policies. Russia's position on the Eurasian continent, at arm's length from major and potentially important gas markets, and its possession of the largest gas reserves in the world, predispose its strategy to dealing with such geographical givens. For Russia, domestic control of its energy resources through state-centred institutionalisation, and those within its strategic space (i.e., within the post-Soviet space), were the first steps in such a new perception potential to affect its environment. With the realisation that gas flows mattered to Russia's national interest, its view of the Central Asian republics changed from these countries as being burdensome Soviet republics in the early 1990s, to important components in a newly emerging economic-strategic approach to the post-Soviet space.

The strategic nature of pipelines can act as geo-economic tools in Russia's efforts to regain an important position in international affairs, particularly in Europe. Russia is unique in that it has an absolute advantage in its possession of gas (and other natural resources) which other powers lack. While Russia perceives matters in its own periphery in zero-sum terms, it must adhere to a Lockean reality at a global level. On the one hand Russia seeks partnerships with European countries in order to secure gas demand in its export markets; while on the other Russia must take into account geopolitical forces beyond the control of its European partners, including the US. How Russia perceives itself, namely as a great power, and the outside world and the role it wishes to play in it, will certainly also feed into its behaviour as an important gas exporter in a dynamic interregional gas market. Russia's ideas about and perceptions of the international political system, and its identity, inevitably also affect the room it has for cooperation with other gas-exporting countries.

PART II

Chapter 4

A theoretical background: Dynamic markets and collusion

4.1 Introduction

For energy-producing and gas-exporting countries, the management of the domestic resource base plays a crucial role in earning export revenues. These resources can also be used to balance the country's budget or to reinvest in other sectors of the economy. The revenues from the energy sector play and have played a pivotal role in resurrecting – at least partially – Russia's economy and other (strategic) sectors during the late 1990s and early 2000s. The merit order for gas infrastructure investments at the level of the firm is based to a large extent determined by socio-economic preferences, which constrain or enable greater gas volumes for export.

Gas firms must also increasingly operate in a dynamically interregional gas market. For now, private international energy firms control a great deal of interregional LNG trade, with their advanced, vertically integrated gas value chains in various regional gas markets. Some quasi government-controlled energy firms, by contrast, still have yet to (further) develop their business in this respect. The interregional gas market exhibits changing dynamics as far as market structure, pricing, contract types, economies of scale (in LNG and pipeline gas trade), amongst other factors. De Jong's [1989] dynamic market theory (also known as the growth-decline paradigm) encompasses the factors which determine an industry structure as it changes over time along its growth path. The dynamics of the market have an impact on the choice of a company's coordination mechanisms. Strategies of the national energy companies acting in the export market have to anticipate dynamic market developments. Conversely, gas firms, when large enough, can also influence the structure of an often oligopolistic market.

Generally speaking, private gas firms have the task for their shareholders of maximising the profits of their equity gas reserve. Conversely, national gas firms have the task of maximising the revenues of a country's gas reserves. In addition, most of the government-controlled energy firms have to take into account the government's wider socio-economic policy goals [Van der Linde 1999]. Depending on the resource-base and the income needs of the government (also determined by absorption capacity), the emphasis or sequencing of certain investments in the value chain is influenced by these wider goals. Therefore, the dynamics of national and private gas firms differs and, in this respect, they have other investment incentives, being more or less pro-active. An important coordination mechanism relevant to this context is the notion of increased cooperation. This may involve cartelisation and/or collusion, which hinges on a number of prerequisites.

The impact of governments' state-level, socio-economic agendas on the gas export merit order are dealt with in Section 4.2. This serves as an extension of the material dimension discussed in Chapter 2 about relative advantages, in the sense that the transition is made from the state to the firm level dimension of this study. Section 4.3 provides an overview of Dynamic Market Theory and its different coordination principles in dynamic gas markets. Section 4.4 is a theoretical summary of collusion, what its preconditions are and what forms of collusion exist.

4.2 The merit order for gas exports

The socio-economic agendas of countries endowed with natural resources influence the merit order for gas export markets, where governments play a leading role in the gas sector. Hence in this particular case, natural gas resources and facilities (e.g., production, transport and storage) are the focal points. Throughout the remainder of this research, the merit order pertains to firm-level investments earmarked for gas export markets. For the purpose of this research, it is assumed that in the long run, a national gas firm aims to maximise the value of gas available for its export markets, given other investment variables.[115] The merit order is a way of ranking available sources of gas and transport options, in this case specifically in determining investments across the value chain of gas. It plays a crucial role for investment decisions in gas-producing and exporting countries, and differs per country.

The amount of gas available for export is constrained by the socio-economic agenda mentioned above. The incentives created by government policies may stimulate or dampen the overall gas export potential. The most important socio-economic considerations include:

- Once gas has been extracted from the subsoil, its future potential production is diminished since it is exhaustible. Some policy considerations, such as the small fields policy in the Netherlands, may include leaving the gas in the ground for possible future production.
- Long-term conservation policies to satisfy domestic macro-economic policies in order to avoid the negative effects of the resource curse.
- Decisions regarding the energy mix: e.g., the use of substitute fuels such as nuclear or coal energy to free up gas volumes for export.
- Caught between the inability to earn as much from natural gas as from crude oil, and low-revenue domestic operations, the potential gas exporter will tend to set aside the resources

[115] The investment variables or factors, which influence a gas export investment strategy, are summarily explained in the toolbox in Chapter 8.

for future use [Davis 1984]. Thus decisions need to be made regarding alternative gas needs, including oil-lifting[116] and the development of gas-based industries.

- Investment of gas revenues outside the gas sector, aimed to develop a country's economy. This carries an opportunity cost since these are not used to develop new resources (or maintain old ones).
- Due to political considerations, amongst other factors, cross-subsidies of domestic gas prices and the subsidisation of gas exports to neighbouring countries through reinvested earnings from gas export markets, encourages a proactive gas export strategy.
- Pursuant to the point made above, gas exports, and gas flows in general, can play an important role in achieving political integration amongst countries. This adds to the points made above a political rather than strictly economic dimension.

The preferences which result from the socio-economic agenda can be translated into policy measures, such as regulation, openness to foreign investment, taxation, etc. Ultimately, these policy measures influence over time the scope for the sequence of investments for gas exports. By extension, as a government-controlled firm, Gazprom is able to play either a proactive role towards gas exports, or a less proactive one. Given the above, the dynamics of national and private gas firms differs and, in this respect, they have other investment incentives.

4.3 Interregional gas market dynamics

The current expansion, evolution and globalisation of the interregional gas market, as will described in Chapter 5, is characterised by a market structure that is naturally oligopolistic. This is the case not only because of the size and location of major reserves, which is important for the long-run, but also in terms of the capital intensity of the natural gas industry. Only a select number of players are able to compete and develop in this industry. In addition, as has been shown above, national gas firms are increasingly expanding downstream in the value chain through new sales strategies and are diversifying their export portfolios in the process. The degrees of vertical integration and concentration vary depending on the phase of evolution the market in question is in (other parameters that differ over time include: e.g., economic scales and costs) [De Jong 1989]. Other factors influenced by the evolution of the market include the propensity to compete, form joint ventures or collude, all differing in their intensity and likelihood as a function of time and market circumstances.

4.3.1 Dynamic market theory

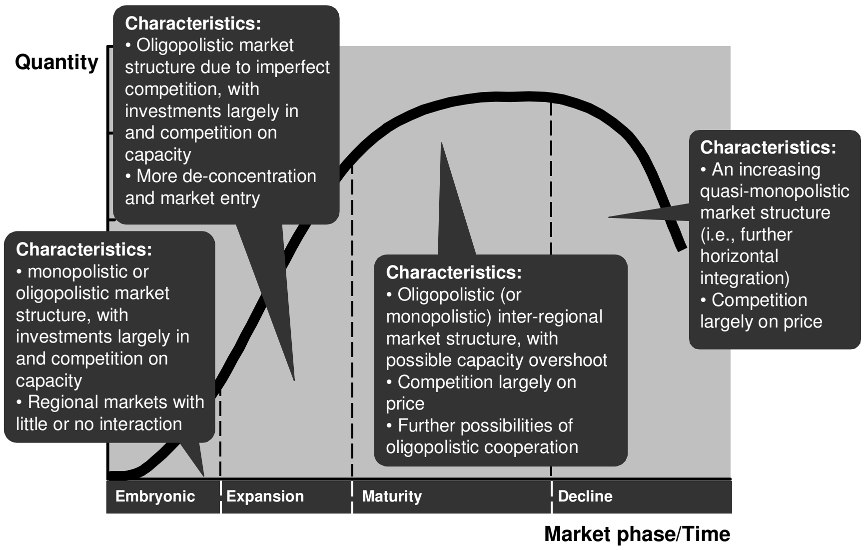
There is no single model that can capture the totality of all major market changes. The so-called dynamic market theory, developed by De Jong [1989, originally 1972] argues that all these market parameters are constantly shifting in scope and value in a long-term market cycle.

[116] Oil lifting refers to the process of re-injecting gas into oil reservoirs to boost oil production.

This cycle, which holds for any given product, is divided into four major phases of development: it starts with an embryonic phase of development, followed by expansion and maturity and finally ends in a decline, see Figure 4.1 below.

The essence of dynamic market theory rests on the relationship between the product life cycle and the paradigm of structure-behaviour-result: Firms behave as a function of the structure of the market, and to a certain extent (see below), markets are influenced by individual firm behaviour. In other words, the paradigm emphasises that the conditions of supply and demand in a specific industry determines its market structure. This can pertain to various players in the gas market: from consumers to producers, from public to private entities. Each market phase of development has different characteristics and bottlenecks, which compel actors in the market to adapt their strategies to newly emerging market situations. According to De Jong [1989], firms with market power can influence market conditions, the latter also being a function of the different market cycle phases. Particularly in markets with strong oligopolistic tendencies such as the gas market, a dynamic market approach is well-suited to analyse how players in such a market setting would interact, since they are few.

Figure 4.1 Developments in the gas market: The growth cycle



Source: Smeenk (2010, forthcoming); Boon von Ochssée (2010, forthcoming), based on De Jong (1989).

Especially when it comes to the natural gas market, the approach is indeed helpful in qualitatively analysing a market strongly characterised by product homogeneity, binding capacity barriers, high barriers to entry, low price elasticity as well as necessary economies of scale [Van Witteloostuijn et al. 2004].

Ultimately, static models do not capture industry and market dynamics, though they help explain strategic behaviour and the incentives firms may have in cooperating or not. Strategic behaviour in general takes place in dynamic contexts, not static ones. Indeed, structural developments in markets are above all dynamic in nature [De Jong 1989]. Dynamic market theory is a useful qualitative tool for explaining the dynamics of a market as it moves from one phase to another and as the actors in the market shift from one form of behaviour to another. Market conditions change, shift from one of phase of evolution into another as circumstances alter, e.g., in terms of costs, technological know-how, economies of scale, entry into the market by new players or market structure, etc.

As such, the oil market was shown to be dynamic, with differing levels of concentration amongst market players having a major impact on the leeway for cooperation, prices, market liquidity and other market parameters [Van der Linde 1991]. For firms operating in industries such as those involving natural resources, managing the value chain in a dynamic process is central to their survival and continuity. The interregional or global gas market, as has been the case for the oil market since its very beginning, is characterised by dynamic circumstances, though revolving around different players and more rigid structures than is the case for the oil market. The gas market is, by comparison, in different phase(s) of evolution than the oil market is, and so circumstances are different as well. The difference between the oil and gas markets lies also in the inherent differences between oil as a liquid and natural gas as a gaseous substance and their transportation.

The different sequential phases in dynamic market theory need not abruptly end as a new one begins. Instead, they gradually roll over into one another as the market situation and characteristics shift gradually over time. Some factors are more constant than others, but they can change and show different characteristics throughout the evolution of a market. The concept of market development relates to the sequence of different market situations, which may arise in the growth cycle. The forces associated with market developments affect market situations to the effect of metamorphosing each from one form into another. The underlying logic of importance to this discussion (i.e., with respect to natural gas as commodity) is the notion of a dynamic market in which consuming regions become increasingly inter-linked as growth and demand rise, together with fluidity (as opposed to rigidity) in a dynamically oligopolistic market (both at regional and global levels). The duration of each phase of market development or evolution is not specific in this regard [De Jong 1989], but in the gas industry one may assume each phase can last as long as several decades.[117]

Looking at the interregional gas market from a dynamic market vantage point, one can witness it experiencing a maelstrom of evolutionary cycles, in which producer and consumer countries are struggling to formulate their strategies, in order to strengthen their positions in an ever-changing market. LNG has made possible the globalisation of the gas market by inter-linking different demand centers and opening up new venues for commercial opportunities, while pipelines continue to play a regional role, depending on the consuming and supplying regions in question. The international gas market is not only in transition but also in expansion with emerging trends such as the increasing – though still rather limited – liquidity of LNG trade and the entry of new regional and intraregional market players, both public and private. Specifically for the European market, the sub-regional markets are also in different phases in terms of the growth cycle. Northwest Europe is more or less a mature market, although the northwest European import market is in expansion due to declining indigenous production. Most of the countries in the other main sub-regional market within Europe, South Southeast Europe (SSEE), are located in an expansion phase (see also Chapter 5). Figure 4.2 provides a typical form of the growth cycle and the changing characteristics, at large, along growth cycle of the gas market.

4.3.2 Coordination mechanisms in dynamic markets

An essential feature in De Jong's [1989] dynamic market approach is the idea that firms are influenced by the structure of the market, compelling them to use different strategies. Throughout the process, firms change, adapt to the new equilibrium and are again affected by new imbalances. The strategies in turn affect their environment; ultimately changing it and the cycle starts over again. The degree of competition (on the scale of monopoly to perfect competition) is directly relevant to the 'gravity' of this effect.

It is inevitable that a certain point, with the changing nature and direction of gas flows, that the producers need to take into account the impact of all these different supply allocation decisions on different (sub)regional and interregional market structures. With the uncertainties in such a transition, from one phase to the next, firms must adapt to new circumstances. Conversely, strategies of gas firms with strong market power in terms of price and volume can affect market structures. The way in which firm behaviour can be coordinated falls into two basic categories: either firms behave as rivals and compete, or they cooperate, trying to exercise some form of joint control over market processes in the value chain. Following this distinction,

[117] In the oil market, each phase was consistently at about 20 years [Van der Linde 1991].

De Jong [1989] identifies three coordination principles, which firms tend to follow throughout the evolution of the market.

1) *Control: Mergers and acquisitions (M&As):* According to de Jong [1989], firms can choose to acquire assets further down along the value chain via vertical integration (see also [Smeenk 2010]). Gazprom's acquisitions in downstream Europe in the form of storage, stakes in or complete ownership of utilities are prime examples. This form of trying to attain control of assets can materialise independently of whether firms actually compete or cooperate. Other forms of M&As, except from vertical integration, are horizontal and diagonal integration. In the oil and gas sectors, gas producers and sellers moving into oil production and sales and power generation is one example of diagonal integration. These M&As can help deal with smaller potential competitors in order to neutralise their possible effect on market share. Particularly players with a comparatively small production capacity but also low supply costs (due to their proximity to the market, for example) and thus low economies of scale, are potential M&A targets. On the other hand, smaller players may want security of stable cash flows, resulting in cooperation with a dominant player in the market.
2) *Firms behave as rivals: Direct competition:* Firms can choose for a competitive model or strategy, in which, for example, as they integrate vertically, they set up direct subsidiaries to penetrate the market further and sell directly to end consumers and thus invest in 'new' projects or greenfields by establishing a whole new subsidiary organisation. The examples of Gazprom (GMT) and Sonatrach are cases in point.
3) *Joint ventures or collusion :* Firms can be driven to cooperate by looking for ways to collude and avoid competition. This can result in cartels or consortia, which does not include setting up some separate organisation while syndicates, joint ventures and/or common subsidiaries or investments do include separate organisations, which can be jointly owned by the firms choosing to cooperate. Shared investments are those made together with rivals whose market-level impact may be very large in terms of production capacity and may have any level of supply costs and associated economies of scale. Particularly those with large reserves are likely to have economies of scale benefits upstream, but might also need to incur significant transportation costs to bring the gas to the market. Since shared investments are made together with other players, they are not wholly owned, i.e., they are jointly owned, and thus to the extent possible, they serve purposes other than deterrence.

According to de Jong [1989], cartels are agreements between producers, which enable them to influence the market to their advantage. Both private and government-owned firms can participate in forming a cartel. Profit sharing, the application of sales quota, the exchange of statistical information and a policy on battling non-cartel members can be agreed upon. Limiting competition, monopolistic pricing, supply restrictions are all goals, which are attributable to cartels [Jacquemain 1987].[118]

4.4 The theory of collusion and stable agreements

The concentration of half the world's gas reserves in only three countries might seem impressive, but the level of reserve concentration is only part of a list of pre-requisites for effectively exercising market power either individually and/or collectively. The ability to exercise market power is an important pre-condition for successful cooperation amongst sellers in any given market. Consequently, the need to consider the behaviour of rival firms makes an oligopoly firm's profit maximisation decision more difficult than that of a monopoly or a competitive firm: A monopolistic firm has no rivals while a competitive firm ignores the behaviour of individual rivals, since it considers only the market price and its own costs in choosing its profit-maximising output.

The theory of oligopoly is the theory of the few, more specifically, as Jacquemin notes: "in contrast [to a competitive outcome], a situation of oligopoly, in which a small number of firms faces a large number of buyers, implies strategic interdependence between sellers, such that the best policy for a firm will depend on that followed by each of its competitors. In this context the anonymity of competition disappears, and economic agents become players" [Jacquemain 1987, p. 48]. In an oligopolistic market firms set prices and output based partly on strategic considerations regarding the behaviour of their competitors [Pindyck and Rubinfeld 2001]. The 'Holy Grail' of research in oligopoly theory has been the ability to use observable quantities to predict the intensity of rivalry in markets dominated by a comparatively small number of suppliers [Schmalensee 1988].

4.4.1 Maximising economic rent

First and foremost, suppliers of natural resource seek to maximise the economic rent to be extracted from production of a natural resource. This will be of particular importance as background information for Part III. Critical in the concept of economic rent in antural resources is that once produced, they are can no longer be recovered, which implies a certain 'user' cost of production [Griffin and Teece 1982]. Natural resource cartel members principally attempt to jointly maximise the economic rent they can extract from the production of their natural resources.

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[118] The stability of collusion depends on a number of interlocking conditions: concentration, number of sellers (in a collusive organisation), barriers to entry and demand inelasticity. There also exist different definitions of what cartels actually are (tacit versus explicit collusion) and different types of cartels.

Gas is only worth what it can bring in gas markets minus transportation (and other related) costs [Davis 1984]. In this sense, the level of economic rent – profit above the opportunity cost of capital – achieved by a gas firm consists on average of the added value of the gas industry and the value created relative to its competitors. Formally, the economic rent from the production of a natural resource can be defined as "any payment made to a production factor above the amount necessary to keep that factor of production in its present employment" [Baumol and Blinder 2000, p. 753]. Applied to the gas industry and specific from the sphere of costs, economic rent can be defined as the difference between the market price for a certain amount of gas minus the total cost of the producer at that level (of production, transport, processing, storage, distribution and use of capital for the specific producer) and the market price for that amount of gas minus the normal cost at that level (the 'normal' cost of production, transportation, processing, storage, distribution and capital, as it applies to competitors):

$$\textit{Economic rent of firm}_j = \textit{profit}_j - \textit{'normal' profit of competitors}$$

$$\textit{Economic rent of firm}_j = q\left(p_M - c_j\right) - q\left(p_M - c^N\right)$$

i.e.:

$$\textit{Economic rent of firm}_j = q\left(c^N - c_j\right) \tag{4.1}$$

with, from a gas producer's perspective:

q	= demand of natural gas in cubic meters;
p_M	= market price for natural gas per cubic meter;
c_j	= total cost per cubic meter for production, transportation, processing, storage, distribution and use of capital, for the specific producer j;
c^N	= 'normal' cost per cubic meter for production, transportation, processing, storage, distribution and capital, as it applies to the competitors of j.

The concept of economic rent is flanked by the notion of value creation in an industry context. In the context of this study, strategic moves and industry processes such as rivalry between producers of a certain natural resource, and attempts to create and enhance market power through the creation of cost advantages, all have a bearing on value creation. See Box 3.2 in Chapter 3, in Smeenk [2010].

4.4.2 Concentration and market power

Market structure greatly influences the behaviour of firms and determines the outcome of the market process [Bain 1951]. Concentration is by and large encouraged by technologically determined scale economies in production on a large scale [De Jong 1989]. A number of concentration indices exist. Indicative of concentration in an industry is the measure of market power. Market power in the gas market, whether on a local, regional, or global level, is driven mainly by long-run marginal costs (LRMC), because of the long-lead times and the capital costs involved in building and completing projects. Of the three cost types, i.e., production, transport (and transit costs) and distribution, transport accounts for the bulk of long-run costs, especially over long distances and when including distribution to small customers, depending of course on the distance covered [IEA 2008a]. The Lerner index (L), also known as the Lerner Index of monopoly power, is an instrument to measure market power. This is given by [Jacquemain 1987]:

$$L = \frac{p - mc}{p} = -\frac{q_i / Q}{\varepsilon} \tag{4.2}$$

with:

p = price
mc = marginal cost
n = number of firms in the industry
ε = elasticity of demand
Q = size of the market
q_i = quantity supplied by firm i

The Lerner index basically says that the firm's ability to raise price above marginal cost is inversely related to the elasticity of demand. Thus, a monopoly firm's Lerner Index equals $-1/\varepsilon$. As the number of firms in an industry grows larger, the residual demand elasticity facing a firm approaches negative infinity, in which case the Lerner index approaches zero. This means firms become price takers, i.e., we have perfect markets. However, In Chapter 7, the Lerner index will be applied to the gas-exporting countries active in the European and Atlantic region.

4.4.3 Number of suppliers

In the real world, the number of active firms in a market is likely to be affected by factors such as the size of market demand and the nature of competition in that market [Colell et al. 1995]. The problem with a cartel solution, in game-theoretic terms, is that it is not stable: If one firm believes that the other firm in a duopoly will stick to the agreed-upon cartel output, it would benefit it to increase its own output in order to sell more at the high price, taking its profit while it can [Varian 1992]. Cartels are not limited to a small number of sellers, although it is a widely held belief that the effectiveness of a cartel is greater when the number of participants is small [Viscusi et al. 2000]. The fewer the potential cartel members, the easier it is to come to an agreement which is durable since cheating is easier to detect [Suslow 2005]. An industry's profits are an increasing function of concentration and a decreasing function of elasticity of demand [Jacquemain 1987], where concentration in the form of few, large players is optimal for collusion. Different members may have differing costs, different perceptions of market demand and even diverging objectives and they may therefore have different price and output preferences [Pindyck and Rubinfeld 2001]. Cartel members may facilitate detection by dividing customers among themselves or adopting a number of related practices [Schmalensee 1988].

4.4.4 Stable agreements and cheating

When prices are raised to monopoly levels, each supplier stands to gain by making undetected price cuts or output increases [Schmalensee 1988]. This is the essence of why cartel members are always keen on cheating and a prime reason for why cartels tend to break down after a certain amount of time.[119] Teece et al. have summarised three essential reasons why members of cartel tend to cheat on their agreements: (1) large differences between marginal costs and price for the individual cartel member, (2) the lure of clandestine price cuts with the aim of attaining new customers while keeping the existing price system intact for current buyers and (3) a low probability of detection, the involved time lags and the lack of costliness of the resulting punishment [Teece et al. 1993]. From a game-theoretic perspective, formal cartels and stable agreements in general are inherently unstable because of the incentive to cheat. Real world examples also show that it is difficult to maintain the stability of cartels [Levenstein and Suslow 2004].

4.4.5 Barriers to entry

According to Schmalensee: "Without entry barriers, there can be no long-run market power [and] collusive behaviour cannot succeed in raising profits in the long run, [therefore] preventing entry of new firms is roughly as important in the long run as restraining rivalry among established sellers" [Schmalensee 1988, p. 663]. Bain defines barriers to entry as factors which allow established or incumbent firms to enjoy supra-normal profits without attracting new entry, categorised into four sources: economies of scale, cost advantages of incumbents, product differentiation of incumbents and absolute capital costs [Bain 1956]. As will be shown in an entry deterrence framework in Chapter 8, entry barriers play a crucial role in possible collusion in the interregional gas market, particularly per reference to certain strategic investments with a high degree of sunk costs.

[119] Since detection and punishment tend to take time, the supergame framework mentioned above has often been employed to examine the stability of collusive agreements, with the Cournot model as the selected stage game.

4.4.6 Inelastic demand

A crucial determinant external to a cartel as in the case of OPEC (but especially relevant for a similar type of entity in the gas market) is the availability of alternative fuels (i.e., backstop fuels) and the price elasticity of demand. It is assumed that price of a non-renewable resource such as oil or gas will reach a certain threshold at which consumers switch to other fuels. The responsiveness and subsequent ability of consumers to do is reflected in the price elasticity of demand. Elasticity of demand may increase with price of the resource, which may be the case when actual or potential substitute technologies exist for the resource in question that are viable at high prices when the cartel faces a linear demand curve [Teece et al. 1993].

Griffin and Teece identify a backstop fuel for petroleum as being, for example, huge unconventional oil reserves for which the user costs are negligible. Once the price of oil reaches a certain level these reserves are summed to become available to meet at an arbitrarily high price, and that price no longer indefinitely rises with the rate of interest [Griffin and Teece 1982]. Thus theoretically at some price of the resource and in excess thereof, it can no longer be sold.[120] Pindyck also argues that the extent to which price trajectories change over time, under circumstances of whether or not the monopolist faces either rising elasticity demand, depends to a large extent on the particular way in which demand elasticities and production costs rise over time as the resource base is depleted [Pindyck 1978].

In the case of gas, the price elasticity of demand depends to a large extent on the availability of alternative fuels. Switching to an alternative fuel when installing new equipment may not be attractive since heating oil and electricity prices have also risen in most cases. Some gas-fired power plants and industrial boilers can be switched to other fuels at short-notice, usually heavy fuel oil in the case of conventional steam boilers and distillate in the case of gas turbines [IEA 2008c].

4.4.7 Cartel definitions and types

Several definitions are predominantly suited to cartels on national markets and do not capture the particulars of international cartels [Van der Linde 1991]. OPEC, for example, would not satisfy quite a number of these cited definitions, and various economists from OPEC countries have tried to show that OPEC even lacks the essential prerequisites for being considered as a cartel [Daoudi 1985]. The discrepancy between formal cartel definitions and OPEC as a cartel flows from the state-centred nature of OPEC. According to Alnasrawi, for example: “The

[120] Because, as Teece, Sunding and Mosakowski [1993] argue, price determines consumption at each date and also cumulative consumption; and the monopoly price trajectory has to be derived by working backwards from the backstop price with Hotelling’s arbitrage condition, resource cartels are even more difficult to form and maintain than are collusive institutions in the more familiar static case.

problem with a cartel theory as applied to OPEC is that it is imposed on the pricing behaviour of an intergovernmental organisation that lacks the necessary conditions and attributes of a commodity cartel. Economic theory on the subject of commodity cartels is explicit.

In order for a cartel to exist in a market, certain features are called for, including an output of the industry; an agreed-upon common price or price structure; and an agreement on quantitative and/or geographic market-sharing. (…) More important, the governments of OPEC member countries have always placed economic and political national considerations above the common economic interests of the group. It is these national interests that, in the final analysis, render fruitless any attempt to categorise an organisation like OPEC" [Alnaswari 1985, p. 88]. A broadly accepted formal definition of a cartel is as follows:

"An agreement (formalised or by acquiescence) between independent market participants in the same or parallel sector, which are (potentially) competitors in the same market(s) or product(s), have action parameters in common and attempt to regulate or influence the market conditions to their own profit" [Van der Linde 1991, p. 21].

Though a condition for a cartel is not based on motives, but on the market behaviour of the market players, it is exactly this definitional perspective of commodity cartels such as OPEC (and possible collusion in the global gas industry) which brings the issue of definition from a purely economic context to a political one. If one considers OPEC and a gas cartel to be cartels in the genuine sense of the textbook definition, then the political dimension should be included as well. The problem with defining OPEC as a cartel is the fact that it is an intergovernmental organisation of nation states and this implies that they maximise political, economic and/or strategic benefit.

Teece, Sunding and Mosakowski, for example, agree that the most informal or tacit type of cartel agreement may be "a gentleman's agreement" to rig prices and/or control output but that "[t]he cartel concept as defined does not include collusion which is merely tacit and which does not involve an agreement, although it is recognised that the market outcomes associated with tacit collusion may sometimes be quite similar to those obtained from cartelisation" [Van der Linde 1991, p. 28]. De Jong posits that 'parallel behaviour' or concerted practices are not yet cartels. These informal, tacit agreements rely on parallel behaviour, which can be especially useful if formal agreements are either redundant or if they clash with antitrust regulations [De Jong 1989].

Other authors merely state that an industry structure where the firms collude to some degree in setting their prices and outputs is a cartel [Varian 1992]. This is a very sensitive issue of definition, for if there is no formal agreement, how can one refer to collusive behaviour of any kind as a cartel? In this respect, Daoudi, who has done research on the emergence of OPEC, introduced a workable and succinct definition of tacit collusion:

"[A]n organisation with the potential and aspiration to become a cartel, which may behave at times as a cartel or may exhibit some of the characteristics of one, but which is not yet a fully-fledged cartel. It is characterised by a loose framework of voluntary cooperation among its members, with great institutional flexibility in which members reach a broad general agreement on a general price structure, but without enforcing, formal production controls [or other cartel profit-raising mechanisms]" [Daoudi 1985, pp. 93 - 109].

The first task of cartel is to decide on a course of action, a set of firm-specific outputs, for example [Schmalensee 1988]. In a strictly rational world where cartel agreements would be enforceable, a cartel would be undertaken if and only if the present value of the cartel's collective profits from monopoly pricing exceeded the present value of the expected cost of operation and enforcement [Teece et al. 1993]. Cartel formation is often hampered by the inability of the potential cartel members to come to an agreement. Hotelling's arbitrage (between the socially optimal production pattern and that of the monopoly) principle provides the most fundamental characterisation of the behaviour of resources cartels as monopolies [Teece et al. 1993].

Classical oligopoly and cartel-versus-fringe models consider cases in which quantity is the decision variable versus price, decided upon by a set of firms which determine a selling price, knowing the global supply function of the other firms, which form a competitive fringe producing a quantity such that their marginal cost equals price [Jacquemain 1987]. A fundamental aspect of cartels is that they can occur both tacitly and implicitly, depending on the nature of industry, cost functions, number of members, etc. Indeed the aspect of tacit versus open collusion and formalisation plays an important role in this context, because ultimately, the type of cooperation that best suits Russia's strategic interests will hinge on how it is best achieved. Firms can mimic explicit, overt collusion of a cartel by cooperating without making formal agreements [Schmalensee 1988]. Stigler notes "collusion takes the form of joint determination of outputs and prices by ostensibly independent firms" [Stigler 1964, pp. 44 - 48].

Tit-for-tat cooperation centred on reciprocity is an explanation of how such mimicking behaviour can arise [Axelrod 1984]. By signing contracts and binding themselves to matching the lowest price offered by any firm, for example, or engaging in a variety of related 'facilitated practices', sellers may be able to support collusive outcomes [Salop 1986]. In order to achieve tacit or covert collusion, the players must deal with 'four Cs': communication, constraints, coordination and confusion [Smit and Trigeorgis 2004]. Explicit collusion essentially pertains mainly to overt cooperation, in which players openly agree to cooperate in such a way so as to maximise joint profits. When considering a small number of firms producing a homogeneous product, tacit collusion can best be described as follows as has been done by Chamberlin:

"If each [supplier] seeks his maximum profit rationally and intelligently, he will realise that when there are only two or a few sellers his own move has a considerable effect upon his competitors, and that this makes it idle to suppose that they will accept without retaliation the losses he forces upon them. Since the result of a cut by any one is inevitably to decrease his own profits, no one will cut, and although sellers are entirely independent, the equilibrium result is the same as though there were a monopolistic agreement between them" [Chamberlin 1933, p. 48].

Thus, even though there is no explicit agreement, tacit collusion can be achieved if players reason into the future vis-à-vis their own profits and the moves of others that might influence the outcome for all the players involved. Whether or not this can be achieved depends to a large extent on the number of potential members in a cartel and the rate at which their profits are discounted. This aspect is discussed below as part of the discussion about the Cournot model and cartel conditions. Different parameters can be used for cartels, depending on the market in question. De Jong recognises three main categories or types: price cartels, production cartels and market division cartels [De Jong 1989]. Cartels appear in different forms, i.e., they can be of a price-fixing[121] nature but it can also be of a volume-restriction nature or agree to divide markets into separate blocks[122] and agree not to enter each other's market segments.

4.5 Conclusion

The international gas market is currently undergoing a major transformation, one that pertains to economies of scale, trading patterns, pricing, concentration of production, and the vertical integration of major companies in the business, etc. Dynamic Market Theory argues that all these elements are constantly shifting in scope and value in a long-term market cycle. This cycle, pertaining to any given product, is divided into four major phases of development:

[121] "Price-fixing agreements can take many forms. In addition to the obvious case of agreements to charge the same price, they can also include agreements on discounts, margins, price differentials, price increases or minimum prices. The objective of a price-fixing agreement is to ensure common net prices" [Irish Competition Authorities 2004].

[122] "As an alternative to price-fixing agreements, firms […] may divide up the market between them and agree not to sell in each other's designated area […] At its simplest, a market-sharing cartel may be no more than an agreement among firms not to approach each other's customers or not to sell to those in a particular area. This may involve secretly [tacitly] allocating specific territories to one another or agreeing on lists of which customers are to be allocated to which firm" [Irish Competition Authorities 2004]. Reciprocal market sharing agreements, whereby each firm refrains from entering another firm's market can act as a barrier to entry for each supplier to the market in question; under those conditions each supplier acts as a monopolist in its respective market share [Belleflamme and Bloch 2004].

it starts with an embryonic phase of development, followed by expansion and maturity and finally ends in a decline. Each market phase of development has different characteristics and bottlenecks which compel actors in the market to adapt their strategies to newly emerging market situations.

De Jong [1989] recognises the possibility that firms with market power can influence the market conditions as do the different market development phases. Depending on the phase of the market these firms operate in they are likely to interact in different ways, by competing or colluding. Collusion and cooperation may include a range of forms of cooperation, from tacit collusion to explicit agreements. Attempting to control the value chain through M&As is another possibility from an organisational perspective. Various preconditions need to be satisfied to one extent or another in order for collusion to be successful, such as market concentration and market power. Collusion or cartels may exhibit different forms, types and have various definitions.

Chapter 5

Interregional gas market structure, trade and pricing patterns

5.1 Introduction

The international gas market is essentially interregional in nature, with on the one hand important fundamental changes occurring in terms of market structure and trade and (interregional) pricing on the other. From a market where relatively isolated gas suppliers and buyers were once regionally, and even locally, captive to one another, local markets have become more regional, and regional markets have in turn become increasingly interlinked. This has in large part been due to the advent and tremendous growth of LNG and, in particular, the evolution of economies of scale in the LNG value chain during the 1990s and 2000s. Increasingly, where pipelines have enabled gas trade within regional markets, LNG has facilitated long-distance gas trade between these regional markets and more distant suppliers. The overall mismatch between the location of gas resources and demand centres, and their growing import-dependence, has in recent years increased the need for further and greater LNG flows.

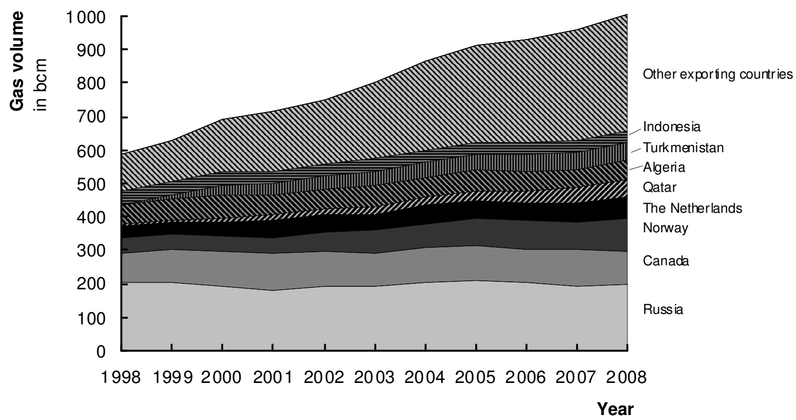
At a regional level, the various regional gas markets, the US, Europe and the Asia-Pacific region are import-dependent to diverging degrees and on different combinations of suppliers and exhibit diverging pricing and trade patterns, this aspect is covered in Section 5.3. The increasing level of import-dependency of the various regional gas markets and policy uncertainties are covered in Section 5.4. Gas trade, especially in the LNG industry has always been underpinned by fixed long-term contracts with oil indexation. Patterns in regional and interregional gas trade are shifting, however, proving to be quite dynamic as suppliers seek to benefit from interregional price imbalances through new business models. Interregional LNG flows have increasingly begun to act as price bridges between the various regional markets through shorter-term trading, parallel to long-term, oil indexed LNG flows. Section 5.5 is a brief discussion about the rapidly evolving world of LNG and how it is being trade in more flexible ways than has traditionally been the case.

5.2 World gas production in 2008

As a result of the asymmetric distribution of reserves as described in Chapter 3, the international gas market, regardless of how it actually functions in terms of trading and pricing, is naturally predisposed to an oligopolistic market structure. Particularly so when one takes into account that since the late 1970s, natural gas reserves have been primarily exploited by national government companies. The supply side of the international gas market is therefore characterised by a limited number of very large–and potentially very large–suppliers and many smaller, heterogeneous players. Just as is the case for gas reserves, gas production is highly concentrated. Rather than being a market where thousands compete to buy and sell, the natural gas market is often dominated by a small number of firms or a powerful consortium, which determines the bargaining relationships in an increasingly regional and interregional gas market [Davis 1984].

Russia is the biggest gas producer of the world (657 bcm in 2008), whereas most of its gas is consumed in Russia. For its export, Gazprom has a monopoly over export flows. According to Gazprom's data, Gazprom's gas export sales in the CIS were 83 bcm and in Europe 170 bcm in 2008 [Gazprom 2009a]. Other major producing countries are the US (583 bcm in 2008), Canada (175 bcm in 2008) and Iran (121 bcm in 2008). Canada exports 58 percent of its production to the US and the remaining production is for internal use. The US consumes most of its gas domestically. Iran could potentially become a major exporter; yet in 2008 it became a net-importer of gas (1.7 bcm). Besides Russia and Canada, Norway and Algeria are major exporters (and producers) of gas. Norway produced 103 bcm in 2008 and exported a large share to Europe by pipeline, and in the near future also by LNG. Algeria consumes a larger share, 31 percent, of its production (82 bcm in 2008) domestically. The Netherlands is a traditional exporter of gas to European countries, which produced 85 bcm in 2008, of which 62 bcm was exported to other European countries [IEA 2009a].

Figure 5.1 Historical export volume development of gas exporting countries: 1998-2008



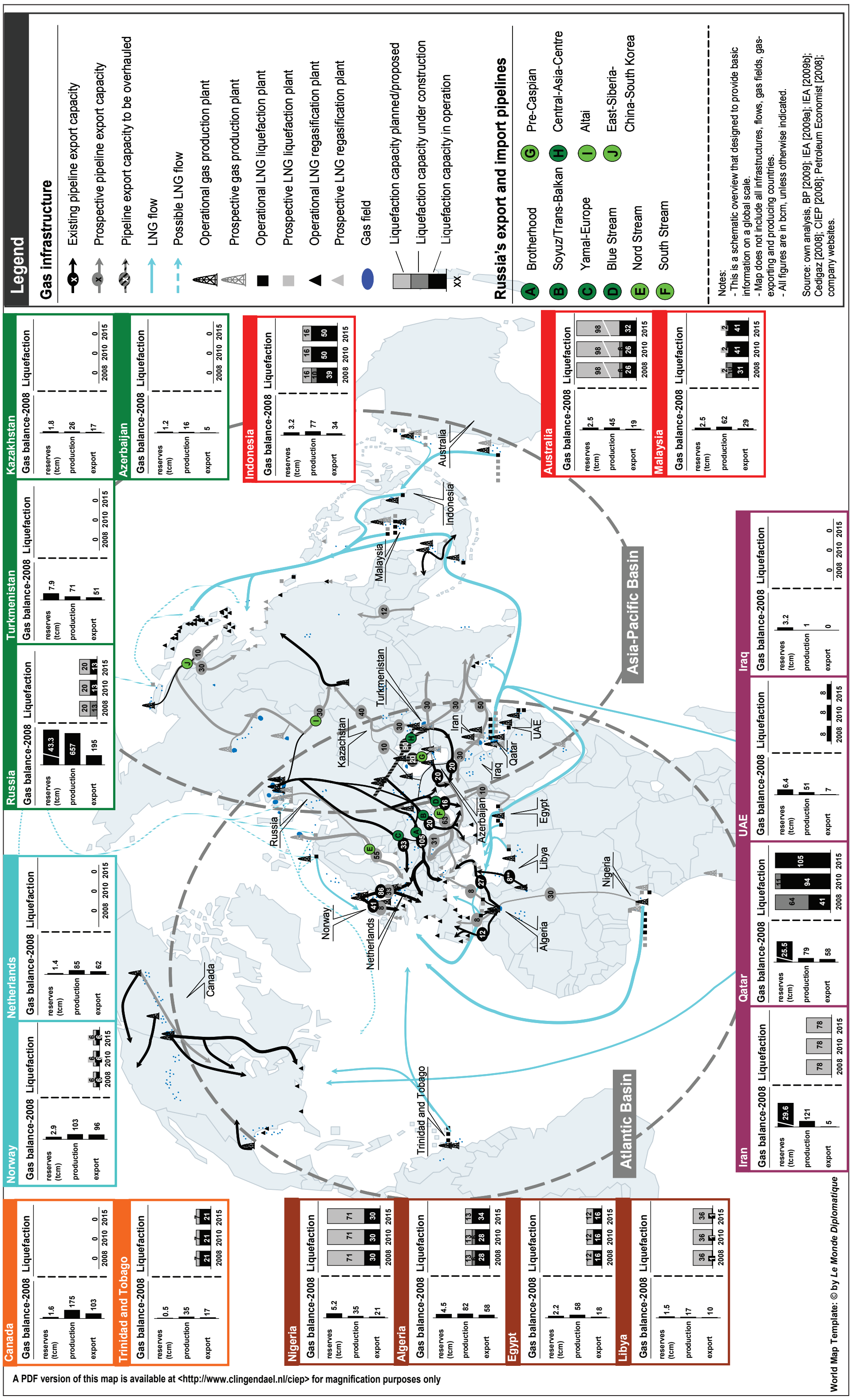
Source: own analysis, based on IEA [2003]; IEA [2008]; IEA [2009].

The UK and Saudi Arabia consume most of their produced gas (respectively, 73 bcm and 70 bcm in 2008) domestically. Other major producers are China (76 bcm in 2007), Mexico (52 bcm in 2008) and Argentina (45 bcm in 2008) [IEA 2009a]. The upstream gas sectors in other upcoming exporters – mainly the Caspian region, Iran, Iraq and Qatar – are relatively under-developed. The Central Asian countries play an important role in Russia's current gas export flows, but ever since the mid-1990s they have been in search of alternative pipeline export routes. Qatar called for a moratorium in 2005 on the North field; halting further investment decisions on new projects while it is bringing to fruition some massive, committed LNG projects [CIEP 2008]. In the Asia-Pacific markets, Indonesia, Malaysia, Australia and Brunei play an important role in LNG exports. The internationalisation of on the one hand Russia, as a pipeline gas exporter to Europe and Asia, and its LNG-exporting counterpart, Qatar, on the other, is likely to have a long-lasting and deep impact on the interregional gas industry. The other major gas exporters (and producers) are outlined in Figure 5.1 above and Map 5.1 below.

5.3 Regional markets and pricing

While the overall market structure of the natural gas industry is highly oligopolistic from a global or interregional perspective, the import-dependencies of regional markets and of separate countries diverge widely, taking into account figures for 2008. In order to appreciate the real significance of the various suppliers and their potential impact on market conditions it is useful to perceive the suppliers through a regional prism, particularly because the regional gas markets in question differ immensely in terms of not only primary energy mixes, but also in terms of import-dependency and thus also gas market structure. The structure of the market will make its effects felt on an increasingly global scale, and regional developments are likely to shape global ones in turn.

Map 5.1 Main net gas-exporting countries and their export infrastructures



Expectations have been raised of further globalisation of the gas business, with different market structures, more fragmented value chains, more flexibility in supplies to markets and shorter-term contracts [De Jong et al. 2010]. The three major regional gas markets for natural gas, the US, Europe and the Pacific region, all trade gas with different types of contracts, each market functioning with its own pricing mechanisms, i.e., spot versus oil- or oil product indexation. This has a direct impact on trade and pricing in the two major LNG trading basins,[123] the Atlantic and Pacific basins, which separate an interregional market for LNG into two distinct sub-markets.

The geography of the interregional gas market will change markedly in the 2010s, towards 2020 and beyond. By 2020, Russia will continue to be an important supplier in the European market, while Russia itself becomes a more global player. Russia will do so by commencing exports to Asian markets through (long-term) pipeline gas supplies, and by venturing into the LNG industry with its own proper LNG projects. At the same time, considerable amounts of LNG (for which liquefaction capacity is either under construction or planned) will become available to many of the same areas in which Russian gas is likely to play a role, from Nigeria, Australia, Qatar and the other Persian Gulf LNG producers, amongst various others (see also chapters 6 and 7). While traditionally the Pacific Basin drove LNG demand in the past, future LNG demand is already influenced by Atlantic Basin gas demand as well. The Atlantic Basin has become comparatively more important in this regard.

5.3.1 The balance between LNG and pipeline gas

Inter- or intra-regional trade consisted of some 201 bcm worth of LNG (or 52 percent of total trade) compared with almost 185 bcm for pipeline gas (some 48 percent of total trade) [IEA 2009b]. With the increase in interregional gas trade due in large part to rising import-dependencies, the growth rate for LNG trade is likely to remain high compared to the growth rate in pipeline gas. A total global liquefaction capacity of 256 bcm existed at the end of 2007; an additional 146 bcm is being constructed, which will take total liquefaction to 400 bcm by 2012 alone [IEA 2009b]. A note of caution should be taken with regard to the demand-side impact of the 2008-2009 international financial and economic crisis.

[123] While LNG is traded mainly in two different major trading areas: the Atlantic and Pacific basins, pipeline gas volumes still dominate international trade by size of yearly volumes. The Atlantic Basin, where LNG trading takes place west of the Suez Canal, consists of the US and Western and Southwestern Europe, where exporters include Trinidad and Tobago, Egypt, Algeria, Libya, Nigeria and Norway. The Pacific Basin, ‘east of Suez’, consists of Japan and South Korea, and newly emerging gas importers such as China and India on the importing side while LNG exporters include Malaysia, Brunei, Australia and Indonesia. Three other LNG exporters, in the Persian Gulf, include Qatar, Oman and the UAE. These LNG exporters in the Pacific basin are officially east of Suez, but are within economically viable distances of the US and European markets as well. As such, they act as exporters of LNG to multiples markets in both basins. Rising demand in Middle Eastern countries should also be taken into account since much gas is to come from this region, especially from the Persian Gulf region.

5.3.2 The European gas market(s)

Market Structure

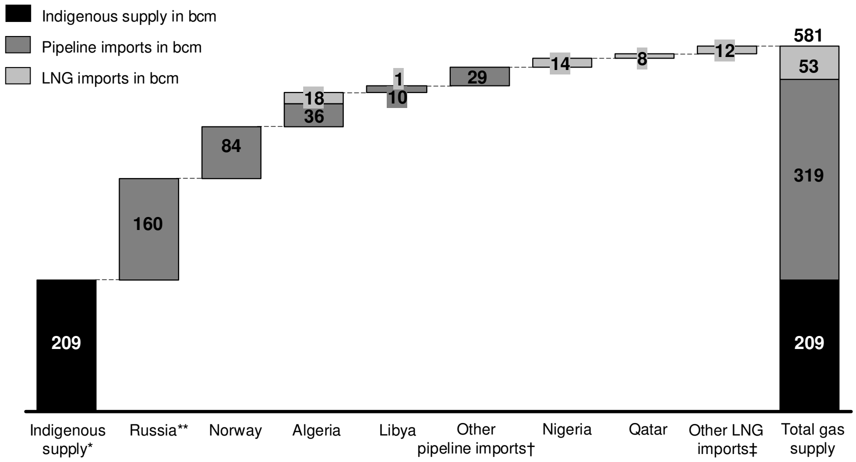
Looking in more detail at the current major regional gas markets for exporting countries – the US, Europe[124] and Asia-Pacific[125] – Europe is by far the most exposed to both pipeline and LNG flows and imports and is already heavily import-dependent.[126] When seen as a major regional market, Europe traditionally relies on indigenously produced gas as well as pipeline gas from Russia, Norway and Algeria, but now it also imports LNG from a number of other sources outside Europe. Of the three main regional markets, Europe is by far the most exposed to both pipeline and LNG flows for its imports. European consumption totalled 581 bcm in 2008, of which 372 bcm were imported (64 percent) [IEA 2009a]. Europe enjoys the luxury of some intra-European supply, with a mature producing area centred on Northwestern Europe (NWE) and the North Sea.[127] The NWE region includes the most important off-take market for net-exporting suppliers within the EU, mainly the Netherlands and the UK. Other relative major production areas within the EU are located in Germany, Romania, Denmark and Italy.[128] Figure 5.2 below provides a graphical overview of Europe's pipeline and LNG supplies in 2008 [IEA 2009a].

The most important non-EU pipeline gas suppliers to Europe include mainly Norway, Algeria and Russia. Norway supplies the UK and Northwest Continental Europe (75 bcm to 84 bcm in 2008). Algeria supplies the Iberian Peninsula (Spain and Portugal as well as Italy (36 bcm in 2008 by pipeline), and Russia is an important supplier to the continental northern, central and southern European markets (160 bcm in 2008). Other pipeline suppliers, including Libya, Iran and Azerbaijan supply small volumes, although more may be available from these countries in the near future. In 2008, the European gas market relied to some extent on LNG supplies, mainly with supplies from Algeria (18 bcm in 2008) and Nigeria (14 bcm), only covering only 9 percent of total European gas consumption. In recent years Qatar has also established some market share in the European gas market (8 bcm) with its recent LNG exports. Northern, central and eastern Europe thus rely more on pipeline gas, while Southern and

[124] In this research, references to 'Europe' and the 'European market' correspond with the inclusion of the EU member-states, Norway, the Balkan non-EU member-states, Switzerland and Turkey while it excludes the CIS member-states.
[125] In this study, Asia is defined by all LNG importing countries in Asia in 2008 – the traditional importing countries: Japan, South Korea, and Taiwan, and the emerging gas markets: India and China.
[126] The non-OECD gas producing countries are also large consumers of gas (for example, the CIS, Middle Eastern and North African countries). This study focuses primarily on the export strategies towards gas-importing countries. Combined with the fact that these countries are more or less self-sufficient, these off-take markets will not be taken into account in an in-depth analysis.
[127] The NWE gas market is defined by Ireland, the UK, Denmark, Germany, the Netherlands, Belgium, Luxemburg, and France.
[128] Other EU gas producing member states – such as Poland, Hungary, France, and Austria – have a very mature gas system with declining production (less than 5 bcm/y) and limited remaining resources [CIEP 2008].

South-western Europe are traditionally dependent on LNG imports, as well as some pipeline imports from North African producers.

Figure 5.2 Gas supply to the European countries by type and source in 2008 (in bcm)



* Excluding Norway.
** Including CIS deliveries via Russia (through intermediate companies); expect from Azerbaijan, which delivers directly to Turkey.
† Azerbaijan: 4.6 bcm; Iran: 4.1 bcm; non specified: 20.6 bcm.
‡ Egypt: 5.3 bcm; Trinidad and Tobago: 5.4 bcm; Oman: 0.2 bcm; non specified: 1.6 bcm.
Note: Europe is defined by all European countries, including Turkey, excluding CIS. Totals may not add up due to rounding.
Source: own analysis, based on IEA [2009].

Pricing in the European gas market

The European market really consists of two markets when it comes to gas pricing: a spot or spot-oriented gas market centred on the UK on the one hand, with its own hub, the National Balancing Point (NBP), and long-term contracts centred on intra-European trading and imports from outside the European market on the other. The NBP, Title Transfer Facility (TTF), Zeebrugge and the Central European Gas Hub (CEGH) at Baumgarten are just some of a number of European gas trading hubs where buyers and sellers can use to buy and sell gas on short-term basis [Cronshaw et al. 2008] Their levels of development and liquidity diverge enormously.[129] The yardstick for hub pricing is the replacement value of the gas rather than the market value principle; contractual prices for natural gas are always geared to the energy content of the gas involved [Dickel et al. 2007; IEA 2008a]. A new trend is for pipeline gas suppliers to reserve capacity for short-term supplies to the wholesale markets and via hub markets, notably producers from Norway and Gazprom, though volumes are still small [CIEP 2008].

[129] The NBP hub saw physically traded volumes rise to 67 bcm and 903 bcm worth of traded volume in 2007 [IEA 2008a]. The TTF and Zeebrugge each reached a level of roughly 10 bcm of physically traded gas and traded gas 25 bcm and 40 bcm, respectively [Cronshaw et al. 2008]. The CEGH reached physical trade occurring at a level of 6.9 bcm in 2007, a 46 percent rise form the previous year while traded volumes rose to 17.7 bcm [IEA 2008a].

The bulk of Europe's gas is traded under long-term, take-or-pay contracts often lasting between 20 and 30 years, often matching the duration of investments.[130] These oil and oil product-indexed contracts cover the required LRMC of the gas.[131] Thus the long-run marginal production costs at one of Norway's most expensive fields acts as a price setter for the European gas market in long-term contracts. The long-term contracts in Europe mostly act as sources of base-load volumes with a high load factor, with little variation or flexibility in delivery.[132] The NBP day-ahead prices reflect regional gas prices in the UK, on a more spot-oriented basis while the German Border Price is an indicator of the oil-indexed gas price on the European continent [IEA 2008a]. The European market is thus a hybrid market involving both short- and long-term trading, with an important gas trading pattern between hubs and long-term contracts arising as such:

"If long-term oil-based contract prices are higher than the gas hub prices, than it is likely that customers will buy at the hub and try to minimise purchases at the contract price. This will drive prices up to contract prices. If there is a well-functioning, deep and liquid hub, then it is possible the hub price will influence the long-term contract price. [...] In this case, the long-term contract price is likely to be a floor price to the hub with players looking to buy additional gas in the traded market, driving prices up" [Cronshaw et al. 2008, p. 41].

5.3.3 The US gas market

Market structure

The US market is an entirely different story when compared to Europe, enjoying virtual self-sufficiency until recently. The US natural gas market is the largest in terms of volume in the world, consuming some 658 bcm in 2008 and importing 112 bcm [IEA 2009a]. Of these 112 bcm, it imported 101 bcm from its North American neighbour Canada and 1 bcm from Mexico in the form of pipeline gas. As for LNG, it imported 7 bcm from Trinidad and Tobago, 2 bcm from Egypt, and 1 bcm from other countries [IEA 2009a]. Thus of the 112 bcm the US

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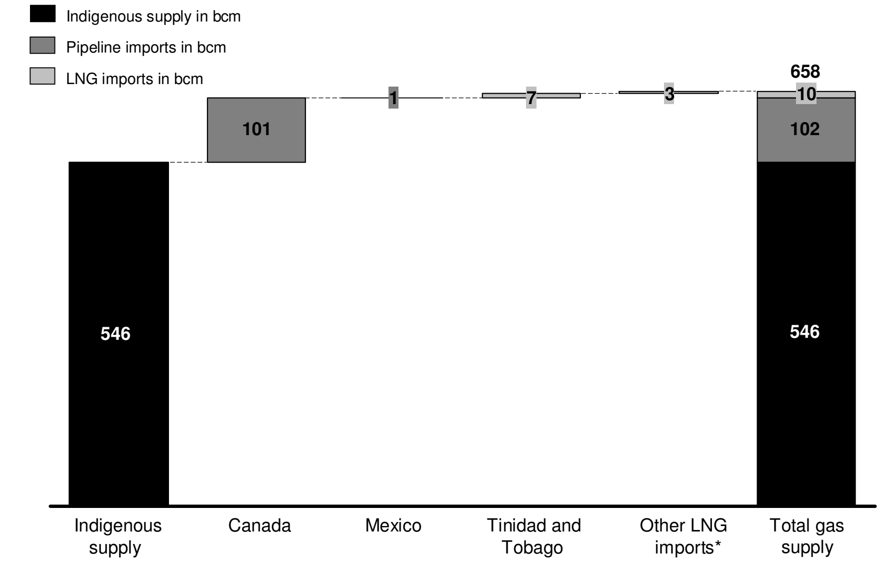
[130] These long-term agreements have several characteristics. The take-or-pay provisions consists of clauses in which the buyer is obliged to pay for a certain amount of gas regardless of whether he uses it or not. All major parties in Europe make use of the so-called market-value principle: the price of gas is valued vis-à-vis other alternative fuel prices for that customer in a particular (export) market, added to the long-term contracts after the first oil crisis, though it was already being used in the Dutch market. The resulting market value or price of gas is then netted back to the seller, i.e., netback values are then calculated: transportation costs and transit fees are subtracted from the price the producer receives. Destination clauses in some supply contracts ensured that gas would flow to the destined market, thus maintaining a local market value approach [Cronshaw et al. 2008].

[131] These contracts use a formula that is linked to competing fuels in export markets. This formula is also linked to the highest-cost marginal field, which in the European case this is the Troll field in Norway. This pricing formula is known commonly in the industry and referred to as the Troll pricing formula [Dickel et al. 2007].

[132] Base-load volumes satisfy a certain base in demand: the 'load factor' measures variations in natural gas deliveries. A high load factor of 100 percent, for example, has no variation while a low load factor involves higher variation.

imported in 2008, 91 percent came from neighbouring pipeline gas exporters and 9 percent from LNG exporters. Figure 5.3 shows the gas supplies to the US by type and source in 2008.

Figure 5.3 Gas supply to the US by type and source in 2008 (in bcm)



* Egypt: 1.6 bcm; Nigeria: 0.3 bcm; Qatar: 0.1 bcm; non specified: 0.5 bcm.
Source: own analysis, based on IEA [2009].

This means gas imports accounted for only 17 percent of total gas consumption, while LNG imports as a percentage of total consumption amounted only 1.5 percent. In recent years however, the development of unconventional gas, stimulated by higher gas prices and fiscal incentives, has reduced the US call on LNG imports (in 2008, the LNG import were less than half the level of 2007) [IEA 2009b].[133] The ongoing economic downturn, combined with lower oil and gas prices, may result in a decline in unconventional gas supplies and lower LNG imports for the time being.

Pricing in the US market

In its functioning as a deep, liquid, and versatile market with hundreds of domestic producers and transmission companies, the US stands in stark contrast to the European market(s).[134] The North American market is the most liquid market in the world as well as the deepest. Its li-

[133] The Barnett Shale in Texas is already contributing 6 percent to total production in the lower-48 states in the US [IEA 2008a].

[134] The combined Canadian and US natural gas markets form the largest integrated natural gas market in the world, with Canada providing roughly a quarter of the combined gas production.

quidity is embodied by the Henry Hub, the most important gas trading hub in the US, which yields the Henry Hub spot gas price.[135] The NYMEX trading platform, which provides futures trading, has proved to be highly successful for gas risk management, providing a very liquid vehicle for hedging short-term US gas market transactions.[136] In view of its depth and liquidity, the US market thus remains the outlet for LNG suppliers, especially those in the Atlantic Basin. Vast amounts of storage in the US and a clear regulatory framework contribute to a well-functioning and liquid market by providing flexibility during times of high demand.[137] Even LNG imports are based on short-term supplies, with only very few long-term supply contracts with buyers in the North American market in existence [CIEP 2008]. This is paradoxical, since LNG trade is supposed to be based exclusively on long-term contract: this mismatch once vindicated the view of some that the US could never become a major LNG importer [Yergin and Stoppard 2003].

A line of separation between the eastern and central US and the western US (California, etc.) is drawn by the Rocky Mountains, with both sides of the US market acting separately. Much of the eastern and central side actually consists of a set of different hubs, each representing demand in different gas consuming centres across the country.[138] If sufficient capacity is available to transport gas between these hubs, price differentials between these hubs will represent the marginal transportation costs between the different locations and price differentials tend to give pipeline companies a clear, timely signal and incentive to build new infrastructure between hubs [Cronshaw et al. 2008]. These basis differentials are a standard element of US gas market trading [Jensen 2004]. The North American market is characterised by thousands of producers, which have an incentive to produce more when prices are high, while mid-stream marketers of gas add value by arranging transportation and storage, and even financing as well as by assuming price risk.[139]

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135 The prices set at Henry Hub on the Texas-Louisiana border are considered to be the primary price quotation for the North American gas market [IEA 2008a]. At Henry Hub, contracts for short-term delivery and trading are available on a day-ahead and month-ahead basis, so buyers and sellers can trade on a short-term basis (as opposed to long-term contracts). Instruments for covering or hedging against risks are available at the NYMEX exchange.

136 While the NYMEX transactions are fully transparent, the swaps market lacks the transparency of the NYMEX exchange quotations [Jensen 2004].

137 Available storage in the US is estimated to stand at 110 bcm, mostly in the form of depleted natural gas fields or oil fields, as well as natural aquifers.

138 There are 38 different hubs in the US and Canada. They have tended to develop at the junction of multiple pipeline interconnections, and usually have access to natural gas storage facilities, allowing the hub operator to offer balancing services, enhancing trading options for both buyers and sellers. The hubs can be located in a producing area near a gas supply basin (such as Henry Hub) or they can be market area hubs, located near a market center, characterized by numerous market participant and access to services, such as balancing and title transfer, organized by the hub operator [Cronshaw et al. 2008].

139 These players are thus often active on the sort-term (spot) and long-term (futures and forwards) market on the NYMEX exchange, where risks can be covered through direct contracts with other counter parties for delivery at a certain hub [Cronshaw et al. 2008]. The debt service on the investment is protected, not in the form of take-or-pay obligations for combined transportation and commodity, but in the form of a 'ship-or-pay' obligation [Dickel et al. 2007].

The predominance of spot trading and liquidity in the US natural gas market has all the characteristics necessary for 'gas-to-gas' competition, in which the market value for gas is determined purely by gas demand and supply factors, rather than indexation to alternative fuels.[140] There appear to be three ranges of price relationships between gas and oil in the US: 1) a discounted gas-to-gas level where the prices of the two fuels are decoupled; 2) a higher level where the gas prices are linked to residual fuel oil and 3) a still-higher level where the gas price linkage is to distillate fuel oil.[141] In the coming years, gas prices in the US market will be set in essence by competition between LNG and unconventional gas production [IEA 2009a].

5.3.4 The Asia-Pacific markets

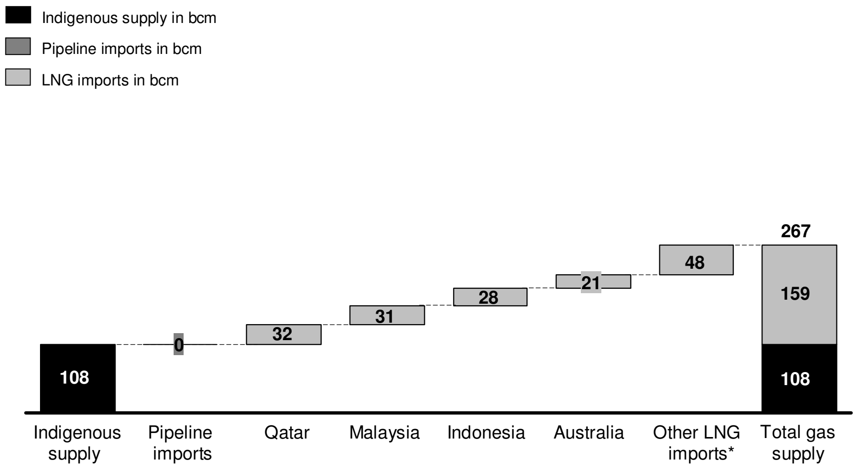
Turning to the Asian-Pacific market, i.e., the Pacific Basin for LNG, a completely different market structure than can be discerned from the ones in the US and European gas markets described above. Traditional gas markets in the Pacific Basin include Japan, Korea and Taiwan, and these three countries have been the driving forces behind LNG trade in the Pacific since the 1960s and 1970s.[142] Since the mid-2000s, China and India have become important new LNG-importing markets in the Pacific Basin, though they have yet to make their joint impact felt in the Pacific Basin (in absolute volume terms). Total gas consumption in the Asia-Pacific region was 267 bcm in 2008. The share of indigenous supply in total Asian gas consumption (excluding intra-regional gas trade by pipeline and LNG) is around 60 percent, due to a few large producing countries in South-East Asia (for example Indonesia, Malaysia and Brunei) [De Jong et al. 2010]. When accounting for gas-importing countries, as shown in Figure 5.4, the share of LNG imports is much higher (60 percent).

[140] For a graphic illustration of this relationship, refer to Figure 27 in [Dickel et al. 2007, p. 121]. However, even Henry Hub prices show a reasonably strong correlation with WTI oil prices at times while at others they follow their own patterns. This linkage weakens and strengthens depending on the relative pricing in the US of gas versus fuel oil, amongst other factors. During the 1990s, gas prices seemed to de-couple from oil linkages after restructuring in the North American industry and so "during an extended period when gas supplies were in surplus – the gas 'bubble' – that indeed appeared to be true. […] But the gas shock of the winter 2000/2001 eliminated the assumption that oil pricing was no longer relevant in North American pricing. During shortage, buyers quickly bid up gas prices, until dual-fired power generation users found it economical to switch from gas to residential fuel oil. Thus an indirect linkage between gas prices and oil prices was re-established" [Dickel et al. 2007, p. 120].

[141] For a graphic illustration of this relationship refer to [Jensen 2004, p. 28]. Gas is responsible for almost 20 percent of power generation in the North America energy scene.

[142] In 1985, the Pacific basin accounted for 40 bcm worth of LNG trade, with Japan in the lead, while by 2000 this figure had risen to nearly 100 bcm, and some 130 bcm in 2006 [Chabrelie 2007].

Figure 5.4 Gas supplies to the LNG importing Asian countries by type and source in 2008 (in bcm)



* Oman: 10.9 bcm; Brunei: 9.5 bcm; UAE: 7.9 bcm; Nigeria: 5.7 bcm; Egypt: 4.4 bcm; Trinidad and Tobago: 1.6 bcm; Equatorial Guinea: 3.7 bcm; Algeria: 2.5 bcm; United States: 1.0 bcm; non specified: 0.2 bcm.
Note: LNG importing Asian countries in 2007: Japan, South Korea, Taiwan, India and China. Totals may not add up due to rounding.
Source: own analysis, based on IEA [2009].

Japan, South Korea and Taiwan

Japan and South Korea have traditionally been powerful LNG buyers in the Pacific Basin. Japan has long been and still is the world's largest LNG buyer, accounting for some 67.7 percent of Pacific Basin trade. Japan boasts the most diversified gas import market in the world through its multiple LNG import commitments. Some 70 percent of Japan's LNG was sourced form just four countries: Indonesia, Australia, Malaysia and Qatar in 2008, by contrast, Atlantic Basin suppliers such as Egypt, Algeria, Nigeria, Equatorial Guinea and Trinidad and Tobago provided almost 5 percent [IEA 2008b]. South Korea and Taiwan accounted for much of the incremental rise in Pacific Basin LNG imports from 1995 onwards. Together, Japan and South Korea are the world's largest LNG importers, importing 95.4 bcm and 36 bcm, respectively, in 2008, with Taiwan following suit at 12 bcm. Collectively, all three countries imported LNG from traditional LNG exporters such as Indonesia, Malaysia and Brunei. Other suppliers to these three important LNG markets include Oman, Australia and Qatar. Japan, South Korea and Taiwan are set to remain important LNG buyers in the Pacific Basin.

China and India

China and India have only just made their début during the last few years as gas importers, primarily in the form of (relatively small) small LNG imports. These two countries, given the rates of economic growth and their desire to increase their use of gas in their energy mixes, are likely to have a long-lasting structural impact on the LNG market in the Pacific Basin and ultimately also in the Atlantic Basin. For now, gas plays a only a marginal role in these countries' energy needs (4-5 percent in 2008) [IEA 2009b]. China has had sufficient domestically produced gas volumes until 2005 to satisfy domestic demand, after which time it began to import LNG, thus joining the ranks of the Pacific LNG buyers. China produced 73 bcm in 2008, but consumed 77.6 bcm in the same year [IEA 2009b]. China is a newcomer to the natural gas market as far as gas imports are concerned when compared with South Korea or Japan (in the Asia-Pacific region), importing 4 bcm worth of LNG from Australia, Algeria, Egypt, Equatorial Guinea and Nigeria in 2008. Recently, China is reported to have begun importing pipeline gas from Turkmenistan with the opening of a pipeline commecting both countries (also see Chapter 6). India produced 29 bcm in 2008, consuming 39 bcm and importing 10 bcm worth of LNG. In 2008, India's LNG imports came from Qatar, Nigeria, Oman, and minor amounts from Australia, Equatorial Guinea, the United Arab Emirates (UAE), Algeria, Egypt, Malaysia.

Pricing in the Asia-Pacific market

As mentioned earlier on in this chapter, the Japanese market is characterised by an almost exclusive reliance on LNG imports, which come primarily from the Pacific Basin (including the Persian Gulf). With Japan as the leading LNG buyer in the region, LNG prices there are logically tied to the Japanese crude oil price. In traditional long-term Asian LNG contracts, pricing is linked to the import prices of a basket of prices, including the Japan Crude Cocktail (JCC), as Japan is the largest buyer of LNG by volume in the Pacific Basin [IEA 2008a][143] Japan's gas base load deliveries as well as peak load requirements are all satisfied with LNG imports.[144] Japan's LNG imports are all tied into long-term contracts as Japan does not enjoy the luxury of hub trading.[145] The tradition of long-term contracts in the Asia-Pacific Basin originates from one of the first Japanese-backed projects, namely the Arun project, resting on the willingness of the Japanese government – through the Ministry of International Trade and Industry (MITI) and Japan's Export-Import Bank (J-EXIM) – to set up the purchase of the gas and the timely construction of an infrastructure for using it [Barnes et al. 2006].

[143] Included in Japan's long-term LNG import contracts is the so-called 'S-curve' to help alleviate, for both LNG sellers and buyers, the effects of sudden, severe oil (or JCC) price swings by establishing ceilings and floors in the movement of the LNG price relative to the oil price. For a graphic illustration of this relationship and further explanations, refer to Figure 28 in [IEA 2007a, p. 111]. Also refer to [Flower 2008a].

[144] Vertically integrated regional companies form the basis of the city gas industry and by the end of March 2007 there were 213 general gas utilities in Japan, of which three major LNG purchasers, Tokyo Gas, Osaka Gas and Toho Gas share some 75 percent of the market in Japan (36 percent, 27 percent and 11 percent, respectively) [IEA 2008a].

[145] Normally, with the functioning of the 'S' curve, the LNG price is above crude oil (JCC) parity at low oil prices but the premium erodes as the oil price increases and is eliminated depending on the size of the constant in the LNG pricing formula [Flower 2008a].

5.4 Growth opportunities for gas-exporting countries

In the period stretching to 2015 and beyond, the OECD markets, i.e., the US and Canada, OECD Europe, Japan and Korea will remain the world's deepest markets by volume, while demand in emerging gas markets such as China and India rises fastest in relative terms.[146] The historic intra-regional supply growth of the Pacific basin is expected to slow, while the Middle East, Africa and to a lesser extent Latin America emerge as more important incremental exporters [Jensen 2004]. Much demand uncertainty has arisen with onset of the financial and economic crisis of 2008-2009. In the mean time, most of the major regional gas-importing markets are expected to continue to become more import-dependent, due to higher gas demand and lower indigenous supplies.

In a 'post-Kyoto' world, gas is seen as the transition fuel towards more renewable energies, because: (1) gas is much cleaner than other fossil fuels, especially in the area of power generation; and (2) gas is an appropriate source to balance intermittent renewable sources, such as wind energy. In the IEA's 'green' scenario, for example, world gas demand in 2030 is 17 percent lower than in de reference scenario, though demand is still higher in 2030 than in 2007. Relatively low lead times and capital costs for Combined Cycle Gas Turbines (CCGT) gas-fired plants are expected to be important contributors to demand for gas in power generation, both in OECD and non-OECD countries [IEA 2009b]. However, long-term gas demand forecasts in the world's most important gas consuming regions are prone to great uncertainties due to various reasons. More than ever, one can observe that analysts and institutions are offering diverging views on the future demand for gas [CIEP 2008]. Below, some of the main gas demand uncertainties are listed below, largely based on [IEA 2009c; CIEP 2008]:

1) In most of the countries the current economic decline has resulted in a reduction in demand and may affect gas demand from 2015 onwards. Depending on the length and depth of the crisis, expected, however that demand will rebound, largely driven by the power generation sector IEA [2009];
2) government policies (including security of supply and environmental policies), surrounding the use of gas in its energy mix, such as the 20/20/20 EU targets,[147] could affected especially the amount of gas imports (either for political or economic reasons) [CIEP 2008];
3) the relative (oil and) gas price (volatility) development vis-à-vis its substitutes, such as coal and renewables;

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[146] Of great significance, in addition, is the absolute rise in consumption in net-exporting regions and countries such as the Middle East and Russia, putting pressure on their export capacity [IEA 2009b].

[147] The EU adopted an integrated energy and climate change policy in December 2008, including targets for 2020. These targets include: (1) cutting greenhouse gases by 20 percent (30 percent if international agreement is reached); (2) reducing energy consumption by 20 percent through increased energy efficiency; and (3) meeting 20 percent of EU's energy needs from renewable sources.

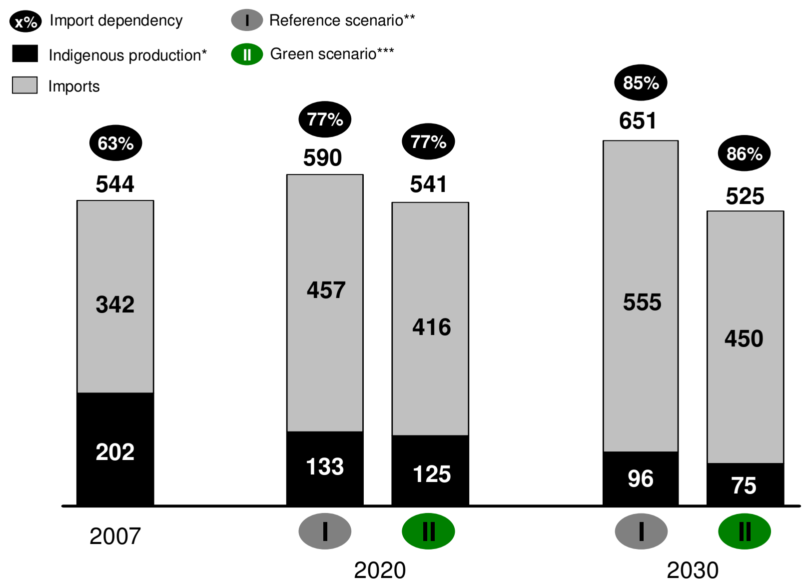
4) Carbon dioxide (CO_2) emission costs and carbon capture and storage (CCS) developments. For instance, with high CO_2 emission costs (and high coal prices) power generation plants will focus on gas;
5) different (price) regulatory uncertainties could have an impact on the role of gas and its demand.

According to the reference scenario of the IEA [2008b], primary energy demand is set to rise by 1.6 percent per annum between 2006 and 2030, an increase of 45.3 percent. The power generation sector is expected to take up much of the demand in this regard as it rises by 2.4 percent per annum between 2006 and 2030, amounting to a 57 percent rise.[148]

5.4.1 The European gas market

According to the Reference scenario of IEA [2009c], OECD Europe will increase its import dependency to 77 percent by 2020 and 85 percent in 2030 (excluding Norway), see Figure 5.5 below

Figure 5.5 OECD Europe gas market: import dependency (reference scenario in bcm)



* Excluding Norway.
** Energy policies are assumed to remain unchanged.
*** The IEA 450 scenario, or green scenario, assumes government action to curb greenhouse gas emissions consistent with 2 degrees Celsius global temperature increase.
Source: own analysis, based on IEA [2009c].

[148] The much higher level of gas prices, in absolute terms and relative to coal prices is the main reason for the downward revision in projected demand growth by the IEA [2008b].

The growth of gas imports will be substantial in some regions. In Northwestern Europe (NWE) the growth of gas imports is mainly due to lower indigenous supplies from the gas fields in the North Sea and in other markets also as a result of higher expected gas demand. The total gas demand will increase by 20 percent from 2007 (544 bcm) to 2030 (651 bcm), according to the Reference scenario. In IEA's 'green' scenario, gas demand will decrease by 3 percent from 2007 to 2030 (525 bcm), although the level of imports will still rise due to declining indigenous production. Apart from the already mentioned uncertainties, the main uncertainties for future European demand are found in policies surrounding the use of gas in the power generation segment (e.g., the role of renewables, the effectiveness of the CO_2 emission trade, the fuel choices as a result of security of supply reasons, and the prospects of CCS), including the potential for energy savings.[149] Other specific uncertainties in regard to European gas demand are undeveloped gas (transit) networks in some sub-regional markets [expert interviews; Correljé et al. 2009].

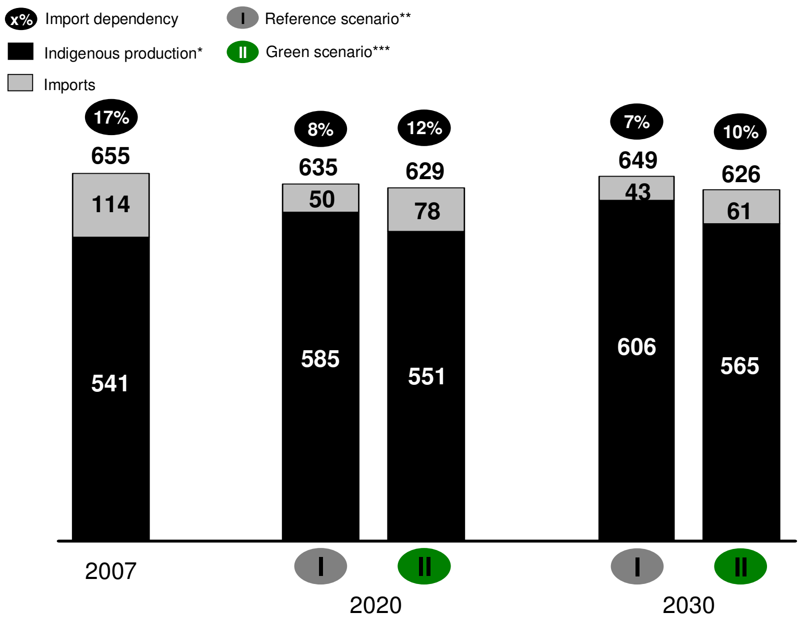
5.4.2 The US gas market

The US is likely to remain only modestly dependent on LNG imports. The EIA [2010] takes into account the significant contribution of unconventional gas production in that region, affecting US demand for LNG imports, which may stabilise indigenous supplies. The future unconventional gas production is the main specific uncertainty in the US (and global) gas markets, especially under currently low Henry Hub gas prices [IEA 2009b]. Another consequence of the surge of unconventional gas production is that the further internationalisation of the gas market, in which the US was expected to become a major buyer of LNG, is not developing as perceived, making a continuation of more regional based gas flows more likely.

According to the Reference scenario of the IEA [2009c], the US is projected to consume some 635 bcm by 2020, and 649 bcm in 2030, which results in a small demand reduction between 2007 and 2030 [IEA 2009c]. According to the green scenario, the demand reduction is slightly higher (4 percent between 2007 and 2030). In absolute terms, over the course of the next decades, with pipeline imports from Canada en Mexico combined with some LNG supplies from Latin America, the Middle East and Africa, it will remain a possible important market for exporting countries. Figure 5.6 provides an overview of the import dependency of the US market in IEA's Reference and green scenario.

[149] For example, European gas imports could vary substantially by 2020 depending on EU policy on 20/20/20 and oil price developments. These policies are the result of a desire to decrease import dependence, particularly from Russia. The resulting bandwidth is 170 bcm in 2020 (312 to 482 bcm). One scenario expects a decrease in EU's gas imports from 316 bcm in 2010 to 312 bcm in 2020. See Chapter 10 for a scenario analysis on aggregated European gas demand (and supply).

Figure 5.6 The US gas market: import dependency (reference scenario in bcm)



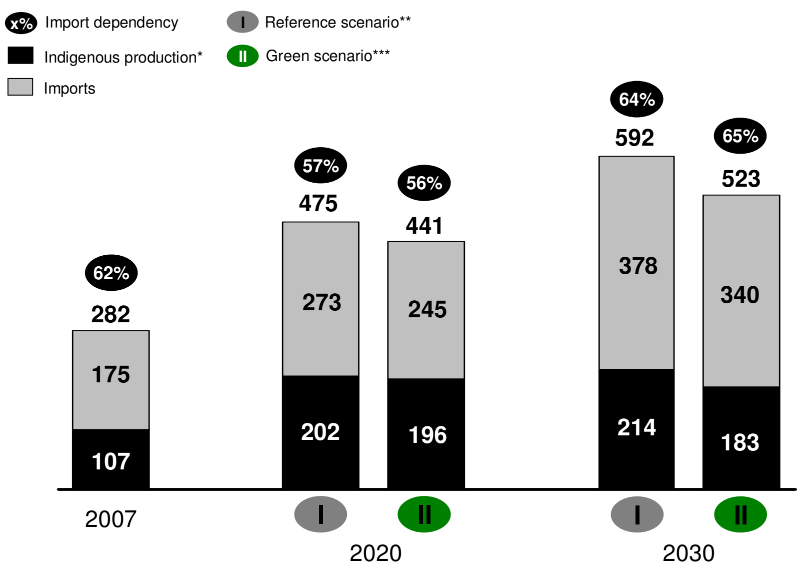
** Energy policies are assumed to remain unchanged.
*** The IEA 450 scenario, or green scenario, assumes government action to curb greenhouse gas emissions consistent with 2 degrees Celsius global temperature increase.
Source: own analysis, based on IEA [2009c].

5.4.3 The Asia-Pacific gas markets

According to the IEA's Reference scenario, demand in the Asia-Pacific countries will stand at 592 bcm in 2030. The OECD Pacific market (i.e., Japan, South Korea, and Australia/New Zealand) grows from 170 bcm in 2007 to 218 bcm in 2030, while China's consumption may rise to 242 bcm in 2030 (up from 73 bcm in 2007) and India's consumption to 132 bcm (up from 39 bcm in 2007). This boils down to 1.1 percent per annum for OECD Pacific countries versus 5.3 percent per annum for China and 5.4 percent per annum for India between 2007 and 2030 [IEA 2009c]. According to IEA's green scenario, gas demand is expected to increase, but less than in the case of IEA's Reference scenario (for OECD Pacific a change of 12 percent in 2030; for China 18 percent; and for India no change) [IEA 2009c].

For China and India, coal is expected to dominate their energy mixes, although environmental policies may change the composition of their energy mix [IEA 2009c]. Most of its growth in gas needs to be fulfilled by imports, although production is expected to rise. The demand growth differs substantially in the medium-term by regional market, according to the reference scenario of the IEA [2009c]. However, the call on imported gas is expected to increase in all above-mentioned regions. In Figure 5.7 the demand growth and the import-dependency is displayed graphically.

Figure 5.7 LNG importing Asian countries: import dependency (reference scenario in bcm)



* Excluding Australia.
** Energy policies are assumed to remain unchanged.
*** The IEA 450 scenario, or green scenario, assumes government action to curb greenhouse gas emissions consistent with 2 degrees Celsius global temperature increase.
Note: Japan, South Korea, India; China; Australia; and New Zealand (in this graph, excluding Taiwan).
Source: own analysis, based on IEA [2009c].

Specifically, China's regulatory landscape, combined with increasing domestic production (the government plans to double its domestic production to 160 bcm by 2015), uncertainties about price reforms, and other market uncertainties, may hinder an additional call on import gas [IEA 2008a]. Future flows to Japan and South Korea, the traditional LNG imports of the Asia-Pacific region, are likely to continue coming from Pacific Basin suppliers such as Brunei and Malaysia as well as Australia and from Middle Eastern suppliers such as the UAE, Oman and Qatar. Future flows for China and India may perhaps materialise in the form of both LNG imports from similar sources as mentioned above for Japan,[150] etc., and pipeline gas imports from the Middle East and Central Asia. China was interconnected by pipeline to Turkmenistan in December 2009, and could possibly be interconnected with Myanmar in the future, Kazakhstan and Russia as well (with Russian supplies reaching other Asian markets as

[150] For example, in April 2008 China signed a long-term deal with Qatar for LNG to be supplied as of 2010 (see Chapter 7).

well, see Chapter 7) [IEA 2009b].[151] Depending on a number of uncertainties, India may be import pipeline gas from Iran and perhaps Turkmenistan by pipeline, although this seems unlikely to occur before 2015 [IEA 2009b], if at all.

5.5 The flexibility of LNG and new business models

The main causes for increased flexibility in the LNG value chain is due to a combination of a number factors [Stern 2008; Jensen 2004], namely the following: Advances in technology and flexibility of different physical components in the LNG chain; the need for buyers to access flexible supplies at short-notice; changing business models and the entry into LNG markets of commercial players oriented towards short-term trading and profitability; the growing influence of price arbitrage between Henry Hub (the US), NBP (the UK) and the JCC; economies of scale in shipping; import-dependencies and rising demand in consuming regions and and interregional price discrepancies.

How future flows are determined depends to a large extent on LNG trade and pricing developments in the important LNG trading basins. As of yet, there thus is no globally functioning LNG market, and long-term contracts will continue to pre-dominate the nature of gas trade. Nevertheless, long-term contracts between buyers and sellers of LNG, the bedrock for investments in a capital intensive gas industry have shown increased flexibility in the face of interregional price differences. High demand in various markets and price discrepancies help stimulate arbitrage in a market with comparatively few sellers and many buyers, hinting at increasing interconnection between markets and a 'shorter-term' market for LNG cargoes. Of course, currently a situation of 'under-demand' or oversupply exists, which has had a considerable impact on this short-term end of the market.

The transatlantic gas markets, i.e., the Atlantic Basin for LNG, sees the strongest potential for increased hub-driven gas-to-gas flows, given the presence of important hubs such as Henry Hub, the NBP and other continental European hubs. The Pacific Basin is likely to see LNG trade mostly based on long-term contracts. A shorter-term market involves spot trading which reveals that the spot price lies above the value in long-term contracts, breaking oil-price linkages with high prices, and conversely; a long market involves spot trading which reveals that the spot price lies below the value in long-term contracts, breaking oil-price linkages with low prices [Frisch 2008]. Neither the markets nor the suppliers appear to be driving the market towards full commoditisation which might lead to a single global commodity price; nonethe-

[151] Though China is already active in the LNG market of the Pacific basin, it opts for diversity of imports and has strengthened ties with its Central Asian neighbors with the aim of establishing more reliable pipeline gas import routes as well. The Chinese are also in talks with Kazakhstan over a similar pipeline to be built from Kazakhstan's western provinces to China where it will also link up with China's West – East pipeline [MEES 2008h] and [PIGR 2008d].

less, some convergence of pricing may occur [IEA 2008a]. Much also depends on the further aftermath of the economic and financial crisis and how long the recession lasts.

5.5.1 The growth of regional hub trade in the Atlantic Basin

In the Atlantic Basin approximately 40 percent of the total trade has been made of "flexible" LNG, before the economic downturn in 2008 [De Jong et al. 2010]. The share of the UK and US markets in the LNG markets will likely continue to drive shorter-term trade in the Atlantic Basin (and beyond). The Atlantic Basin (with the US Henry Hub on the one hand and European hubs such as NBP, TTF, etc., on the other) holds much potential for continued and perhaps increased short-term LNG trade. The US market already boasts a deep and liquid market, while in Europe the rise of more flexible intra-regional supplies is boosting liquidity there as well. A new trend, for example, is for LNG and pipeline gas suppliers to reserve capacity for short-term supplies to the wholesale markets and via the hubs, notably LNG producers and from Norway and Gazprom by pipeline, though volumes are still small [CIEP 2008]. Contractual commitments downstream of the receiving terminal can be met through the purchase of gas at trading hubs, enabling the LNG to be shipped to other markets [Flower 2008b]. Since OECD Europe, for example, will see its incremental import demand satisfied by both pipeline gas and LNG, LNG imports to Europe will interact with pipeline gas sold on the basis of oil- and hub-based prices [IEA 2007a].

The result is also that gas prices can move more freely and in a more unpredictable manner than is the case in long-term contracts. These more volatile prices can fluctuate above the price level established in long-term contracts, and thus when hub indices exceed indexation in long-term contracts; sellers have an incentive to index their contracts to a stronger weighted impact of hub prices. Conversely, hub-based prices can sink below the oil-indexed level established in long-term contracts, which will encourage buyers to do the same: argue for greater spot indexation. New hedging instruments have, during recent years, facilitated short-term trade between Henry Hub and the European spot markets. In this manner, intraregional, flexible pipeline volumes in Europe, for example, can interact on a short-term basis with interregional, flexible LNG in the Atlantic Basin (and beyond). Should a number of re-gasification terminals be built on the west coast of the US, these could put additional pressures on rigid LNG through exposure to Henry Hub prices [Stern 2008]. All of the above should be seen in light of the current (2009-2010) economic recession.

5.5.2 The persistence of long-term contracts in the Asia-Pacific Basin

The trade in LNG in the Pacific Basin is characterised mostly by LNG trading involving oil price indexation (see Section 5.4.3 above). The share of flexible LNG in the Asian market may thus be considerably lower than the Atlantic Basin. Only a small share of LNG is traded on a true spot basis, the prices paid for spot cargoes tend to reflect the current market situation (such as power outages and sudden demand expansion) [IEA 2008a, p. 23]. With the 2008-2009 global economic and financial crisis, prices in this 'short-term' market have fallen substantially below oil parity as the market shifted form a seller's to a buyer's market. Japan's integrated gas utilities have generally been able to buy exceptionally expensive spot LNG cargoes in the Pacific Basin and beyond because they have purchase portfolios large enough to absorb the high price of these individual cargoes; and seller's arguments for price increases, especially in higher oil price ranges [IEA 2007a]. The converse now holds for buyers in a buyer's market: low short-term prices encourage a downward price review in these contracts. In addition, these utilities form purchasing consortia in order to collectively increase their clout and purchasing power. During 2008, the outage of a nuclear power plant in Japan created additional demand for individual LNG cargoes, making room for diversions of cargoes from as far away as the Atlantic Basin.[152]

5.5.3 Newly emerging LNG business models and downside risks

Economies of scale, interregional price differences (e.g. arbitrage opportunities), the opening of the US market, high energy prices in this decade and a sellers' market have together combined to create new business models for LNG which diverge significantly from the traditional long-term contract [CIEP 2008]. Downstream integration into re-gasification assets occurs in three forms: 1) an integrated, bi-lateral model where the buyer pays for re-gasification, 2) self-contracting, which is a second generation model and 3) a third-party construction of a re-gas terminal where either a seller or buyer buys capacity on a long- or short-term basis (e.g., such as the Gas Access To Europe (GATE) terminal in the Netherlands).[153] Self-contracting also occurs in the European pipeline gas markets and increasingly occurs in a similar manner for LNG.[154] The new business models for LNG include allocations of output for short-term deals, self-contracting and aggregation [IEA 2008a; CIEP 2008; De Jong et al. 2010]:

1) Producers reserving part of their liquefaction capacity for short-term deals.
2) Producers and mid-streamers contracting their own production: Upstream stakeholders purchase planned liquefaction output, and in turn market it by themselves, either through

[152] Another example involves a Qatari diversion of LNG in November 2006. One of Qatar's first diversion deals was concluded when Korea Gas agreed to a long-term contract for 2.6 bcm at prices which are understood to be above crude oil parity at an oil price of $60/bbl, which is a significant premium over the prices in Korea's other long-term purchase contracts [Flower 2008b]. While the S-curve has been the mechanism of choice in these contracts, Japan was reported to be prepared to use new term contracts for Indonesia involving a full exposure to the JCC price, i.e., parity-based, from 2010 onwards [PIGR 2008c]. The impact of the economic recession is undoubtedly serious enough to force a review of these price terms.

[153] For an extensive description of gas supply business models and financing, refer to Chapter 2 in [Smeenk 2010].

[154] Pipeline suppliers to the European market, notably those from Russia, Norway and Algeria, also appear to add "flexible supplies", not committed to their markets by means of long-term contracts, in their supply portfolio for Europe, for purposes of direct marketing and sales in the wholesale spot market [De Jong et al. 2009; CIEP 2008]. For example, GMT has already contracted pipeline capacity in the Nord Stream pipeline (see also Case study 3, Chapter 9).

capacity and/or equity acquisition at re-gasification terminals downstream in consuming countries or even direct sales to willing buyers. Various pockets of liquefaction output, or equity liftings, are thus allocated to different markets by either a consortium or joint venture or by one single player, achieving supply diversity and optimal revenues through the attainment of re-gasification assets downstream. This strategy may be pursued by LNG producers already established in the market with assured cash flows from earlier investments or by new LNG players, to the extent there is sufficient cash flow from supplies committed under long-term contracts.

3) The emergence of LNG aggregators buying LNG long-term and selling it in a mixed portfolio (though few companies have actually ventured on with this business model): So-called aggregators make sales commitments at LNG receiving terminals in emerging LNG consuming countries. Often, long-term supplies are bought by an aggregator and then sold on a short-term basis in different markets as described above; this aggregates supply and demand and interlinks regional markets still further. This has given rise to so-called 'market-or-pay' agreements between upstream equity lifters or aggregators, in which liquefaction output is bought by the aggregator, often an IEF, regardless of whether the output is marketed or not. They hereby clearly intend to move LNG through their own integrated systems much as they might earlier have done with third-party contracting.

Yet, the movement away from oil-linked price clauses in long-term contracts to short-term or spot market purchases or even term contracts with gas-linked pricing poses a substantial challenge, costs and risks to gas sellers [Jensen 2004]. At the value chain level, some consequences of self-contracting (and other forms of flexibly marketing LNG) are [De Jong et al. 2010]:

- The need for producers to secure re-gasification capacity in different markets (or overcapacity in case of a pipeline system) in order to realise the potential of arbitrage. In addition, this is done so as to maintain shipping capacity such that a supplier remains capable of reaching the markets included in its arbitrage portfolio;
- the need for producers to develop the tools and capabilities to sell gas directly in markets of their choices without long-term supply contracts for flexible gas.

These business models may lead to chronic surpluses in shipping and re-gasification, which would results in higher risks and costs for producers (and aggregators). This enabled LNG (and pipeline gas) to become more flexible, fostering the impression that interregional gas-to-gas competition may decouple this flexible LNG from long-term, take-or-pay, oil-indexed contracts. The downside risks of the new business models are both revenue- and volume-related. When the current sellers' market transforms into a buyers' market, short-term and spot gas prices may well be less desirable than the prices realised under long-term contracts and it may even prove difficult to place LNG in markets which are already well supplied. According to De

Jong et al [2009], for these reasons the self-contracting producers and aggregators often exploit at least one "haven" of last resort for their LNG via firm's re-gasification capacity. In many cases this lies in the US as it offers the most liquid market, with the most capacity to absorb surplus LNG even in an oversupplied global market. Obviously, with the impact of the rise of the production of unconvetional gas in the US, this situation has fundamentally changed.

Whether these new business models will evolve and develop further depends on (1) the risk appetite of LNG suppliers to continue to exploit their resources on the basis of the new business models in conditions of lower and/or volatile energy prices; (2) the ability and compliance of the markets, particularly the European market players and to a lesser extent those in Asian markets, to accept and manage the supply risks associated with these business models; and (3) the preparedness of producing and consuming governments to distance themselves from LNG sale and purchases transactions. The current economic crisis might encourage gas exporting companies to go for long-term contracts instead of choosing a business model of flexible supplies [De Jong et al. 2010].

5.5.4 The tendency towards further short-term trade

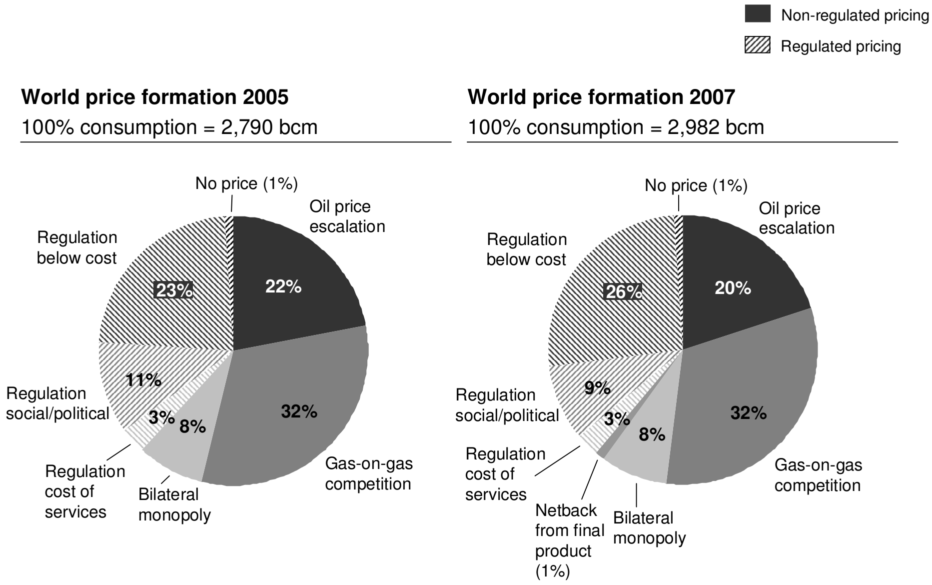
The advent of new business models in the marketing of LNG, in which pockets of LNG become more flexible on the basis of short-run price fluctuations between regions – and within these price discrepancies – the spread between price levels paid for short-term LNG and long-term contracts, means pricing issues are bound to arise in the long run. Interregionally flexible LNG supplies, i.e., 'uncommitted' LNG volumes, will shift in accordance with shorter-run price spreads first between regional markets, then between basins, even as 'pockets' of pipeline gas mainly within Europe also become more flexible. The price spreads between various regional markets for LNG feed into longer-term contracts, more adequately reflecting demand and supply patterns [IEA 2009b]. The effect of these new business models on interregional trade is to create greater connections between the various regional gas markets, to create room for shorter-term trade, where peak-load 'optimisation' of LNG flows as complements to flexible pipeline gas is one thinkable form of short-term trade. Indeed shorter-term trading can involve pipeline gas-for-LNG swaps, term contracts, i.e., three to five-year contracts.[155]

Per reference to Figure 5.8 below, the share of gas-to-gas, spot-oriented pricing remained the same between 2005 and 2007 in relative terms though in absolute terms it grew, largely as a

[155] This 'half-way-house' contractual model is based essentially on the idea that it provides producers with a bandwidth between long-term contracts and spot sales, possibly appealing to those LNG producers whose assets have been largely amortised and who expect a continuation of today's seller's market or who, like Qatar, have developed a project based on self-contracting to sell in another market when desirable. The process of term contracting and tendering in both basins has led to increased prices, shorter contract duration and, at times, reduced volumes.

result of the growth of spot LNG imports in traditional LNG-importing countries in Asia and in Spain, for example.

Figure 5.8 World natural gas price formation in 2005 and 2007



Source: IGU [2009].

The bulk of gas-to-gas pricing corresponds with Henry Hub and NBP pricing, given the fact that the US and UK gas markets are very large. The traditional netback pricing mechanism in the regional markets described above accounts for more than 50 percent of the total world's consumption. Pricing based on regulation (e.g., cost of service, below-cost and social and political) is responsible for almost another 40 percent of the total world's gas consumption. This pricing mechanism is largely applied in producing countries, where much of the gas production is consumed locally. Some countries where regulated prices prevail (such as in Russia and Ukraine) are investigating other pricing mechanisms. The shares of other pricing mechanisms are rather small [IEA 2009c]. The economic and financial crisis of 2008-2009 is bound to have an important impact on these aforementioned pricing patterns.

Note should be taken of new technologically innovative developments and techniques for liquefaction and re-gasification and their potential impact on shorter-term trade in the long run. Floating liquefaction, for example, is a process in which liquefaction plants – specially designed for the purpose – are located offshore to develop otherwise stranded gas fields, from small to large ones. At the same time, new offshore re-gasification techniques involving ships with on-board re-gasification equipment could pave the way for yet more flexible LNG deliveries to markets as expensive re-gasification (and liquefaction) terminals and Not In My Back Yard (NIMBY) problems can thus be circumvented. It involves a quicker implementation schedule when compared to conventional land-based LNG receiving terminals because offshore re-gasification buoys are used instead [IEA 2008a].[156] Such acquisitions could prove valuable assets for gas suppliers in a European market with rising dependency and increased short-term trading. Another development which favours economically feasible short-term LNG trading is floating storage.[157] Various types of actors in the LNG value chain, from suppliers to buyers, are increasingly active in the floating storage market where gas is stored offshore for the summer and sold to any one regional market during the winter for a higher price [WGI 2006a].

5.6 Conclusion

The 2008-2009 economic slow down in gas demand has demonstrated that tightness in interregional LNG flows can easily be reversed, and that future developments in gas demand are never certain. Regional gas markets such as Europe, the US and Japan, together with 'newer' markets such as China and India, are likely to continue functioning as they do. 'Flexible' LNG will proceed to act as a source satisfying marginal needs as it interacts with base-load pipeline supplies, primarily in Europe. There is thus a globalisation of the regional gas markets as LNG increasingly acts as an interregional gas price marker.

Significant price differentials between major regional gas markets have encouraged major producers and shippers to allocate production of liquefied gas into portfolios including long-term and shorter-term sales. These developments have helped push and pull LNG from a regional and bi-lateral type of trade to a more global and multi-lateral environment. These interregional, flexible LNG volumes, though limited in absolute terms, move to and fro between regions at great price sensitivity, doing so on the basis of some form of spot, short-term or hub-type trade, arbitraged away from originally long-term flows. These diversion effects demonstrate the tendency towards hub-based indexation, or gas-to-gas competition on an interregional basis. In a buyer's market and under conditions involving falling demand, and thus also falling shorter-term prices (and oil prices), such trading poses significant downside risks.

Along regional lines, the gas markets in the US, Europe and the Asia-Pacific region will continue to exhibit differences in market structure and import-dependency. In terms of pricing

[156] Excelerate Energy has been successful offshore in the US, in the Gulf of Mexico in 2005. Kuwait, for example, which has a really small harbour, is also planning to use the system. Taqa Petroleum, a subsidiary of the UAE's Abu Dhabi National Energy Company, bought from BP a strategically located platform plus emptied gas fields known as P15/P18, just off the Dutch port of Rotterdam, for eventual offshore re-gasification and storage use [MEES 2007a].

[157] For example, Qatar uses floating LNG to arbitrage between markets by maintaining liquid volumes for such trades [WGI 2009d].

and trade these markets will continue to differ substantially as well. The US and (part of) Europe remain on the short-term side of the gas-pricing spectrum while to a large degree Europe and the Asia-Pacific region remain dependent on long-term trade. However, with the rising flexibility of LNG, particularly in the Atlantic basin, but also between both major trading basins, some interregional price convergence is likely to occur. The rise of flexible LNG, in large part owing to new business models, is likely to be an important driving force in the further globalisation of LNG trade. LNG volumes are thus likely to interact further with pipeline volumes on a gas-to-gas or short-term basis as LNG imports increasingly roll into the market on a marginal basis, even as oil and gas prices could continue to be closely linked with one another. As has been cautioned in this chapter time and again, the manner in which they do so is likely to be affected fundamentally by current conditions involving interregional gas market oversupply.

Chapter 6

The 'inner' gas market integrators

6.1 Introduction

As has been indicated previously, the interregional gas market is predisposed to an oligopolistic market structure simply due to the distribution of gas reserves. The developments described in the previous chapter as far as gas market structure, trade and pricing are concerned, are likely to be dominated in the long run by a limited number of countries. A large portion of these gas reserves, some 75 percent, lies in countries where the state decides on the timing and conditions under which these volumes are exploited and sold. It is important to grasp the nature of the National Energy Firms (NEFs) in these countries and their strategies in order to appreciate how these actors may behave in the long run development of interregional gas market. These countries delegate the management of their gas resources to their NEFs which, for the purpose of this study, fall into two camps: the so-called 'inner' and the 'outer' gas market integrators (which are covered in Chapter 7). The inner integrators include Russia, Azerbaijan, Turkmenistan, Kazakhstan, Uzbekistan and Iran. Russia has aimed to extend its ties with Iran and already plays an important role with regard to the former Soviet countries.

These countries are grouped together as 'inner' integrators in this chapter because of the following reasons:

1) They are 'inner' gas market suppliers or potential suppliers because gas flows from these countries emanate from *within* the Eurasian continent;
2) they currently supply or could potentially supply gas mostly by pipeline (but in the medium- to long-term aim to develop LNG exports or have already done so to a limited extent);
3) as a result, despite accounting for some 45.2 percent of known conventional gas resources [IEA 2008d; BP 2009], these countries play a limited role in interregional gas trade (though this may change in the future);
4) in one manner or another, they are involved in the web of complexities of the landlocked Caspian Sea region (where Russia and Iran have a special relationship), either as landlocked states themselves or as important stakeholders in the region's development;
5) The categorisation of this group of countries in this manner encompasses both Russia and Iran, which have a number of common interests on the Eurasian continent, differing fundamentally in that respect from other gas-exporting countries outside this group.

All the country reviews in this chapter are organised in a similar fashion: they respectively cover gas reserves and balance, gas sector developments, gas export ambitions and sales strategy as well as ties to Russia and Gazprom, where applicable. Section 6.2 covers Russia, where oil and gas reserves have been covered in Chapter 3 (in an effort to build the case for an integrated Russian gas strategy). Section 6.3 summarily covers the former Soviet republics: Azerbaijan, Turkmenistan, Kazakhstan and Uzbekistan. Section 6.4 deals with Iran, also one of the inner integrators, with which Russia has a geopolitical relationship rather than merely geo-economic one. For this reason, Section 6.4 includes a small section on the geopolitical dimension of the Russia-Iran relationship.

6.2 The Russian Federation

Having concluded in Chapter 3 that Russia wants to build on its natural resources to achieve a relative advantage, this chapter is essentially a follow up of this line of argumentation at a company level, with a focus on Russia's gas sector. Both Russia, as a principal, and Gazprom, as an agent, operate in a space with geo-economic opportunities and constraints. Russia as a state can influence the boundary solutions for Gazprom, both in terms of domestic and foreign policies. This may help secure, for example, gas flows on the Eurasian continent, which was once part of the Soviet system of production and distribution. Understanding Russia's priorities and goals as well as its export strategy with respect to current and new potential markets will enable one to understand how it should carefully balance internal versus external focal points.

Internally, Russia has to ensure a stable and reliable revenue stream from its natural resources, partly in order to plan and guarantee investments in other sectors with the aim of modernising and diversifying the Russian economy. The Russian government has to provide incentives so as to allocate gas production areas to both Gazprom and other Russian gas firms (i.e., independent gas producers[158]). In addition, Gazprom must live up to its public service obligation to supply Russian citizens with relative low-priced gas (although this is planned to change).

Externally, Gazprom aims to maximise its revenues, which takes into account both access to markets (possibly via vertical integration), as well as possible moves to do the same by rivals. The growing import-dependence of the European market(s) presents Russia with an opportunity to maintain or expand market share even as it seeks to export to large and diverse gas markets, such as China and the US. Russia is shifting from a regional, captive supplier to a more global one, both by pipeline as well as LNG.

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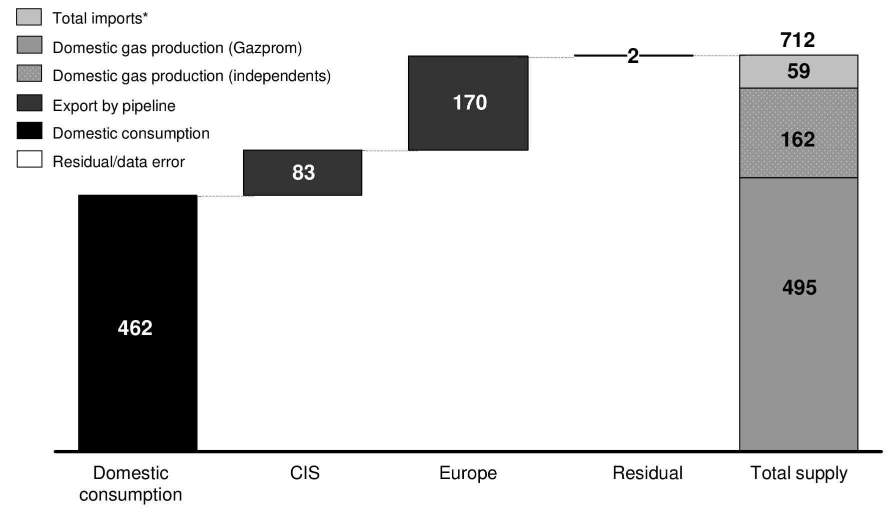
[158] The term 'independent' has become increasingly unsuitable since Gazprom formed strategic relationship with and has taken (minority) equity stakes in these companies [Stern 2009b].

Section 6.2.1 is an overview of Russia's gas reserves and current gas balance. Section 6.2.2 provides an impression of Russia's gas sector in terms of revenues, institutionalisation, decision-making, and foreign participation. In Section 6.2.3, attention is paid to Russia's domestic gas needs and strategy. Section 6.2.4 addresses Russia's gas export ambitions by pipeline and LNG flows to the CIS, European, Asian, and the US markets. Section 6.2.5 provides the main uncertainties related to Russia's merit order.

6.2.1 Current Russian gas balance

Russia's gas reserves and how they compare to oil reserves was covered in Chapter 4. It produced 657 bcm in 2008, which is more than 20 percent of the world's total [IEA 2009a]. Domestic Russian gas consumption amounted in 2008 to 462 bcm, which makes Russia a significant gas consumer, the second largest after the US [IEA 2009a]. According to Gazprom's data, Russia exported 170 bcm and 83 bcm in 2008 to Europe and the CIS countries, respectively, through Russia's export infrastructure, linking it first with CIS and then with European. These volumes were accompanied in 2008 by 59 bcm worth of imported Central Asian volumes by Russia and then either consumed domestically or re-exported [Nemtsov and Milov 2008; Gazprom 2009a]. In 2008, Gazprom accounted for 75 percent of total Russia's production, see Figure 6.1.

Figure 6.1 Russia's gas balance in 2008



* Imports: Turkmenistan (38.1 bcm); Uzbekistan (12.8 bcm); Kazakhstan (8.6 bcm).
Note: Totals may not add up due to rounding. Gazprom's data calculated in European bcm's. Production from independents is assumed at: domestic production minus Gazprom's production
Source: own analysis, IEA [2009] for domestic consumption and production; Gazprom [2009] for exports, imports and Gazprom's production.

As far as the domestic reserve distribution and production within Russia are concerned, Gazprom controls roughly 56 percent (28.9 tcm), implying that it controls 13 percent of the world's gas reserves. The so-called 'independent' gas producers control the remaining share of Russia's reserves, 44 percent (18.9 tcm).[159] The most important production areas in the Russian gas industry are those which have been producing for decades, located in Western Siberia, south of the Yamal area in the Nadym-Pur-Taz (NPT) area, good for some 80 percent of Russia's gas production. The Russian gas industry is at a cross-roads as it must shift production from these mostly mature production sites to the potential producing areas in parts of Eastern Siberia, the Far East and in the region north of the Arctic Circle as well as other parts of the Yamal peninsula [IEA 2008c]. There are three categories of major gas fields located in various provinces: (1) major gas fields which are in decline; (2) those which have reached a plateau production profile; and (3) the 'new' gas fields, often in new gas provinces at a considerable distance from Russia's current infrastructure. See Map 6.1 for a geographical overview of the most important gas fields in (and outside) Russia.

Mature fields and production areas

The mature fields include the super giant gas fields south of the Yamal peninsula, which have provided the bulk of Russia's gas production during the days of the Soviet Union, i.e., Medvezhe (2.69 tcm), Urengoy (2.5 tcm), Yamburg (2.6 tcm). These fields are also known as the 'big three', and are in a significant decline at a rate of some 20 billion cubic meters per year (bcm/y), - 'very mature' in geological terms [Stern 2005].

Fields with a flat production profile and brownfields

Most of the relative 'smaller' fields have entered in a flat production profile. Some of these fields, mostly located in Western Siberia, offer possibilities of brownfield investments to increase production in order to hold up the decline in the big three fields (sometimes mentioned as the Russia's small field policy). Zapolyarnoye is the most significant, it has peaked as recently as 2005 at 100 bcm/y and is currently also entering its decline [Stern 2009b]. Brownfield investments in the NPT area are another option in the shorter-term to accommodate falling production rates.[160] Of additional importance are the resources at the Obskaya- en Tazovskaya bays, south of the Yamal peninsula, also in western Siberia near the 'supergiant' Yamburg field, which may add their weight of 2 tcm worth of reserves to supplementing production from the Yamal area [Gazprom 2006].[161]

[159] Roughly 75 Percent of Russia's gas fields are concentrated in 20 (ultra) gigantic deposits (more than 1 tcm), mostly controlled by Gazprom. In addition, there are dozens of the 'large-scale' fields (0.3-1 tcm) and more than 600 medium and small fields (about 10 bcm) [Zhiznin 2007].

[160] These fields are all close to the existing infrastructure, and as was mentioned also, they are therefore relative more "economically practicable to develop" [Gazprom 2006, p. 33]; [Gazprom 2008b, p. 40].

[161] These fields are estimated to have a production potential of up to 82 bcm/y [Stern 2009b].

The new gas provinces:

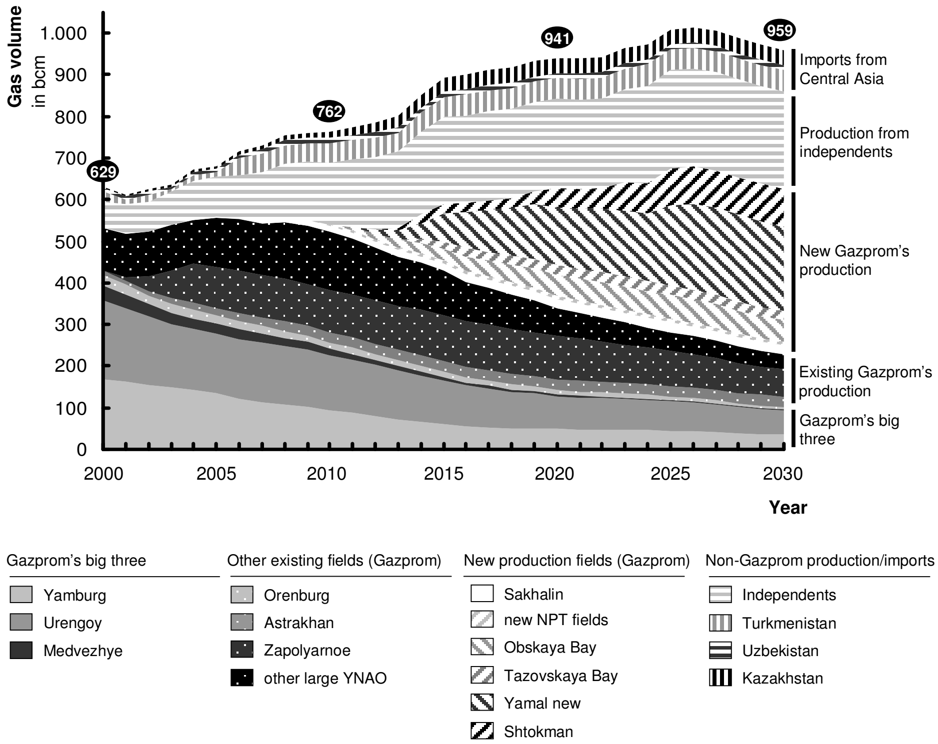
The main 'new' gas provinces are parts of Western Siberia, Yamal, East Siberia, Sakhalin and the Barents Sea, which includes the next generation of very large gas fields [Stern 2009].[162] The Bovanenskovkoye (3.2 tcm) and Kovykta (1.9 tcm) gas fields, amongst a number of other, smaller gas fields and constellations of gas fields, are those currently earmarked for either domestic consumption or exports. The Shtokman gas field (3.6 tcm), the equivalent of Norway's entire proven resource base, is located in the Barents Sea. According to the latest plans, gas from Shtokman is expected to come on stream in the late 2010s, in 2016 with pipeline and in 2017 with LNG volumes to Europe and the US [Platts LNG Daily 2010].[163] Given their size, the reserves at Yamal (e.g., Bovanenkovskoye and Kharasavei) could form the bulk of Gazprom's production well into the next decades. The collective output from Yamal at Gazprom's accounts is estimated at 135-175 bcm/y by 2020, and 310-360 bcm/y by 2030.[164] The Yuzhno Ruskoye oil and gas deposit (1 tcm) is due to produce 25 bcm by 2009 at design capacity and is tied to the Nord Stream project (see also Case 3 in Chapter 10) [Gazprom 2009a]. Gas from the Kovykta field and other fields in Eastern Siberia and Far East (such as Chayandinskoye) may be put into production for the development of Russia's domestic market. This is likely to be done in combination with exports by pipeline to Asian countries, such as China, South Korea and Japan (see Section 6.2.4).

For a more detailed account of possible Russian gas production (including old, plateau and new fields) by region to 2030, see Figure 6.2 below. In addition, production from independents is estimated to become substantial in Russia's supply portfolio: from 17 percent in 2008 to almost 25 percent in 2030.[165] Imports from Central Asia, mainly from Turkmenistan and Kazakhstan, are also estimated to grow due to newly-signed contracts (70-100 bcm/y by 2010; see Section 6.3) [Stern 2009b].[166] By 2008, these imports had become relative more 'expensive'

[162] The location of the gas fields in remote areas far from the main UGTS areas are known for their harsh climactic conditions involving permafrost and, worse yet, thawing permafrost [Stern 2009b].
[163] Previous plans for Shtokman called for gas production to start in 2013 and LNG production in 2014. The first phase was expected to reach total production of 23.7 bcm [Platts LNG Daily 2010]. The first phase of the field will be developed by the Shtokman Development Company, where Gazprom is the main shareholder (51 percent) and Total (25 percent) and StatoilHydro (24 percent) have minority stakes.
[164] By 2011, production from Yamal's Bovanenkovo field is expected to reach 8 bcm/y (which will increase to 140 bcm/y in the long-term, according to Gazprom) [IEA 2009b].
[165] The frontrunners amongst the independents in 2007 were Novatek (28.5 bcm), Rosneft (16.2 bcm), Lukoil (14.3 bcm), Surgutneftegaz (14.1 bcm), and TNK-BP (10.1 bcm) [Stern 2009b]. A somewhat artificial division can be made between the independent gas companies as follows: companies whose main business is oil but have significant interests in (non)associated gas, which includes Lukoil, Rosneft, Surgutneftegas and TNK/BP. Then there are companies whose main hydrocarbon reserves and business are gas-related, these included mainly Itera and Novatek, but including all the companies that comprise the Union of Independent Gas Producers (Soyuzgaz). Another category includes companies in which Gazprom has a substantial shareholding, such as Sibur and Purgaz.
[166] However, the amount is uncertain due to lower Turkmen exports to Russia following an explosion in the CAC pipeline. It might be possible that Russia will import a substantial amount of gas from the gas field Shah Deniz II in Azerbaijan (also see Section 6.3). This is not included in Figure 6.2.

due to gradual price increases to match European levels in 2009. This means that gas from Central Asian can only be sold at a substantial loss within Russia [Stern 2009b]. It should be noted that Figure 6.2 is but one possible projection. There are a multitude of scenarios imaginable, which may shape Russia's supply portfolio differently, and these are subject to a number of uncertainties which are discussed in Smeenk [2010].[167]

Figure 6.2 Russia's supply portfolio: A possible projection



Note: Future possible production from East Siberia and Far East, except from Sakhalin, is not included.
Source: UBS [2008].

[167] For instance, CERA estimates that gas production will be lower after 2014, compared to UBS's [2008] projection, largely as a result of lower production from the Yamal fields. Gazprom sets out targets of 610 bcm-615 bcm/y by 2015 and 650-670 bcm/y in 2020. By 2020, according to Gazprom, new fields will account for around 50 percent of Gazprom's gas production. This would mean an increase in its production of 300 bcm/y during 2008-20 [Stern 2009b]. Stern [2009] projects a production level of 480-580 bcm/y for Gazprom and 150-200 bcm/y for non-Gazprom producers (gas supply from the UGTS only). Lukoil envisages to produce 40 to 50 bcm/y from its gas fields in Russia by 2015, the bulk coming from the Bolshekhetskaya depression group of fields in Western Siberia, Rosneft should bring its giant Kharampur field onstream after 2012, yielding 27 bcm/y by 2015 [AGC 2008a].

The development costs for all these new fields are tremendous, costing in the tens of billions of dollars over a period of at least twenty years [Gazprom 2009a]. Thus massive greenfield investments are required, which include not just production costs but also infrastructural costs for link-ups with the United Gas Transmission System (UGTS) as well as processing facilities.[168]

6.2.2 Institutionalisation of the Russian gas sector

In order to try to balance earnings from the oil and gas sectors and the differences between CIS and European gas market, the Russian leadership under Putin intends to employ an integrated long-run energy strategy.[169] Upon observation, one can discern that Russia has come to see gas as a spearhead for its long-run economic development. The lack of control exercised during the politico-economic crisis of the 1990s led Putin to restore some measure of order through state-centred reforms, returning Russian society to a state of relative stability (also see Chapters 3). The reorganisation of the gas industry during the 1990s and Putin's restructuring included a shift from the planned production system of Gosplan to a more market-based, profit-maximising system, embodied by Gazprom [Stern 2005]. In order to ensure a stable and reliable revenue stream from its natural resources, the Russian government has since 2004 increased state control over and ownership in its energy sector around national champions.[170] The higher oil prices (due to stricter OPEC production policies towards the end of the 1990s) ensured the inflow of greater of export revenues, which led to a partial implementation of policies [Åslund 2007].

It is in this light that the creation of national champions was an effort, in the first instance to halt further asset stripping and embezzlement, and in the second place to reverse the overall trend of decentralisation which had set in under Yeltsin (see also Chapter 3).[171] Russia's NEFs

[168] Due to neglected maintenance and refurbishments (especially during the 1990s as a result of shortage of funds and the economic chaos), large parts of the UGTS in Russia (and other CIS countries) are in a deplorable state and need to be refurbished. For example, by 2001 the capacity of pipelines exporting gas from NPT had fallen from the design capacity of 577.8 bcm/y to 518 bcm/y [Mitrova et al. 2009; Stern 2009b]. Concerning a new project, for example, in 2008 the total development costs (production and pipeline and LNG transportation capacity) for Shtokman alone are estimated to exceed $40 billion [Stern 2009b].

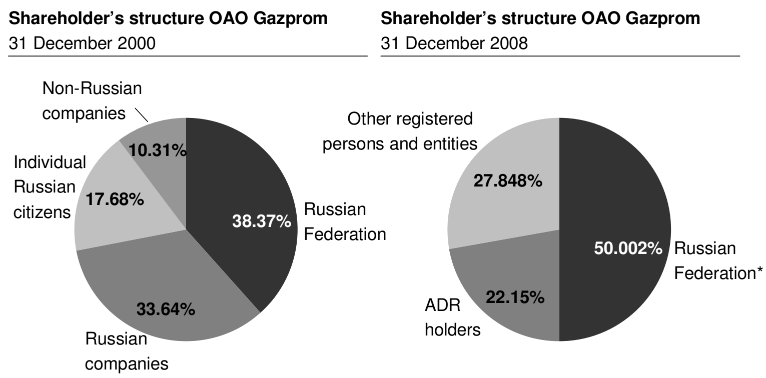
[169] For a historical overview of the institutionalisation of the Russia's gas sector, see Part II in Smeenk [2010]. In Putin's study ('Strategic Planning of Replacement of Regional Mineral Reserves in Conditions of Forming Market Relations'), Putin argued already that the transfer of control of Russian strategic sectors, such as oil and gas, to private owners was a costly mistake. This experience from the nineties should be reversed – not necessarily by re-nationalisation. For Russia, from Putin's point of view, the mixture of state-private ownership has to be the best solution for strategic companies, so that the state can regulate these sectors. According to his study, Russia should welcome foreign investors for their knowledge and financial resources [RusEnergy 2005].

[170] One of the most prominent cases was the arrest and conviction of Yukos' chief executive Michael Chordorkovski. This led to the dismantling of the Yukos' Empire. Moreover, Russia had limited the access to its resource for IEFs [Fredholm 2005].

[171] However, Gazprom continues to spend its money in a questionable fashion by taking stakes in non-core businesses and selling some entities below market value [Hartley and Medlock III 2008; Nemtsov and Milov 2008]. Additionally, Putin

are Gazprom in the gas sector and Rosneft and Lukoil in the oil sector. The Kremlin has also tried to assert greater control over the oil industry via Gazprom, and thus forming Gazprom into a NEFs [Victor 2008]. These state-controlled companies can be used by the state as an instrument of internal and external policies [Russian Ministry of Industry and Energy 2003]. Decentralisation during the 1990s was felt especially in the oil sector, while the gas sector remained centralised with a large minority Russian government stake, changing little between 1993 and 2004.[172] Putin had set out to strengthen the government's control over Gazprom in an apparent conviction that privatisation and free market capitalism in key Russian sectors was not in Russia's national interest.

Figure 6.3 Shareholder's structure OAO Gazprom in 2000 and 2008



* The Russian Federation is represented by The Federal Agency for federal property management (38.373%); state company OAO Rosneftegaz (10.74%); and OAO Rosgazifikatiya (0.889%).
Source: Gazprom [2001]; and Gazprom [2009].

In addition, Gazprom argued that any degree of vertical separation would erode its economies of scale and the functioning of the entire production, transport and distribution system [Mitrova 2009]. With the new stake of 50.002 percent in the vertical-integrated company as of late 2005, the Russian Federation now had direct control of its operations and its management (see also Figure 6.3). The vision emerging in 2004 was that Gazprom should become a multinational oil and gas company, representing interests of the government both domestically and internationally [Stern 2005]. Becoming a multi-market player is thus one of Gazprom's pur-

established another way to ensure substantial incomes for members of government (and top managers in Gazprom) via secondary positions, besides their main (governmental) position [Business week 2009].

[172] The ownership of the company changed remarkably little during this period, while Russian legal entities owned a further 35 to 40 percent, Russian individuals, including employees owning 15 to 20 percent and foreigners between 10 and 12 percent [Goldman 2008]. Former Gazprom's CEO, Vyakhirev, however, was not in full control of the company and significant asset stripping weakened the company as Gazprom executives established their own little empires at the expense of the company (see Part II in Smeenk [2010]).

poses, and indeed, that of the Russian government [Fredholm 2005; Gazprom 2009a; 2009b].[173] Ultimately, merging Gazprom and Rosneft into one single very large NEF would have been the first step in giving this NEF a position in the international oil market as well as the interregional gas market. Yet, this step has not been taken.[174]

As a firm, Gazprom must take into account Russian government priorities as well as make decisions in the interest of its business continuity. From a government perspective, Gazprom can be an engine for maximising social wealth by utilising gas revenues for fuelling domestic economic growth and diversity, padding the government budget and the stabilisation fund. Developing a gas-based industry (in order to diversify its economy) may also shape Russia's domestic gas strategy and policy. Maintaining relatively low regulated gas prices in Russia will like wise play a role. From a corporate perspective, Gazprom's role consists of maximising (windfall) profits from domestic, CIS, and other export markets. Since 2006, Gazprom officially attained an export monopoly over the gas flows from Russia to its foreign markets.[175] Russia's challenge in devising a gas strategy as is to balance and control a set of interlocked agents of which Gazprom is but one of several agents. Without the independent gas producers and the Central Asian producers (Turkmenistan, Kazakhstan and Uzbekistan) and in the future possibly Azerbaijan, Gazprom may probably not fulfil its export obligations to Europe.

Decision-making process within the gas sector

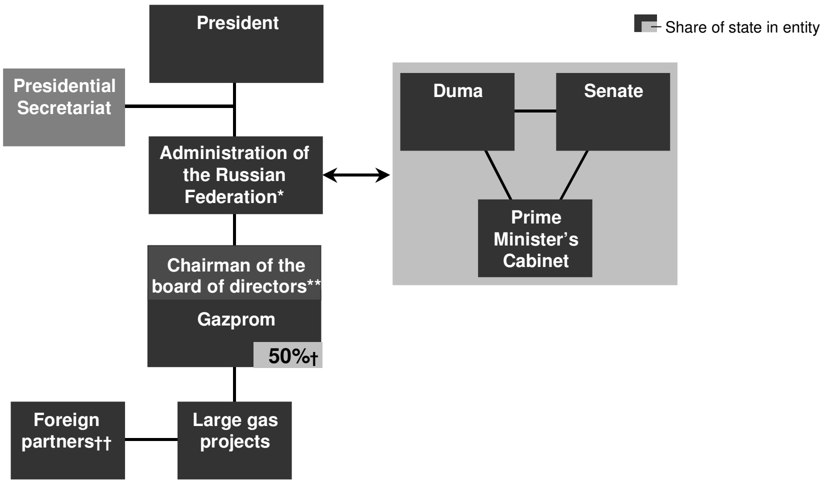
Increasingly, since Putin came into power, Gazprom's strategy became an important priority of Russia's government: "Gazprom became the first business structure in which Putin by deliberate plan seized the commanding height" [Nemtsov and Milov 2008, p. 4]. On a strategic level within the Russia's gas industry, decision-making is very centralised, and largely influenced by the government [Mitrova 2009]. As mentioned by Mitrova [2009], Gazprom operates in many ways as a 'quasi-ministry', like it was during the Soviet times.

[173] The strategic goal of OAO Gazprom is: 'becoming a leader among global energy companies by conquering new markets, diversifying business activities and pursuing supply security' [Gazprom 2009a]. At the same time 'The main aim of the Russian Energy strategy is strengthening of competitive positions of the Russian energy industry in the world market" [Russian Ministry of Industry and Energy 2003; Zhiznin 2007].

[174] In 2005, the Gazprom-Rosneft merger was abandoned due to the complexities in the financial architecture of the transaction and resistance from Rosneft management and their sponsors within the government [Stern 2005].

[175] In June 2006, the Russian Duma officially granted Gazprom an export monopoly, i.e., the exclusive control over gas exports from Russia. This gives Gazprom complete control over exports, naturally, and forbids any access by foreign rivals to its pipeline network. The Duma voted on legally solidifying a "single export channel for gas exports," as the *Duma Energy Committee* said in a public explanatory note, because "gas should be considered a strategic raw material and therefore should be exported through a single export channel to protect the national interest" [PIGR 2006]. For Russian gas sales in CIS and Baltic states, besides Gazprom's sales, some intermediaries also have supply contracts. Gazprom does not have exclusive control in LNG projects over gas exports, e.g., Sakhalin II.

Figure 6.4 A schematic schedule of the decision-making process in the Russian gas industry



* Including Presidential Administration (Kremlin).
** For all intents and purposes, also first Deputy Prime Minister.
† 50.002 percent, see also Figure 10.5.
†† For example: Royal Dutch Shell; E.ON Ruhrgas; ENI; Wintershall; Total; and StatoilHydro.
Source: own analysis, based on company interviews; Gazprom information.

In principal, the administration of the Russian Federation (including the Kremlin) is responsible for strategic decision-making. The administration is led by the president (currently Dimitri Medvedev), which in turn is advised by the Presidential Secretariat. The Prime Minister's Cabinet and relevant ministries, Duma and the Senate, influence this process, as well as members of Gazprom's management board.[176] Gazprom is largely responsible for the implementation of Russia's gas strategy. Informal links between the different governmental and corporate bodies, such as between the president and the Prime Minister (Medvedev and Putin respectively), make the process of decision-making comparatively opaque. Figure 6.4 gives an approximated overview of Russia's decision-making in the gas industry.[177]

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[176] A large number of people working at Gazprom are part of Putin's network. The chairman of Gazprom's board of directors, Viktor Alexeevich Zubkov, for example, is also the first Deputy Prime Minister of Russia. The role of Sechin (Deputy Prime Minister and chairman of Rosneft's board of directors) is relatively more important for decision-making within the oil sector.

[177] This overview is designed to provide a simplified, perhaps even oversimplified impression of decision-making in the Russian gas sector. Informal and formal forces may also be at play to such an extent that it is beyond the scope of consideration for this study.

Foreign participation in Russia's gas sector

After the dissolution of the Soviet Union and the first years of transition until mid-1990, the Russian energy sector became relatively open for foreign investors, especially the oil sector.[178] The gas sector remains largely centralised. However, some gas fields were developed by foreign companies, such as Royal Dutch Shell, Mitsui and Mitsubishi in Sakhalin II (founded in 1994) and BP via TNK-BP (founded in 2003) in the Kovykta field. A number of foreign companies met difficulties and had to reduce (e.g., Royal Dutch Shell in Sakhalin II) or even cease their activities in Russia. The traditional form of foreign participation in development gas fields was subject to conditions specified in production sharing agreements (PSAs). Under Putin, the priority has been given to other contractual forms, particularly to public-private partnership (PPP), which is a means of better organising the development of resources under conditions determined by the state [Van der Linde et al. 2007].[179] In most of the large fields, Gazprom has a majority stake for strategic reasons [Mitrova 2009; Zhiznin 2007]. These foreign participations are often part of a broader cooperation through vertical asset swaps (see below). Cooperation with major foreign corporations is desirable in terms of their large financial and technological potential and corporate experience [Zhiznin 2007; Stern 2005].[180] The most important foreign partners, in addition to the above-mentioned companies, with stakes in the Russian gas sector are *Badische Anilin- und Soda-Fabrik* (BASF)/Wintershall, ENI, E.ON Ruhrgas, Total, ExxonMobil, Sakhalin Oil and Gas Development Co (SODECO), Indian Oil and Gas Corporation (INGC) and StatoilHydro [Mitrova et al. 2009; Zhiznin 2007].

6.2.3 Domestic gas needs and strategy

Russia's primary energy mix in 2008 (684.6 Mtoe) was composed as follows: 55 percent of gas, 19 percent of oil, 15 percent of coal, 5 percent of nuclear and 6 percent of hydropower [BP 2009].[181] Russia is thus a major gas consumer, where domestic demand in Russia takes up almost three quarters of Russian production, see Figure 6.1. Russian per capita consumption of gas is similar to that in Canada, but consumption per US dollar of GDP is roughly five times higher than IEA countries [IEA 2007], hinting at vastly less efficient consumption in Russia. Due to third-party access (TPA) and sales restrictions, oil companies have to flare significant volumes (estimates are around 15-50 bcm/y or even more) [Stern 2005]. Russia's economic

[178] For an extensive overview of foreign participation in Russia, see for example Zhiznin [2007], Stern [2005; 2009] and Part II in Smeenk [2010].

[179] In addition, many of these PSAs were implemented solely by foreign partners [Mitrova 2009]. See also Van der Linde *et al.* [2007] for an overview of PPPs in Russia.

[180] Another way to attract foreign investments is the (international) capital market though initial public offering (IPOs). Gazprom's removal of limiting foreign shareholders in 2006 has resulted in a tenfold rise in market value (to more than $250 billion) [Mitrova et al. 2009].

[181] For an extensive analysis on the Russian gas strategy within Russia and CIS, see for example Pirani *et al.* [2009], Stern [2005], IEA [2008].

growth (when measured by GDP from 1999 until the economic crisis in 2008: 5-8 percent per annum), combined with relatively low, subsidised domestic prices resulted in a high gas demand [Stern 2009b]. Gas prices are subsidised in order to provide Russian industrial and residential consumers with some leeway. In addition, low gas prices have forced other fuels out of the power generation and industrial sectors, the share of gas in Russia's grew from 43 percent in 1990 to 55 percent in 2008 [BP 2009].

The Russian gas market itself is in transition. During the 1990s, in the aftermath of the collapse of the Soviet Union and the economic chaos that ensued, demand for gas in Russia fell substantially. With the Russian financial crises in 1993 and 1998, demand fell even further and the Russian domestic gas market was plagued with a default of payments by customers, both in the residential and industrial sector [Stern 2005]. After 1998, when the Russian economy picked up again owing in part to a devalued Russian rouble, gas demand began to rise to pre-1991 levels (from 418.2 bcm in 1991, to 352.8 bcm in 1999 and 420.2 bcm in 2008) [BP 2009]. With the onset of the 2008-2009 financial and economic crisis, Russian domestic demand significantly dampened [WGI 2009i]. Stern [2009] projects a domestic demand of 385-440 bcm in 2015.

Gazprom supplied Russia's domestic market with 260 bcm. Further downstream, Gazprom holds 'blocking-stakes' in more than 70 percent of gas-distribution plants [Mitrova 2009]. The IGPs fulfill other domestic demand, although Gazprom is increasingly trying to control the Russian gas sector [Hartley and Medlock 2008].[182] Deliveries from the IGPs are almost entirely concentrated in the power and industrial sector and are not delivered to residential customers or even distribution companies [Stern 2005]. Of Gazprom's sales in 2008, the largest shares went to non-household sectors: 32.5 percent went to power generation, 16.8 percent to the utility sector and much of the remainder to the industry sectors. Russian household consumers were responsible for 16.8 percent of the total Gazprom's sales in Russia [Gazprom 2009a]. In the face of high domestic demand until recently, the difficulty for Gazprom has been to develop the required infrastructure to accommodate flows from the independent gas producers without running the risk of seeing empty pipelines long before they have been amortised [UBS Investment Research 2008]. Nevertheless, the independent gas producers provide Gazprom with the opportunity to share the investment burden. A growing share of gas investments in Russia is expected to come from the independent gas producers, contingent upon them gaining access to Gazprom's transmission system [IEA 2008c].

[182] For example, in 2006, Gazprom purchased a 20 percent stake in Novatek and had established 'strategic partnerships' with Lukoil and Rosneft [Hartley and Medlock III 2008].

In 2006 the Russian gas exchange (Mezhregiongaz) was launched with the aim of liberalising the Russian gas market and introducing market principles in the traditionally state centred Russian energy supply system. The volumes traded thus far are only at experimental levels not exceeding 10 bcm in 2007 (less than 2 percent of gas sold in Russia) and constitutes thus only a small step towards liberalisation [Stern 2009b].[183] The liberalisation allow Gazprom and the independent gas producers to sell on spot terms when prices are well above those set for the domestic market and securing the IGPs' access to the pipeline network.[184]

In addition, with the proper legislation and tax structures in place, it is possible to provide an incentive to the IGPs to develop non-strategic fields, channelling the volumes to foreign markets through Gazprom. Gazprom in turn could then be in charge of maximising the value of these volumes and distributing the resulting added value to the independent gas producers as a means of sharing the risks and benefits.[185] The proposal for this mechanism has been put forward to the Russian Duma [CIEP 2008].[186] There currently still are bottlenecks when it comes to channeling non-Gazprom gas to Gazprom's pipeline network: the IGPs are force to flare some 40 bcm worth of gas production because Gazprom does not yet offer favorable access to its pipeline network [Financial Times 2009f].[187] With gas oversupply in Gazprom's export market(s) in 2009, Gazprom is in a difficult position, as export monopolist to accept these volumes.

The relatively low current domestic gas prices contribute to the overall importance of energy for the Russian economy, manifested in the national accounts, distorting efficiency incentives and discourage investment in Russia's gas sector [Åslund 2007; Gazprom 2009a].[188] Long demanded by the IMF, WTO and EU, in November 2006, the Russian government took the decision to gradually increase regulated gas prices (with a difference between the industrial and household prices), so that by 2011 they will reach export parity with Europe, excluding trans-

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[183] A gas exchange (or hub) will allow gas prices to float as they do on European hubs, properly reflecting demand and supply conditions. The amounts of gas exchanged should reach 15 bcm by the end of 2008 [PIGR 2007].

[184] Initial 2006 deals indicated an average price of $60/mcm, or $1.70/Mbtu, compared with the average domestic price of $1.25/mbtu, reflecting the willingness of some industrial consumers to pay more for volumes than state-regulated prices for volumes beyond those provided by Gazprom on a long-term basis [WGI 2008d]. Besides the introduction of spot sales, long-term contracts for industrial customers were introduced. Gazprom insists that the general scheme on the country's gas sector development until 2030 should be adopted before the implementation of regulations on non-discriminatory, third-party access for independent gas producers to the pipeline system [WGI 2009i].

[185] Indeed, Russia's Federal Antimonopoly Service (FAS) has been instructed by the cabinet to amend the Gas Export Act in order to enable Gazprom to share export profits with the independent gas producers [Kommersant 2008b].

[186] Gazprom has invested heavily over the last few years to expand the Urengoy transportation system to enable the independent gas producers to boost output from the region's fields [UBS Investment Research 2008].

[187] Rosneft has even begun a court case against Gazprom in order to compel the company to allow access to its pipeline network.

[188] During the 1990s the gas sector moved away from a principle of 'cost-plus' pricing to de facto 'price-cap' regulation [Mitrova 2009].

mission costs and customs duties [Stern 2009b; Gazprom 2008a].[189] According to Stern [2009], this policy will have some important consequences:

- sales of gas from the relatively more expensive new fields (such as Yamal) could be profitable on the domestic market;
- there will increasingly be an incentive for (particularly independent) producers to maximise its production and sales for the domestic market;
- investments in efficiency and energy saving will be more profitable;[190]
- In the longer-term, a netback parity with West European prices would make the domestic Russian market more attractive than exports (due to additional transport costs).[191]

Russia's export potential is thus directly linked to domestic developments not only in terms of domestic Russian prices but also Russia's primary energy mix. The most important domestic concern of the Russian government is ensuring that domestic demand in Russia is met first, and Gazprom as an agent of the state, is tasked with a PSO in this respect. This is a political as well as an economic priority for the Russian government [Gazprom 2008b]. Relatively high gas prices, e.g., by mid-2008, but also the current economic downturn could delay the current scheme of gradual gas price increases [Stern 2009b].

6.2.4 Gas export ambitions and strategy

During the late Soviet times, Russia was dependent on Europe as a hard currency-earning market, while providing its CMEA and Soviet allies with cheap, subsidised energy.[192] Gazprom's current exports should be seen as split into European and CIS exports. Within Europe, one can distinguish former CMEA countries and West European countries and Turkey. Russia benefits not only from its location and the size of its resource base, but also from its status as the key incumbent in Europe, where it can affect the supply-demand balance such that it can have knock-on effects in the Atlantic LNG basket [Barnes et al. 2006; IEA 2007a]. As mentioned above, Russia has, at the political level as well as in the commercial sense, more global ambitions. Specifically for its export markets, Gazprom aims to [Zhiznin 2007]:

[189] See Table 2.9, p. 74, in Stern [2009] for the estimated average Russian gas prices from 2007 to 2011. The approach of relatively gradual and controlled increases aims to support the government's general anti-inflationary policy, including tight monetary supply [Mitrova 2009].

[190] Mitrova [2009] suggests a rule of tumb for the power sector that gas-saving measures will become economically justified when prices are above $100/mcm.

[191] From Russia's governmental point of view, exports to the foreign markets, however, are still more attractive to Russia (as a government), due to export duty revenues (30 percent on exported gas), except for the member of the Customs Union (Russia, Belarus and Kazakhstan) [Mitrova 2009]. Nevertheless, in the short-and mid-term, import prices of Central Asian gas are expected to be higher than Russia's domestic prices [Stern 2009b].

[192] For a historical overview of Russia's export strategy, see Part II in [Smeenk 2010], Stern [2005; 1999].

1) secure its present market position in price and volume terms;
2) enter new regional markets, such as Asia-Pacific and the US market by pipeline and LNG exports;
3) evolve new business models of sales, such as self-contracting and integrate vertically by controlling storage and downstream activities closer to the market;
4) explore short-term contracts and spot trade in Europe;
5) minimise its reliance on troublesome transit countries such as the Ukraine and Belarus[193], collect debt from and increase the profitability in its CIS export markets;
6) ensure that it remains the only economically viable transit route to Europe for Caspian gas; and
7) developing upstream exploration and production opportunities in other countries.[194]

The diversification of Gazprom's export activities is schematically portrayed in Figure 6.5.

Figure 6.5 Diversification of Gazprom's export activities

* Under construction/committed or planned/proposed.
Source: own analysis, based on RPI [2005].

Near abroad: export to CIS markets

Gazprom's gas sales in the CIS were 83 bcm in 2008 [Gazprom 2009a].[195] Most of the CIS sales is concentrated in Russia's transit countries: Ukraine (61 percent) and Belarus (23 per-

[193] Some 80 percent of Russia's gas exports to Europe now travel through the Ukrainian network.
[194] Additional aims of Gazprom, although less related to its export strategy, are (1) lower dependence on import equipment and services, and (2) attracting foreign investments [Zhiznin 2007].
[195] Excluding the Baltic states. See Pirani [2009] for an extensive overview of CIS gas strategy.

cent). Other less important export markets are Kazakhstan (10 percent), Moldova (2 percent), Armenia (2 percent) and Georgia (1 percent) [Gazprom 2009a]. Although the energy mix differs by CIS country, gas is an important contributor to their energy needs. The share of gas in the Ukraine's energy mix is more than 40 percent, whereas in the case of Belarus this is almost 70 percent [BP 2009]. These CIS countries are heavily dependent on Russia's (and other CIS's) imports [Pirani 2009].

Gazprom's strategic challenge in the CIS is about how to govern the increasingly complex interdependent relationships with three groups of countries in an effective way:

1) Central Asian countries and Azerbaijan, on which Gazprom's dependence for key gas supplies could rise, as well as countries which one in some cases necessary for transit purposes (see below);[196]
2) Caucasus countries where it had to compete with gas flows from Azerbaijan and Iran [Tokmazishvili 2009; IEA 2008c];
3) Ukraine, Belarus and Moldova where Gazprom will be selling gas as well as needing territory to ship gas to Europe (from Central Asia as well as Russia). Gazprom has a problematic transit relation with a number of CIS countries, which has led to various disputes (such as in 2006 and 2009) [Mitrova et al. 2009; Stern 2005].[197]

As the 2000s unfolded, several important developments in addition to a change in management saw Gazprom take CIS gas trade back under its control. This includes moving away from barter and trading intermediaries (which sold gas from Central Asia and Russia) [Pirani 2009]:

- a change in Gazprom's supply position led to a corresponding rise in the strategic value of Central Asian gas in its future supply portfolio, although it becomes more expensive; and
- the economic recovery of CIS economies, combined with Gazprom's new geo-economic framework (see Section 6.2), raising Russian prices and higher import prices from Central Asia, leading to a new commercial framework: more profitability and increasing export prices to the principal of European netback pricing [Yafimava 2009; Stern 2005; Mitrova et al. 2009].[198]

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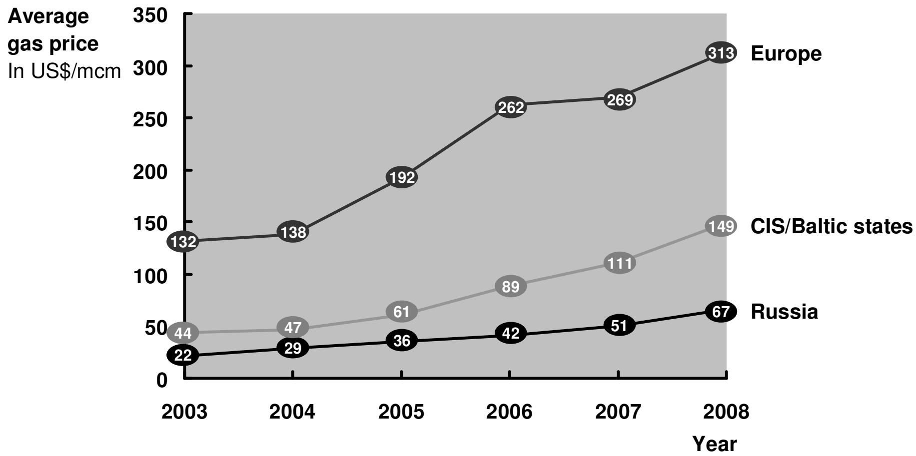
[196] Russia's strategy towards the Caspian region changed during the period after the collapse of the Soviet Union (see also Part II). During the 1990s, Gazprom replaced gas (barter) trade between Turkmenistan and other CIS countries (mainly Ukraine) by intermediates, like Itera. These middlemen companies captured most of Central Asian resource rents. As a result of increasing competition, combined with the strategic importance of Caspian production for Gazprom's gas supply portfolio, Gazprom changed its strategy to a more commercial relation [Stern 2005Victor and Victor 2006].

[197] Also see Part II and Chapter 10 in Smeenk [2010].

[198] In addition, the Russia-Ukraine gas disputes (in 2006, 2008, and 2009) have accelerated European netback price implementation for Ukraine [Mitrova et al. 2009]. However, avoiding vulnerability to disruptions of Gazprom's supplies to Europe in transit through the western CIS and geopolitical considerations may delay the implementation of its netback policy in the western CIS [Pirani 2009].

Due to the maturity of CIS markets, the desire to reduce its dependency on Russian gas and its increasing convergence to European gas price, in terms of volumes, there are relatively small market opportunities in CIS markets from Russia's perspective.[199] On the one hand, Gazprom is attempting to secure and maintain market share by buying equity in large gas consuming components of the value chain, such as transport, power and industrial enterprises.[200] On the other hand, it may want to keep its current contractual flexibility (e.g., Gazprom's current volume contract with Ukraine need to be signed every year) as a tool of managing Gazprom's supply portfolio [Pirani 2009].[201]

Figure 6.6 Gas prices for Gazprom's gas in different markets: 2003-2008



Note: Average exchange rate RUR/US$ in 2007: 25.6; and in 2008: 24.8.
Source: Gazprom's databook 2007; Gazprom [2009].

As far as Gazprom's export markets are concerned, prices differ immensely by market, see Figure 6.6). As mentioned above, prices in Russia itself are regulated, and amounted to \$67/thousand cubic meters (\$67/mcm) in 2008. CIS and Baltic prices were \$149/mcm on average, while European prices stood at \$313/mcm [Gazprom 2009a]. Much of these price differences are attributable to the path-dependency aspects of a transition from Soviet-era gas

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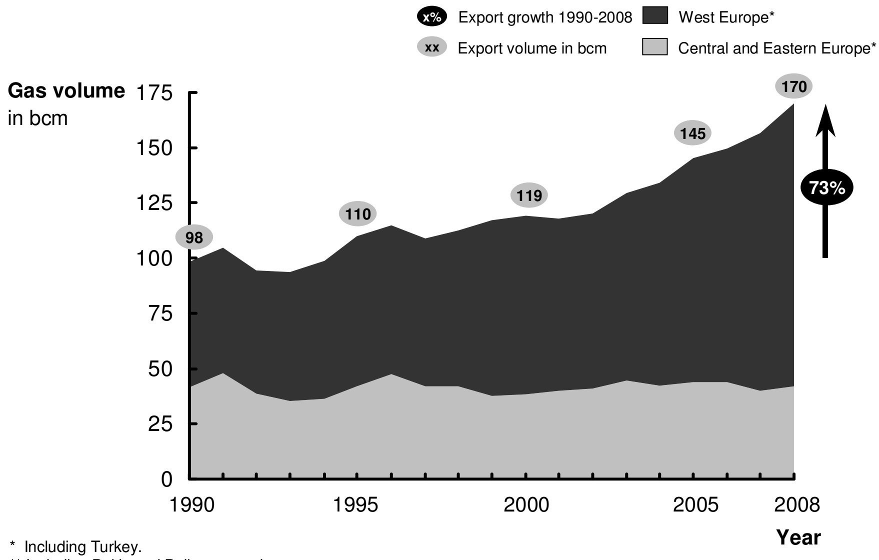
[199] Although it is difficult to predict, Stern [2009] estimates similar volumes (75-85 bcm in 2015), excluding Azerbaijan and Kazakhstan, to those of the mid 2000s.
[200] For example, it has taken equity stakes in Armenian, Kazakh, Moldovan and Belarusian transportation assets [Mitrova et al. 2009].
[201] Gazprom's contract with Belarus will end in 2012 [Yafimava 2009]. The 'commercialisation' of Russia's trading relation with western CIS countries could, however, entail long-term contracts [Pirani 2009].

pricing and subsidies to the current, more market oriented setting (see Part II, Smeenk [2010]).

Far abroad: export to European markets

Gazprom's supply to Europe has increased by around 73 percent between 1990 and 2008. The sales to Western Europe (including Turkey) have more than doubled, with a relatively sharp climb since 2002 (almost 5 percent per year growth). This is not the case for Central and Eastern Europe, where Gazprom's gas sales increased by only 1 percent between 1990 and 2008. The total sales of Gazprom in Europe were 170 bcm in 2008. In Western Europe, Germany (34 bcm), Turkey (21 bcm), Italy (20 bcm), the UK (19 bcm), France (10 bcm) were the largest European markets for Gazprom. In Central and Eastern Europe, Hungary (8 bcm), Czech republic (7 bcm), Poland (7 bcm) and Slovakia (6 bcm) are also significant markets for Gazprom. Figure 6.7 shows the development of Gazprom's gas sales in Europe form 1990 to 2008, whereas Figure 6.8 gives an overview of Gazprom's sales and markets share per country.

Figure 6.7 Export volume of Gazprom to Europe: 1990-2008

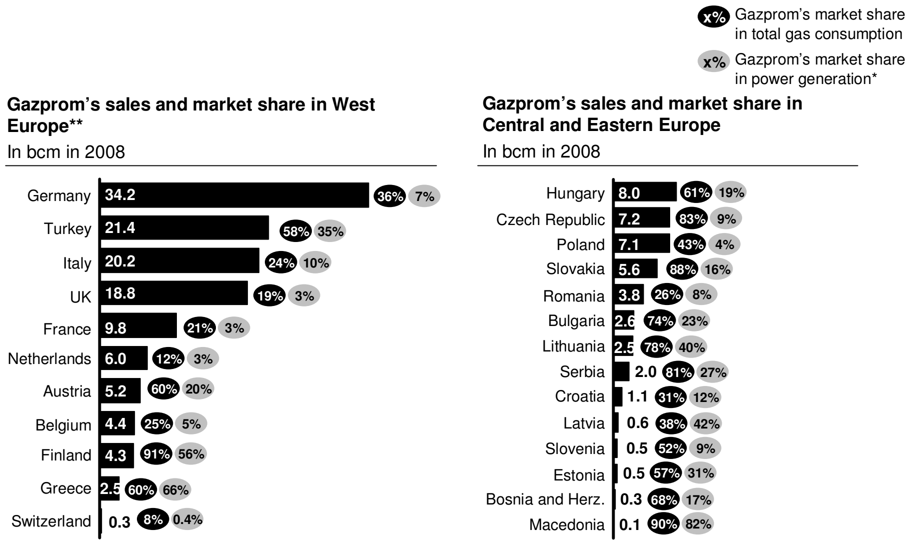


* Including Turkey.
** Including Baltic and Balkan countries.
Note: in European bcm's.
Source: own analysis, based on Gazprom annual reports and Stern [2005].

From a Russian point of view, the European gas market as a whole can be fallen into four different categories, or sub-regions: South and Southeastern Europe (SSEE), Northwestern Europe (NWE), North and Northeastern Europe (NNEE) and other Central and Eastern

European (CEE) countries.[202] Each of these different sub-regions exhibits different gas use intensity, depends to differing degrees on Russian gas and each region has its own infrastructural level of development. As a result, Russian gas plays a disproportionally large role in terms of share and end-usage in a number of countries. Some of these countries may try to curb their dependency, which implies a decrease or limit of Russian gas imports. Figure 6.8 includes Gazprom's market share in total gas consumption and in power generation.

Figure 6.8 Gazprom's sales and market share in European countries in 2008



* Power generation includes electricity and heat sold (data for 2007).
** Including Turkey.
Note: Total Gazprom's sales in Europe account 169.7 bcm in 2008. Other sales, not mentioned above, are 0.5 bcm.
Sales in Ukraine in 2008 are 50.4 bcm; in Belarus: 19.0 bcm; Kazakhstan: 8.7 bcm; Moldova: 2.4 bcm; Armenia: 1.9 bcm; and in Georgia 0.6 bcm.
Source: own analysis, based on Gazprom annual report [2009] (converted to European bcm's); total gas consumption and gas consumption for power generation are based on IEA [2009].

The absolute values of Gazprom's market shares are greater in countries of Western Europe than in Central and Eastern Europe. In Germany and Italy, for example, Russian gas enjoys a larger market share but on average, in terms of power generation, the share is actually quite small (expect from Turkey). Both countries' gas markets may be heavily reliant on Russian gas, but in power generation terms it is less significant. In Central and Eastern Europe the absolute volumes of Russian gas are smaller, but Russian gas has a much greater market shares in terms of total gas consumption and power generation.

[202] Southwest European countries (including Spain and Portugal) could not be reach economically by pipeline with Russian gas. In the future, Russian LNG might be shipped to this region. For instance, in October 2009, Gazprom and Spanish oil and gas company Repsol have signed a MoU on cooperation in oil and gas projects.

Gazprom's strategy is likely to hinge on the potential for growth in maximising the space for acceptable import-dependency in each sub-region, mainly in major countries in NWE and SSEE, such as Germany, Italy, UK, France, the so-called 'Big Four'. In addition to market opportunities, Turkey has a special role, because geographically it lies in a strategic area between Europe and the Middle East as well as the Caspian region. Suffice it to say for now that Turkey is a major potential transit hub for a variety of gas flows by pipeline, primarily from the Middle East (Iraq), Caspian region and of course Russia. The NWE region offers hub trading opportunities and some storage, as does CE, while simultaneously the other regions are smaller in terms of volumes (e.g., NNEE) or depend more on LNG. In its gas strategy, Russia is reaching out to those countries with the strongest economic and commercial interests in Russia (e.g., Germany, Italy and France), while limiting to the greatest extent possible any intrusion on the part of the newer EU member states [Trenin 2007]. Besides the framework of the EU-Russia Energy dialogue, as a political basis for long-term energy cooperation, Russia has established bilateral energy dialogues on governmental level with, for example, the Big Four [Zhiznin 2007]. Through these partnerships Gazprom aims to secure downstream positions through joint ventures and asset swaps (see below).

Midstream: Cooperation in storage and export route diversification pipelines[203]

Gazprom's Yamal-Europe, Blue Stream, Nord Stream[204], and the newer planned South Stream[205] pipelines are all ostensibly part of a strategy aimed at ensuring Gazprom's market position in price and volume terms, as well as reducing reliance on Ukrainian transit. Notwithstanding some of the risks, miscalculations and costs, gas supplies through the Yamal-Europe pipeline have broken up Ruhrgas' monopoly in the German market, while the Blue Stream pipeline helped establish a strong position in Turkey. The Nord and South Stream is aimed to ensure its market position at the NWE and, respectively, SSE sub-regions. In addition, by having a combination of different export routes to the European market, Russia can, in theory (and as Norway already does with its various pipelines), shift its volumes intra-regionally as

[203] For a further account of gas transit see Chapter 10 in Smeenk 2010 and for an overview of the strategic-economic role of pipelines from a Russian perspective, refer Chapter 11.

[204] The offshore pipeline Nord Stream (2 times 27.5 bcm/y), connecting Russia directly to Germany via the Baltic Sea, will be linked to the UGTS in Russia, with the reserve base being the Yuzhno Ruskoye field and Shtokman. See Case study 3 in Chapter 9 for an extensive overview and analysis on this investment.

[205] South Stream, with a planned capacity of 63 bcm/y up from the initially planned capacity of 31 bcm, is a planned and proposed pipeline running from Russia over the Black Sea to Bulgaria. Two possible routes are under review for South Stream's onshore section from Bulgaria – one, north-westwards and the other, south-westwards. The resource base for the South Stream pipeline is likely to be the Urengoy field in West Siberia or Caspian reserves [WGI 2009a; Gazprom 2008a]. Also refer to Case study 2 in Chapter 9 for an extensive overview and analysis on this investment.

and when spot and short-term prices shift, mitigate transit risks, and/or increase its bargaining position towards western CIS countries.[206]

Additionally, the transit risks in western CIS countries could also be solved by taking majority ownership stakes and/or by Russian ratification of the Energy Charter Treaty and its Transit Protocol. However, currently Ukraine refuses to allow Russia to have a controlling stake. Meanwhile, Russia refuses to ratify the ECT treaty due to (1) the current political climate between Russia and EU; and (2) it is seen in Moscow as a threat to Gazprom's commercial interest [Pirani 2009]. Therefore, this governance system to mobilise investment is reviewed in Russia (in addition by other stakeholders too), by treating foreign investments in its energy sector at its own sovereign discretion. As a result, in April 2009 Russia launched a new conceptual approach to a legal framework for energy cooperation. In July 2009, it subsequently decided to withdraw from the ECT with the aim of developing and proposing its own legal framework [Van Agt 2009].

Another focal point for securing capacities in pipeline and storage is to create flexibility and arbitrage opportunities. Gazprom owns pipeline capacity in Germany via Wingas, in the Interconnector (10 percent) between Belgium and the UK and has an option on 9 percent in the Balgzand Bacton Line (BBL) pipeline (from the Netherlands to the UK).[207] Various countries in Europe have storage capacities, with Austria and Hungary being important focal points in Central Europe and Germany and Benelux being focal points in NWE. Gazprom has commercial interests in both storage markets, mostly via Wingas. It is expected that Gazprom will develop more storage capacity in Europe.[208]

Sales strategy in Europe

Having dealt with the volumes, more attention can be paid here to the actual Russian sales strategy in Europe in terms of long- versus short-term sales and vertical integration (i.e., business models). Gazprom's export subsidiary 'Gazprom Export' is responsible for Gazprom's exports. Based on Gazprom's current long-term contractual agreements to Europe the export

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[206] Also see Chapter 10 in Smeenk [2010]. After the completion of the Nord and South Stream, if Gazprom were to decide to use Ukrainian transit route as a last resort, transit through Ukraine could fall to 0-16 bcm/y. However, storage in Ukraine is expected to remain important for Russia [Mitrova et al. 2009; own estimates].

[207] In exchange for a 9 percent stake of Dutch Gasunie in the Nord Stream pipeline.

[208] Storage is an essential tool in the gas value chain for handling (seasonal) variations in consumption. Demand is particularly high during the winters, while storage can be used during summers to pick up the stock in demand. Storage can come in the form of LNG storage tanks, 'linepacking' (storage in the pipeline itself), in underground caverns and in depleted gas fields or aquifers. In late 2008, Gazprom signed an MoU with Taqa to "pursue a partnership to jointly develop the Bergermeer gas storage facility" in the Netherlands. In addition, it will provide cushion gas to the Bergermeer gas storage project in the Netherlands (cushion gas refers to the gas injected into the underground storage facility to bring it up to operating pressure). This is an interesting development since this would constitute an important storage joint venture with another NEF in Northwestern Europe [Platts LNG Daily 2008].

volumes are about 180-200 bcm/y in 2015 (minimum and maximum deliveries respectively), an increase of 10-20 bcm/y from 2008. Most of these current, additional contracts are related to the construction of the Nord Stream pipeline [Stern 2009b], also refer to Case study 3 in Chapter 9. In Europe, Gazprom is currently renegotiating supply contracts (e.g., the long-term contract with E.ON Ruhrgas) such that minimum off-take obligations were lowered.

1) *Traditional long-term take-or-pay contracts:* Gazprom has historically sold gas to European consumers at their respective borders using netback pricing (linked to oil prices) in long-term take-or-pay gas contracts (with a duration of 20-30 years) with European mid-streamers (see also Part II in Smeenk [2010]) [Stern 2009b]. Many of Gazprom's contractual commitments have been signed in the 1980s and 1990s, some of which will continue well into the 2010s. Gazprom signed new long-term agreements with a number of countries in 2005-2007.[209]
2) *Direct sales: Cooperation and (vertical) asset swap:* As a result of liberalisation in Europe, an effort can be seen on Gazprom's part of to sell its gas further downstream.[210] As was mentioned above, Gazprom's downstream activities in Europe started through the creation of a joint venture with BASF/Wintershall (Wingas). The amount of gas sales of Wingas has increased significantly: from 3.4 bcm in 1995 to 27.4 bcm in 2008 (an average annual growth of more than 17 percent) [Wingas 2006; Wingas 2008]. Other joint ventures have been formed, for example, with Italian (ENI) and French (Gaz de France, now GDF Suez) companies, in order to sell gas directly in these markets [Zhiznin 2007]. In most of the cases, joint operation in gas storages and transport routes to and within Europe (see above) and vertical asset-swaps are part of this business model when it comes to cooperation with mid-streamers. Through vertical swaps, Gazprom has gained direct access to European markets by cooperating with European mid-streamers. Two cases stand out here: Gazprom's swaps with partners in Germany centred on the Nord Stream pipeline and Gazprom's cooperation with *Ente Nazionale Idrocarburi* (ENI) from Italy centred on the Blue and South Stream pipeline. In both cases, Russian gas ends up on the German and Italian markets, ownership stakes are exchanged across the chain (also in Russia's upstream sector) and the parties involved share the profits.[211] In addition to this model of co-

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[209] Long-term contracts have been signed with various European countries: Italy (until 2035), France (until 2031), the Czech Republic (until 2035), Austria (until 2027), and Germany, with four long-term contracts extended until 2035 for a total of 20 bcm [Gazprom Export 2008].

[210] For an overview of Gazprom's interests in various EU countries as of late 2007, refer to Meijknecht [2008]. [Meijknecht 2008]

[211] Wintershall (a subsidiary of BASF) is an important stakeholder in a joint venture with Gazprom, centred on the Siberian Yuzhno Russkoye gas field: Gazprom owns 51 percent, while Wintershall owns 24 percent in Serverneftegazprom (the Russian license-holder to the exploration of the Yuzhno Russkoye gas field) as well as 10 percent worth of no-voting right preferred shares. Wintershall is also engaged in the joint venture Achimgaz, in which Wintershall owns 50 percent and Gazprom the other 50 percent, an upstream venture in which Wintershall provides some of the technical expertise. In exchange for its minority stake in Yuzhno Russkoye, they have agreed to increase Gazprom's minority stake to 49 percent and to swap

operation, other business models of selling gas directly to European customers are: (1) wholly-owned greenfield operations or (2) M&As.

3) *Direct sales: Greenfields:* In one of the first steps of taking a foreign position outside Russia, Gazprom set up the wholly-owned Gazprom Marketing and Trading (GMT)[212] in 1999. The focus of GMT is to optimise the usage of its capacities on the Interconnector pipeline as well as on leasing and natural gas trade, involving spot–based sales and non-Russian gas. It is designed to focus on its own trading activities in NWE on the NBP, Zeebrugge, TTF, and PEG hubs. GMT sells gas to end consumers through subsidiary (retail) companies in the UK and France [Gazprom 2008b]. According to GMT [2009], GMT's gas sales increased from 1.2 bcm in 2003, to 4.1 bcm in 2005 and 25.1 bcm in 2008.
4) *Direct sales: Acquisitions:* Gazprom is attempting to secure and maintain market share by buying equity in power and industrial enterprises, which are large gas users. This M&A strategy is mostly occurring in mature markets, while greenfields are likely to be explored in growth markets [De Jong 1989].[213] Due to Gazprom's high market capitalisation a merger with a European mid- and downstream player seems not applicable (if desirable, only with IEFs, such as BP or Royal Dutch Shell). Most of the past and current acquisitions are occurring in Russia and in Central and Eastern Europe, also in order to control its transit pipeline network. Gazprom is increasingly bidding for (retail) assets in Western Europe as well, for example in the UK [AGC 2007a]. In these markets, Gazprom is exploring both a strategy of horizontal and diagonal (e.g., the power and/or the oil sectors) integration.

From the schedule mentioned above, one can discern that Gazprom combines a long-term sales strategy with a short-term, optimisation-based one [CIEP 2008]. A possible gap may provide room for volumes through the renewal of potential long-term contracts and any volumes traded above that level can be traded on a short-term basis, either in the form of shorter-term contracts or on spot markets at hubs such as NBP, TTF and/or Baumgarten.[214] In a seller's market, as and when Gazprom increases its share on European hubs, Gazprom could push these prices upwards as it increasingly becomes a marginal supplier in shorter-term European markets [Komduur 2007].

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oil interest in Libya. The two partners will also take up a 50-50 percent share in Wingas Europe, a venture designed to market Russian gas in Europe at large, outside Germany.

[212] GMT Ltd is a 100 percent subsidiary of ZMB GmbH, which is a 100 percent subsidiary of Gazprom Germania GmbH. Gazprom Germania is 100 percent owned by OOO Gazprom export, which is a 100 percent subsidiary of OAO Gazprom. The headquarters of GMT is based in London. Other 100 percent subsidiaries of GMT are GMT France SAS in Paris and GMT USA, Inc in Houston [Gazprom Marketing and Trading 2009].

[213] Görg argues that acquisitions are more likely to taken place in Cournot-type markets, except for situations involving relatively high adaptation costs. Under such conditions, a greenfield strategy seems more desirable [Müller 2001].

[214] Gazprom has acquired a 50 percent stake of the Baumgarten hub in mid 2007. It co-owns the hub with the Austrian gas company [AGC 2007b]. The hub is the end point of Gazprom's planned and proposed South Stream pipeline and is located near some of Austria's main distribution pipelines. It also possesses storage facilities with a combined capacity of 2.1 bcm.

Far abroad: export to the Far East markets

Russia aims to develop, export and integrate its eastern gas resources with those in western Siberia by means of extensive greenfield investments, which is part of its role as an 'inner integrator'.[215] The Far East also encompasses northeastern China (Manchuria) and Japan as well as the Koreas. According to Stern and Bradshaw [2008], the gas market in East Siberia and the Far East is expected to grow to 27 bcm in 2020 and 32 bcm in 2030, which could rise to 41 and 46 bcm, respectively (when account is taken of the rising demand of gas-processing industries). In the mean time, pipeline gas exports to China and Korea could reach 25-50 bcm by 2020, and LNG exports to the Asia-Pacific region could reach 21 bcm by 2020 and 28 bcm by 2030, which would imply a doubling of Sakhalin 2's 12.8 bcm/y LNG export capacity. The vast majority for Russian domestic consumption and exports is expected to be produced at Yakutia and Sakhalin, while Irkutsk and Krasnoyarsk will themselves play a marginal role [Stern and Bradshaw 2008]. From a Russia's point of view, pipeline exports to the Far East are part of the regional Russian gasification strategy. Gazprom's drive to integrate reserves is expected to be a major policy priority for the period 2010-2020 in a massive greenfield-based drive to optimise Russia's hitherto untouched eastern resources from Western Siberia (Yamal and Shtokman), to Siberia (with Kovykta as the centrepiece) and the Far East (where Sakhalin forms the main reserve base).

Indeed, Gazprom's internationalisation is based on three rationales: (1) attempting to vertically integrate into Europe's downstream gas market; (2) globalisation of its gas exports to markets other than Europe; while (3) diversifying its reserve base [Locatelli 2008]. Gazprom has at its disposal several options for diversification: 'going east' as far as a regional initiative is concerned within Russia itself (gasification) and the accompanying export development to China, in order to add a third export market to Gazprom's portfolio. However, it is LNG that potentially offers Gazprom the means of becoming a more (flexible) global player. The 2003 'Russian Energy Strategy' placed significant emphasis on the development of Far Eastern gas resources, with the possibility of expanding production up to 106 bcm/y by 2020. During the same year, it is stated that the region will become accountable for 15 percent of total Russian gas exports [Stern and Bradshaw 2008].

Russian volumes to China

On the pipeline side, China has pursued a gas import and pipeline construction deal with Turkmenistan as well as Kazakhstan and this has a major impact on potential volumes from and deals with Russia, which would have to compete with Central Asian volumes.[216] Indeed,

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[215] For a detailed overview of developments and plans concerning Russia's Eastern Siberian and Far Eastern resources, refer to [Stern and Bradshaw 2008].

[216] China has completed the Turkmenistan-China pipeline stretching from eastern Turkmenistan to Xinjiang Province, with a capacity of some 30 bcm/y.

with a Chinese choice for Central Asian gas instead of Russian gas through the Altai pipeline (for China's West-East pipeline) from Western Siberia seems to have improved China's bargaining position vis-à-vis Russia and have diminished the prospects for the Russian Altai pipeline (30 bcm/y when completed) [Stern and Bradshaw 2008]. If Russia's Far East projects will be realised, the Kovykta field is the most obvious choice for forming the basis for Russia's far eastern export route[Stern and Bradshaw 2008]. In addition to the Altai pipeline from Eastern Siberia to China's Xinjiang province, plans have been drawn up for two pipelines to enter China's Manchuria province from Russia's Far East, fed by Sakhalin I and surrounding resources.

A memorandum of understanding was signed between Gazprom and China National Petroleum Corporation (CNPC) at the meeting of the Chinese and Russian presidents in Beijing, in March 2006, regarding two gas pipeline projects: one from Western Siberia and the other from gas fields further east with a projected 68 bcm/y worth of Russian gas to be exported to China in 2020 [WGI 2006b]. A renewed understanding was reached in October 2009 on the supply of 70 bcm, starting in 2014-15, with pricing issues yet to be resolved [WGI 2009h] (although China accepted market prices on gas from Australia). Gazprom is already planning to start with construction of the Yakutia-Khabarovsk-Vladivostok, in operation by 2012 at the earliest [WGI 2008a].

One of these pipelines is in fact the Yakutia-Khabarovsk-Vladivostok pipeline, linking Sakhalin to Russia's Far East, planned to form the backbone of Russia's far eastern gas supply network in the region (for exports to China and South Korea). The other pipeline branches off from the Chayandinskoye-Khabarovsk pipeline (from eastern Siberia to the Far East) and is to enter China near the Russian town of Blagoveshchensk. Ultimately, this entire network is planned to be connected to existing infrastructure in eastern Siberia as well as planned infrastructure in that region. Finally, this will be interconnected with the network in West Siberia (and Urengoy) from which the Altai pipeline is to branch off. It is questionable however if, from a commercial logic, it is necessary to build all these interconnections within Russia.

South Korea

Russia agreed on a supply contract with South Korea at a government level in September/October of 2008, with the formal signing of the agreement is planned in 2010. South Korea would be supplied through the pipeline from Yakutsk and Sakhalin from 2015 onwards with 10 bcm/y. This represents the equivalent of 30 percent of South Korea's annual LNG consumption. South Korea is the biggest LNG importer after Japan and gas is good for 13 percent of its primary energy mix. Russian pipeline supplies appear to be in favour with the

South Korean government, these volumes seen as a reliable complementary source of gas with respect to a LNG market.

Far abroad: export to different regional markets by LNG

The LNG trade is, in the coming decade and beyond, likely to reposition Gazprom from being a regional player (in either Europe and/or Asia), to a more global one. Only Sakhalin II now provides Gazprom with the opportunity to sell LNG to the Pacific Basin, which is seen by Gazprom as part of a global strategy [Stern and Bradshaw 2008].[217] As far as proper Russian LNG is concerned, there are three main areas of attention: Sakhalin II for the short-term and Sakhalin III and IV[218], Shtokman and Yamal for the longer-term. The exchange of technology between Gazprom and LNG-oriented players (such as Royal Dutch Shell) takes place in the Sakhalin II project, and it could be intensified along the value chain on the whole of Sakhalin island. This may involve further integration, for example also, with the Sakhalin I project, led by ExxonMobil.

With the apparent onset of climate change and, specifically, global warming, in the long-term, Murmansk and Yamal LNG may increasingly have a global reach with the melting of the ice in the Arctic Ocean giving way to shorter and thus less costly routes to both East and West. Then, both locations will be within an economically acceptable distance of both the Atlantic and Pacific basins. The distance between Russia's north Siberian liquefaction areas and US and Asian markets will be almost equal and will give Gazprom thus favourable arbitrage possibilities (as Qatar already does today).

6.2.5 Uncertainties related to Russia's merit order

There are many uncertainties with respect to the development of a new merit order for Russia (and Gazprom). First, there are uncertainties concerning the level of domestic demand in Russia. The availability of gas from existing sources of production may increase due to the rise in domestic gas price levels, energy conservation and reducing dependency on gas fired power generation. The growing Russian economy may on balance require more gas for its domestic market, although this has become more uncertain due to the economic instability since the autumn of 2008. From a government perspective, supply to this market will be given priority over exports. Second, the levels of gas imports from Central Asia to Russia and gas production of independent gas companies are uncertain. There is increasing competition from Asia and Europe for Central Asian gas, which makes it not self-evident that the gas flows will go to Russia. Uncertain government policy towards independent and foreign gas producers within Rus-

[217] Gazprom's export chief, Alexander Medvedev, has said that "joining the Sakhalin II project provides a powerful impetus for accomplishing a large-scale project in the energy supply sector to Asia Pacific countries and North America. It will stimulate implementing a stage-by-stage entering strategy on the world LNG market" [Financial Times 2007].

[218] Royal Dutch Shell was invited in mid-2009 to help develop Sakhalin III and IV.

sia makes the production from these producers also more volatile. Third, the present uncertainty about future gas demand in Europe and Asia, stimulated also by the recent economic instability, may delay new commitments on contractual agreements and therefore new investments. There are also price uncertainties, especially in China, which negatively influence Gazprom's investment programmes. Government policy measures and regulatory affairs (in Europe) will also increase uncertainty with respect of new investments for Gazprom [CIEP 2008].

All these uncertainties, combined with the current economic crisis which has a large impact on Gazprom (as a result of exposure to short-term liabilities), will influence new investments along the Russian gas value chain as far as investment decisions currently on the table are concerned.[219] In the upstream for example the pace of additional gas production from new gas fields (mainly Zapolyarnoye, Yuzhno-Russkoye, Shtokman and Yamal Peninsula) in order to replace declining production from the four giant gas fields (Medvezhye, Yamburg, Urengoy, and Orenburg) and increase production for the export market. In the midstream, green- and brownfield projects in order to allocate new supplies to growth markets, such as the South Stream, could be suspended. Also new Russian LNG projects could be delayed due to the above-mentioned uncertainties. In the downstream, new greenfield investments for direct sales (in corporation with foreign companies) may be deferred [CIEP 2008].

6.3 Gas strategies of former Soviet republics in the Caspian region

As was explained in Chapter 3, the break-up of the Soviet Union in the early 1990s has changed the institutional make-up of economic and political relations between the former Soviet-states. Russia realised over the course of the 2000s that the region would play an important geo-economic role in its gas balance. Given the geographical circumstances and Russia's natural monopsony through the lack of alternative export infrastructures from the region,[220] the three Central Asian gas exporters have had, up to recently, little choice but to sell their gas to Russia. Now that Turkmenistan's export route to China has been opened, this situation has changed significantly for all three of these countries.

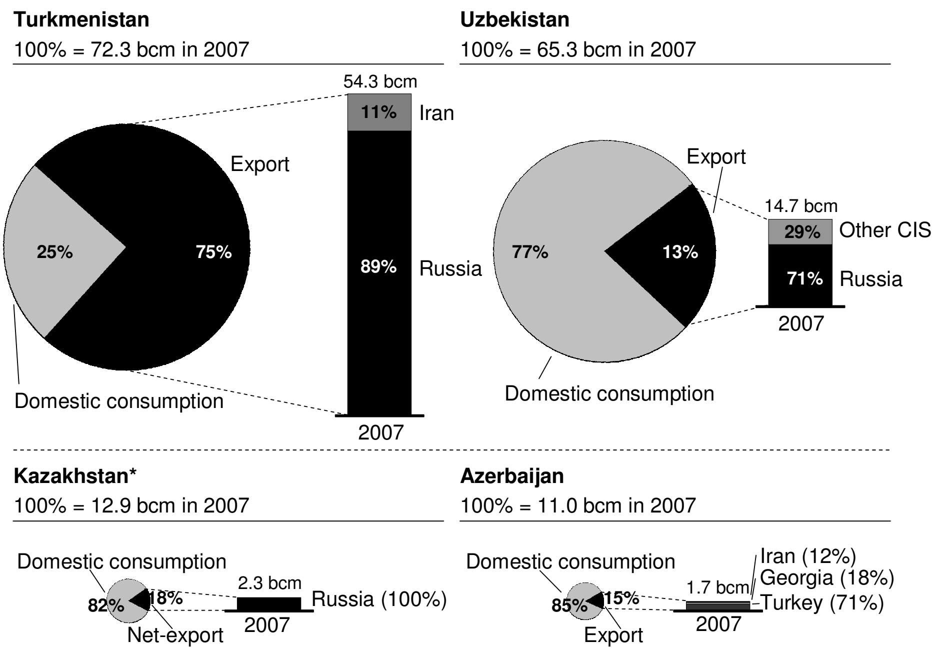
During the 1990s, the Caspian Sea countries formulated their own strategies, which were not necessarily in line with Russian interests, pursuing alternative export routes for gas to Asia and Europe to lessen their dependence on Russia. Upon the collapse of the Soviet Union, and through the 1990s, the US and other Western energy firms became enticed by the region's energy potential, forging ahead with exploration contracts in Azerbaijan and set to play a new

[219] The position vis-à-vis foreign participation in Russia's upstream gas sector could positively be changed as a result of the economic crisis of 2008-2009.
[220] The physical inter-linkage between Russia's current UGTS and the Central Asian states dates back to the days of the Soviet Union.

part in negotiations in the region, in Kazakhstan as well [CIEP 2004]. The US and Western governments in general have supported IEF access to Caspian Sea gas reserves during the 'new great game' and do so today as well, primarily in Kazakhstan, Azerbaijan and Turkmenistan.[221]

However, the success of a so-called multi-vector approach, in which these countries attempted to diversify their ties extensively beyond the region, was ultimately rather limited. Internal, structural socio-economic problems, such as an ill-functioning legal system, led to investment delays. In the construction of alternative export pipeline projects, the Caspian Sea countries experienced strategic competition between governments and NEFs and IEFs.

Figure 6.9 Natural gas balances of Caspian countries in 2007



* Figures of Kazakhstan are estimates and are from KazMuniaGaz. Other sources (Gazprom and Kazakhstan Statistical Agency) estimate higher volumes. Totals may not add up due to rounding.
Source: IEA [2008c]; IEA [2008].

Combined with low oil and gas prices, intense competition for new possible off-take areas, issues of the legal status of the Caspian Sea[222] and transit risks, which placed pressure on profit-

[221] For an overview of the problematic development of a new legal status of the Caspian Sea, see for example [Zhiznin 2007].
[222] Confirmation of recent onshore gas finds in Turkmenistan (e.g., the Yolotan gas field) is likely to intensify competition for exploration and development rights in Turkmenistan and a succession of governmental delegations have received varying degrees of encouragement on the Turkmen side [IEA 2009b].

ability, only a limited number of projects was realised. During the 1990s, the Caspian Sea region became dependent to a large extent on the transport of their exports through Russia. During the second half of the 1990s, with the rise of Russia's domestic gas demand (see Part II in Smeenk [2010]), Russia began to show more interest for Central Asian gas as volumes from the region correspondingly gained in (geo-)strategic significance, as discussed in Chapter 3.[223]

Collectively as a region, Central Asia and Azerbaijan hold almost 7 percent of total world's gas reserves (12.54 tcm) [BP 2009]. The combined flows from the three Central Asian producers feed into the Russian UGTS and are re-exported mostly to CIS markets such as the Ukraine, totalling 77 bcm in 2007 [IEA 2008b].[224] The 'natural' monopsony hereby afforded to Russia is a major advantage today for Moscow in its dealings with the sovereign Central Asian suppliers, providing it with some bargaining power over them. Conversely, they persistently seek alternative export options. This game involves Russia, China as well as a number of other regional and extra-regional players (Iran, Afghanistan, Pakistan and India) and external powers, such as Europe and the US [Amineh 2003]. As a result of the 2008-2009 economic crisis and the Russian-Ukrainian gas conflict(s), the position of and competition for new gas exports from the Caspian region may change. Currently, Turkmenistan is the biggest reserve holder, producer and exporter of gas in the Caspian region. Other countries produce a relatively small amount of gas (Azerbaijan and Kazakhstan) or consume their gas largely domestically (Uzbekistan). The bulk of Caspian exports goes to Russia. Turkmenistan is exporting some of its gas to Iran, whereas Azerbaijan is supplying gas directly to the Turkish market (combined with minor exports to Iran and Georgia), see also Figure 6.9 [IEA 2008b].

6.3.1 Azerbaijan[225]

Azeri total gas reserves are estimated at 1.2 tcm [BP 2009]. Azerbaijan has one of the longest traditions as a gas and oil producer [Bowden 2009]. In a relatively short amount of time, after the 1999 discovery of the offshore Shah Deniz gas field (450 bcm)[226] in the Azeri shelf of the Caspian Sea, Azerbaijan changed its position from a net-importer to a net-exporter in 2007 [CIEP 2008]. During the 1990s, the Bakhar gas fields were responsible for 40 percent of the

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[223] Gazprom itself underscores this aspect explicitly: "As the groundwork for sustainable gas supply in the future, Gazprom is looking to tap into new fields in Yamal and the offshore fields in the Barents Seas. All these areas have exceptionally challenging climactic and geological conditions. Gas will cost much more to extract there compared to other regions. Meanwhile, Gazprom is keen to use the huge gas resources of Central Asia to optimize its gas supply for export" [Gazprom 2008a, p. 61].

[224] In addition, an international legal framework for energy cooperation between Russia and Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan is being developed, in which the Eurasian Gas Alliance could be an important platform for the gas sector (besides Russia's bilateral agreements with these countries) [Zhiznin 2007].

[225] For a recent in-depth analysis on Azeri (future) gas sector, see for example Bowden [2009].

[226] StatoilHydro (25.5 percent), SOCAR (10 percent), Total S.A. (10 percent), LukAgip, a joint company of ENI and LUKoil (10 percent), Oil Industries Engineering & Construction (10 percent), and Turkish Petroleum Overseas Company Limited (9 percent) are shareholders in the Shah Deniz consortium. Currently, BP is the operator.

Azeri total production. Other vital fields are Nikhichevan, Gunashli, Iman and Asheron. Most of these fields, except for Shah Deniz and the Azeri-Chirag-Gunashli (ACG) associated gas fields[227], are operated by the State Oil Company of Azerbaijan Republic (SOCAR), which has close ties with the Azeri government [Bowden 2009; Amineh 2003]. In 2008, Total signed an memorandum of understanding with Azerbaijan, which covers the offshore Apsheron block [Bowden 2009].

In 2008, Azerbaijan produced a total of 16.3 bcm (10.8 bcm in 2007), including associated gas production from the Azeri-Chirag-Guneshli oil field (2.4 bcm in 2007) and Shah Deniz (3.1 bcm in 2007) [Bowden 2009; IEA 2008d], while it consumes 11 bcm [IEA 2009a]. In 2008, Azerbaijan had an energy mix of which 68 percent was satisfied by gas, 27 percent by oil and 4 percent by hydro-electricity [BP 2009]. Some of the gas production from phase I of the Shah Deniz field (8.6 bcm/y) is sold within Azerbaijan (1.5 bcm/y), the remainder is already fully contracted to Georgia (0.8 bcm/y) and Turkey (up to a maximum of 6.3 bcm/y), with small volumes re-exported from Turkey to Greece (up to a maximum of 0.75 bcm/y). Azerbaijan exports its gas through the South Caucasus Pipeline (SCP), which could eventually be extended to 20 bcm/y [Bowden 2009; IEA 2008d]. Gas is sold on a joint basis via a gas aggregator (the Azerbaijan Gas Supply Company) [Bowden 2009].

Azerbaijan has the potential to expand its gas production via the development of Shah Deniz Phase II and additional production from SOCAR's fields. From 2012 onwards, phase II could bring around or above 12-15 bcm/y of additional gas to the market, of which 9-12 bcm/y could be available for export [IEA 2008c]. Europe (including Turkey), Iran, Russia and potentially Georgia have to compete with one another and the domestic market for these supplies (expected to increase to 13-15 bcm in 2015) [Bowden 2009]. Iran may possibly increase its Azeri imports substantially to 12 bcm in 2012, whereas Russia offered to buy Shah Deniz phase II gas at 'European-level' prices.[228] The Azeri gas to Russia could be shipped via a Soviet-era pipeline (design capacity is 13 bcm/y, although real operating capacity is plausible lower), which had to be reversed [IEA 2008d]. The Russian desire for Azeri gas makes sense from a strategic perspective, because it could moderate Azeri competition towards Turkey and other SSEE markets. In addition, Gazprom could use Azeri gas on a commercial basis for relaying it to the Blue or South Stream pipelines (Case study 2 in Chapter 9). Although Azerbaijan had a westward looking policy and there are Western companies involved in Azeri upstream devel-

[227] The Azerbaijan International Operating Company (AIOC), an international consortium, operates these fields through a 30-year PSA signed in 1994 [Bowden 2009].
[228] In June 2009, Gazprom already signed an agreement with SOCAR for the annual purchase of 500 mcm from SOCAR's own gas fields [Eurasia Insight 2009b]. In September 2009, Azerbaijan agreed to export gas to Iran 5 bcm/y. The gas is destined for consumption in Northern Iran.

opments, Russian and Iranian proposals provide additional leverage with regard to European transit and off-take countries and companies.

6.3.2 Turkmenistan[229]

Until late 2006, the 'neo-Stalinist', flamboyant dictator Saparmurat Niyazov practically decided on all matters political and economic in Turkmenistan. Since his death in 2006, Berdymukhamedov has replaced him as the country's leader and officially controls the process of decision-making over the gas and oil sector [Zhukov 2009a]. Turkmenistan is still seen by Russia as part of its exclusive sphere of influence [Olcott 2006]. Speculations on the part of some observers that the country's reserve base may be larger than officially held (one which has lingered ever since the fall of the Soviet Union) appeared vindicated with the recent discovery of new gas fields. Official sources in Turkmenistan put the country's reserve base at 22.4 tcm [Zhukov 2009a], far more than the recently updated 7.94 tcm reported in BP [2009], up from 2.43 tcm in 2007. The most sizeable and truly large deposit discovered in 2008 includes the South-Yolotan-Osman gas field, estimated to contain between 4 tcm and 14 tcm.[230]

Turkmenistan is the region's largest gas producer, producing 70.8 bcm in 2008, 2.2 percent of the world's total, and thus also the most important Central Asian gas supplier to prospective importing countries [IEA 2009a]. The Dauletabad and the Yashlar fields are Turkmenistan's major gas-producing areas, with the former forming the backbone of Turkmenistan's gas production. Alongside the above-ground risks affecting gas production in Turkmenistan, there are likely to be significant challenges with the next generation of gas production from these new fields.[231] Two 100 percent government-owned companies, Turkmenneft and Turkmengaz, are responsible for the Turkmen oil and gas sector. The Turkmen gas sector is partly closed to foreign investors. In principal, onshore projects are exclusively allocated to the state companies. Two small projects are subjected to foreign partners from the US, Turkey and the UK, some of the partners operate through service contracts [Zhukov 2009a]. An exception was made for Chinese CNPC, which has obtained drilling exploration wells at the South-Yolotan field since 2007 and already has a PSA in the Amu Darya basin [PIGR 2008g].[232] Turkmenistan is also

[229] For a recent in-depth analysis on Turkmen (future) gas sector, see for example Zhukov [2009].

[230] The South Yolotan and Osman fields were discovered in 2006 and early 2007, respectively, and are located close to the Yashlar field, estimated to hold 0.7 tcm. The best estimate for the South-Yolotan-Osman field is 6 tcm, which is now considered to be a single structure, which would make it one of the biggest fields in the world, the fifth or fourth largest (c.f., North Field and South Pars) [PIGR 2009b]. Other discoveries include for example a large gas condensate field at the South Gutlyyak field [PIGR 2008h]. Another recent find includes a field near Gurrukbil-Garabil, near the Dauletabad field [IEA 2009b]. Its oil reserves (0.6 billion bbls) and production (205,000 barrels per day) are rather small when one compares it with Kazakhstan, the leading oil producer of the region [BP 2009].

[231] These challenges will likely come in the form of greater long-run extraction costs, mostly because of the depth of new reserves, high pressure and high temperature as well as the fact that the gas is mostly sour [IEA 2009b].

[232] However, the Turkmen government has announced that it will retain its (quasi-)monopoly over onshore deposits [Zhukov 2009b].

looking for possibilities in terms of exports and swaps with Iran.[233] Other foreign interests in onshore development are limited to service contracts, although offshore fields are currently more open for foreign investors (e.g., Petronas, Dragon Oil, Wintershall, Maersk Oil and ONGS Mittal Energy. Some other projects are under negotiation).[234]

In 2008, Turkmenistan had an energy mix of which 76 percent was satisfied by gas and 24 percent by oil [BP 2009]. Turkmenistan's total as well as per capita consumption is high, 15 bcm in 2007, because gas is supplied free of charge or largely subsidised. Its current exports are also significant (54.3 bcm in 2007). The Turkmen government had the intention to raise production to 100 bcm in 2010, 160 bcm in 2015, 190 bcm in 2020, and 250 bcm in 2030, and indeed Turkmenistan has much potential [IEA 2008c].[235] However, the IEA [2008] estimates that Turkmenistan's production cannot exceed 100 bcm/y in the mid-term. Zhukov [2009] projects a minimum production of 105 bcm in 2015 from the onshore fields and a maximum of 126.9 bcm. The projection of the offshore production on the Caspian shelf could increase from 3.5 bcm in 2008 to 14 bcm in 2015 [Zhukov 2009a]. With an expected growth of domestic consumption from 18 bcm in 2007 to 20-30 bcm/y in the mid-term [IEA 2008c], largely due to the development of gas-based industry in Turkmenistan, a significant amount of gas will remain available for exports.[236]

As a result of the importance of Central Asian gas in Gazprom's supply balance, Russia secures additional volumes by means of new contractual agreements. Thus, in April 2003, Putin and Niyazov signed a 25-year agreement on the long-term cooperation in the gas industry between Gazprom and Turkmengaz, which was accompanied by a long-term gas supply contract between both parties (70-80 bcm from 2009 onwards until 2028) [WGI 2007b; Gazprom 2008a; Zhukov 2009a]. In the face of Turkmen requests for price increases and in an effort to maintain its position in the region, Gazprom gradually increased the price paid for Turkmen gas. From $60/mcm in 2006 (which was still a 50-50 barter/cash deal) [IEA 2008c], the price for Turkmen gas rose from $130/mcm to $150/mcm in 2008 and from $250/mcm to

[233] Potentially, Gazprom, Turkmengaz and NIOC may find an arrangement in which Gazprom supplies northern Iran with small gas volumes from Turkmenistan under a swap agreement [WGI 2009i].
[234] See also Table 9.6 in Zhukov [2009, p. 283] for an overview of the involvement of foreign companies in the Turkmen gas and oil fields. Currently, RWE is negotiating on development rights for an offshore block and underscores Turkmenistan's growing and apparent readiness to export gas to Europe. If hydrocarbon reserves are found in the area, RWE might gain a license for production during 25 years [WGI 2009l].
[235] The South Yolotan-Osman field alone could begin phased production at 10 bcm and move gradually to 70 bcm [PIGR 2009b].
[236] Because of the use of other methodology, Zhukov [2009a] estimates are much lower, namely 14-16.9 bcm in 2015. In order to meet its export commitments, gas production will need to increase to 119-141 bcm by 2015 [Zhukov 2009a].

$270/mcm in 2009 [Kommersant 2008a], moving in principle to 'European' market-based netback prices [IEA 2009b].[237]

Russia has also offered to aid in improving the Soviet-era infrastructure that carriers Central Asian gas to Russia in a bid to tie in Turkmenistan and facilitate further flows.[238] The system runs from Turkmenistan and Uzbekistan via Kazakhstan to Alexandrov Gai in Russia, to be boosted in capacity to 90 bcm/y by 2009-2010 (current capacity is estimated at 45-55 bcm/y). In order to boost the transport of additional gas production from West Turkmen gas fields (and Kazakh fields) to Russia, the associated countries signed an agreement to revamp a littoral Caspian Sea pipeline from 10 bcm/y to 30 bcm/y by 2012 in mid- and late 2007.[239] In April 2009, Russia decided to stop buying Turkmen gas, following an explosion in the Central Asia Centre pipeline [WGI 2009j]. Russia and Turkmenistan are still renegotiating lower volume and price terms in their contracts. For now, there is no official clarity what progress will be made further in this matter.

From 1997 onwards until 2024, Iran has been importing gas at a minimum of 4 bcm and a maximum of 8 bcm/y via the Korpezhe-Kurt pipeline from Turkmenistan to Iran [Olcott 2006; Zhukov 2009a]. Although historically speaking there have been price disputes between Turkmenistan and Iran, in January 2010 both countries inaugurated a new pipeline that has the potential to double flows to Iran to 20 bcm/y [WGI 2010f]. Exports to China through a new pipeline from gas fields in southeast Turkmenistan are has started in December 2009, which should reach to full load factor (at least 30 bcm/y) by 2012.[240] In China the pipeline will be connected with the West-East pipeline, which stretches from Xinjiang province. China's regulatory landscape, combined with increasing domestic production and market uncertainties, may hinder an additional call on import gas [IEA 2008c]. After the fall of the Taliban regime in 2001, the Turkmenistan-Afghanistan-Pakistan-India[241] (TAPI) pipeline has been brought back under discussion, but its realisation is still very uncertain and is discussed more

[237] Gazprom's earlier agreement with Turkmenistan included prices at the Kazakh border linked to the amount paid by Gazprom's long-term European customers [WGI 2007b].

[238] Gazprom plans to modernise and upgrade its Soviet-era Central Asia-Centre (CAC) pipeline system. The CAC pipeline system consists of four main pipelines (e.g., SATS 1, 2, 4, and 5), and was build in phases during the 1960s, 1970s and 1980s.

[239] The objective is to revamp the existing Soviet SATS 3 branch of the CAC, a littoral section known as the "Pricaspiskiye" pipeline, bringing the pipeline's capacity to 20 bcm/y from 10 bcm/y, by 2012. This pipeline is linked to the CAC pipeline system in Kazakhstan, with volumes supplied consisting of 10 bcm/y from Turkmenistan and Kazakhstan, respectively. In 2008, Gazprom announced that this pipeline could be expanded to 30 bcm/y. Turkmengaz, Kazmuniagaz and Gazprom will upgrade the pipeline [IEA 2008d]. By mid-2008, Turkmenistan suggested that the line could be expanded even further to 40 bcm/y [WGI 2009l].

[240] In August 2008, Turkmenistan agreed with China in principle to increase its sales volume to 40 bcm/y [IEA 2009b].

[241] The pipeline would run from the Dauletabad gas fields in southeast Turkmenistan, either via a southern route through Heart and Kandahar in Afghanistan and Pakistan to India, or via a northern route. However, on this issue, Russia's Gazprom maintains that the gas being proposed to be transmitted through TAPI pipeline is in fact owned by Gazprom through its agreements with Turkmenistan [Jalalzai 2003].

in a geopolitical rather than a practical framework (the pipeline has a planned capacity of 30 bcm/y) [Zhukov 2009a; IEA 2008c].[242] Indeed, Chapter 11 deals with the geo-strategic dimension of this pipeline.

In early 2008, the Turkmen president promised to commit 10 bcm/y worth of gas to Europe by 2009, though no commercial arrangements or agreements were made [WGI 2008e]. Moreover, how this gas will be transported to Europe remains uncertain. The TCGP (see Case study 1, Chapter 9) is still merely a speculative project, which is subject to uncertainty over permits in offshore transport through the Caspian Sea and possible political transit risks in Georgia [CIEP 2008; Zhukov 2009a]. Europe and the US are also investigating different measures to import Turkmen gas (see case studies 1 and 2 in Chapter 9).[243] When adding up the volumes from Turkmen export agreements under discussion, the agreed annual volume promised, is boosted to 118 bcm/y in total (excluding the speculative TAPI pipeline and exports to Europe). In the most favourable scenario (which is uncertain), some 10-20 bcm/y could be available by 2015 for additional export commitments and, perhaps, even more export possibilities in the long run.

6.3.3 Kazakhstan[244]

Kazakhstan, like Turkmenistan, is ruled by an ex-Soviet regime headed by Nazerbayev, although the regime is much less totalitarian. The regime was relatively open to foreign investment and international energy firms in its oil and gas sector. However, this has changed in recent years. In 2002, Kazmunaigaz became the Kazakh NEF and in 2004 new legislation was introduced that gave Kazmunaigaz a minimum stake of 50 percent in new PSAs [Yenikeyeff 2009]. Kazakhstan's ties with Russia are relatively close, but Kazakhstan is also opting for cooperation with foreign players.[245]

As far as oil reserves and production are concerned in 2008, Kazakhstan had reserves of 39 billion barrels (bbls) and produced 1.5 million barrels per day (mb/d) which was 1.8 percent of the world's total. Kazakhstan is therefore clearly an important oil producer and exporter, the

[242] During the 1990s, American and other firms examined options to transit gas from Turkmenistan through Afghanistan to Pakistan and India, and attempts were made at the corporate and policy-making level in the US to win over Taliban-led Afghanistan to conclude a deal in this regard, which ultimately failed. After the September 11, 2001 attacks, a direct US presence in Afghanistan brought the prospect of the trans-Afghanistan pipeline closer to reality.

[243] Currently, the EU, through its INOGATE programme, and the US Trade and Development Agency had and is financing (pre-)feasibility studies in exploring (non-)pipeline options via the Caspian Sea [IEA 2008d]. In addition, the EU floated the idea of consolidated a gas purchasing mechanism for gas east from the Caspian Sea (i.e., the Caspian Development Corporation, CDC) [IEA 2009b]. Therefore, in line with the TAPI, the TCGP project is still more discussed in a geopolitical framework [Zhukov 2009a].

[244] For a recent in-depth analysis on Kazakh (future) gas sector, see for example Yenikeyeff [2009].

[245] From 1997, Belgium's Tractebel was responsible for Kazakh trunk pipelines via Intergaz Central Asia. But in 2000 Kaztrangaz took over the gas infrastructure [Yenikeyeff 2009].

largest in the Caspian region. Conversely, the country has 1.82 tcm worth of gas reserves (1 percent of the world's total) [BP 2009]. Kazakstan is also a considerable producer: 25.9 bcm in 2008, according to IEA [2009b], although its upstream gas sector is relatively underdeveloped [CIEP 2008]. Most of the gas deposits are located in the west of the country, notably in associated gas fields such as Tengiz[246] and Karachaganak.[247] Kashagan is another important associated gas field being developed by foreign partners (with the associated gas being under high pressure).[248] Other significant fields include, for example, Zhanazhol and Uritau. Much of the gas produced in Kazakhstan is either re-injected for oil lifting or is flared, but some of it is also exported to Russia for further processing. Russia and Kazakhstan established the Kazrosgaz joint venture (50 percent is owned by Gazprom and 50 percent by Kazmunaigas) in 2002.[249]

In 2008, Kazakhstan had an energy mix (64.7 Mtoe) in which coal enjoyed the largest share at 52 percent, followed by natural gas at 29 percent oil at 17 percent and hydropower at 3 percent [BP 2009]. Coal thus plays an important role in Kazakhstan's domestic consumption, enabling it to export a large portion of its oil and some natural gas production. In 2007, it exported 5.5 bcm to Russia [IEA 2008c].[250] Annual gas production in Kazakhstan could increase to 40 bcm by 2015 and 50 bcm by 2030 [IEA 2008c].[251] Estimates are that the gas volumes for commercial use could reach between 30 and 40 bcm by 2020, against rising domestic demand of 18-20 bcm [IEA 2008c]. As a result, 10-22 bcm/y could be available for export by 2020, whereas Yenikeyeff [2009] estimates the availability of export at 19-20 bcm/y by 2015 (in the best case, probably 7-9 bcm/y higher when imports from Uzbekistan remains to be taken into account).

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[246] Tengiz is developed under a PSA (Tengizchevroil) with Chevron, ExxonMobil, Kazmunaigaz and the Russian-owned LukArco [Yenikeyeff 2009].

[247] The deposit is being developed by Karachaganak Petroleum (KPO), an international consortium that includes British Gas, Chevron, ENI and Lukoil. The Karachaganak field is actually a condensate field located onshore, containing an estimated 1.3 tcm worth of natural gas [US Department of Energy 2008]. In 2007-08, Tengizchevroil and KPO have been responsible for more than 70 percent of gas production in Kazakstan [Yenikeyeff 2009].

[248] The consortium operating the field is the Agip Kazakhstan North Caspian Operating Company (Agip KCO), which includes the following shareholders: Kazmunaigaz; ExxonMobil; Royal Dutch Shell; Total; Eni; Conoco; Inpex [Yenikeyeff 2009].

[249] This is centred on the giant Orenburg Gas Processing Plant (OGPP) complex in Russia (near the border with Kazakhstan) to market Kazakh gas internationally. In November 2005, Gazprom and Kazmunaigas' transportation subsidiary, Intergas Central Asia also signed medium-term contracts dealing with the transportation of Russian and Central Asian gas through Kazakh territory from 2006 to 2010 [Gazprom 2008a, p. 61.] Both countries agreed to process 16 bcm/y from Karachaganak (to be processed at the OGPP) in mid-2007, to be used domestically in Kazakhstan and re-exported through Russia [Gazprom 2009b].

[250] According to IEA [2008c], in 2007, Kazakhstan imported 3.2 bcm/y and exported 5.5 bcm to Gazprom. The 2007 Gazprom Annual Report mentions that Gazprom imported 8.5 bcm from Kazakhstan and exported 10 bcm to Kazakhstan.

[251] The Kazakh government projects and production level of around 80 bcm by 2015 and 114 bcm by 2020 [Yenikeyeff 2009].

Of these volumes, Yenikeyeff [2009] projects that 15 bcm/y will be sold to Gazprom, which is in line with preliminary agreements. In August 2008, Chinese CNPC and Kazamunigaz agreed to build a gas pipeline (10 bcm/y), which will link to the Turkmen's one. According to the IEA [2008c], Kazakh gas deliveries to China are expected to be rather small, although an integrated pipeline system could offer swap opportunities [Yenikeyeff 2009].[252] In the future, a small volume of gas might be transported directly to Europe via the TCGP. However, this is highly uncertain because of competition from potential export routes for gas to Russia and China, as in the Turkmen case.[253]

6.3.4 Uzbekistan[254]

Uzbekistan is also ruled by a former Soviet ruler, Karimov, and is the most reclusive and isolated of the four republics covered here. Uzbekistan has 1.58 tcm of gas reserves (0.9 percent of the world's total) and is a significant gas producer, producing 67.4 bcm in 2008, (2.1 percent of the world's total). Its production is consumed largely domestically (53.1 bcm in 2008) [IEA 2009a]. Uzbekistan is producing gas from approximately 50 gas fields, in which seven fields are responsible for more than 95 percent of the total production (which include Shurtan, Zevardy, Dengizkul'-Khauzak, Alan, Kokdumalak, Pamouk and Koultak fields) [Zhukov 2009b; Amineh 2003]. Uzbekistan's energy mix in 2008 (52.2 Mtoe) relied for 84 percent on gas, 11 percent on oil, 3 percent on coal and 3 percent on hydropower [BP 2009]. Uzbekneftegaz is largely responsible for the country's gas production (for about 95 percent). Some other foreign companies, such as Russia's Gazprom and Lukoil and Zeromax joint ventures, operate in upstream (via joint ventures with Uzbekneftegaz). In order to boost its gas production, Uzbekistan has also signed new PSAs, primarily with Russian and Asian companies [Zhukov 2009b; IEA 2009c].[255]

Uzbekistan exported 10.5 bcm to Russia in 2007 and other Central Asian countries (4.2 bcm in 2007)[IEA 2008b]. Uzbekistan is also responsible for part of the Turkmen transit to Russia. According to estimates, this situation will remain for the near future [Zhukov 2009b; CIEP 2008].[256] In 2002, Gazprom signed import contracts with Uzbekistan [Stern 2005]. Uzbekistan recently offered to sell Gazprom 16 bcm/y in 2009 and possibly double this amount in the future [WGI 2009l]. The construction of the Turkmen and Kazakh pipeline to China will

[252] This route will run parallel to the already operational Kazakhstan-China oil pipeline. For an extensive overview of the politico-economic factors involved in China's oil import diversification strategy, in which Kazakhstan plays a central role [Handke 2006].

[253] This could change only if the Chinese project does not succeed and/or the amount of re-injections at Tengiz and Kashagan decrease [Yenikeyeff 2009].

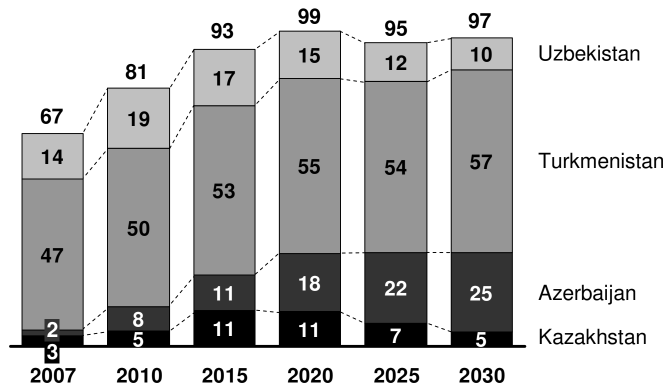
[254] For a recent in-depth analysis on Uzbek (future) gas sector, see for example Zhukov [2009b].

[255] See table 9.11 in [Zhukov 2009b, p. 375] for an overview of projects with foreign participation in Uzbek gas sector.

[256] "The situation will cardinally change only if a large gas deposit is found and rapidly brought on stream – but the probability of such development is low. Export supplies could also be increased at the expense of domestic consumption" [Zhukov 2009b, pp. 389 - 390].

open up the possibility to start gas trade with China, although it will be difficult to increase its export level above 15-16 bcm/y by 2010 (and in the best case 20 bcm/y in 2015, probably temporary) as a result of the domestic consumption. A direct link to the European market via the TCGP is purely speculative (also see Chapter 11).

Figure 6.10 Export potential from the Caspian region (base case scenario)



Note: Base case scenario. Totals may not add up due to rounding.
Source: own analysis, based on CERA [2007]

When one combines all the export potential from the Caspian region, Turkmenistan could export a large amount of gas, followed by Azerbaijan as a result of its Shah Deniz field (see also Figure 6.10, which represents but one of many imaginable scenarios). However, Gazprom has already locked in most of the exports, while China and Iran have some import contracts as well. The remaining spare production capacity could be exported to different regions, including Europe and Pakistan and/or India. Currently, Azerbaijan is the only exporter of gas to OECD Europe (including Turkey, Switzelrand and Norway), and could increase its exports to Europe.

The current economic crisis, combined with the Russian-Ukrainian gas disputes in 2005-06 and 2008-09, could have an impact on the interests to Caspian gas of the different stakeholders and therefore on the outlook for Caspian gas production and exports. From Russia's perspective there are roughly two scenarios:

1) First, as a result of the declining economic activity and gas demand within Russia and other CIS (principally, Ukraine)[257], the pressure on Russia's supply portfolio, and therefore Caspian imports fell in the short run and this will remain for the medium term. The reduction of the call on Caspian imports might be encouraged by ongoing greenfield investments in Shtokman and possibly Yamal.
2) In a scenario involving the delay of new Russian (e.g., as a result of a lack in financial feasibility) combined with newly committed supplies (take-or-pay) to Europe, the importance of Caspian gas in Russia's gas balance will persist. As a consequence of potentially declining economic activity in China, gas for power generation could be affected negatively, which may have an impact on additional gas import requirements from the Caspian region as well.

From a European view, the Russian-Ukrainian gas disputes accelerated the perceived need for greater imports from the Caspian Sea region in order to diversify away from Russia and Ukraine (in terms of both the origin of supplies and routes). However, current dampening European gas demand and imports may postpone the commitment of new gas supplies from outside Europe.

Regardless of external factors such as oil prices and macro-economic conditions, the Caspian Sea countries (especially Turkmenistan and Kazakhstan) are likely to continue playing Russia, China and Europe off against one another. For now, on-the-ground export route diversification is limited. Yet from in late 2009, Turkmenistan (as well as Kazakhstan and Uzbekistan) is no longer as reliant on export routes to Russia.[258] As a result of Turkmenistan's (as well as Kazakhstan's and Uzbekistan's) successful development of an alternative gas export route to China, the balance of bargaining power in the region will certainly change. In a similar manner, Azerbaijan may continue to play off Russia, Iran and European buyers as and when more of its gas becomes available.

6.4 Iran

Section 6.4.1 is an overview of Iran's gas reserves and current gas balance. Section 6.4.2 provides an impression of Iran's gas sector in terms of revenues, institutionalisation, decision-making, and foreign participation. In Section 7.4.3, attention is paid to Iran's domestic gas needs and strategy. Section 6.4.4 addresses Iran's gas export ambitions by pipeline and LNG. Section 6.4.5 is an overview of Iran's cooperation with other gas exporting countries. Iran's gas

[257] The gas demand within Russia could be not as much of affected as a consequent of reducing government's drive to increase regulated prices, rising prices could stimulate inflation, which may have a negative impact on the economic development.

[258] This is the result mainly of the scheduled opening of a large-volume export route to China, in addition to existing smaller capacity link to Iran [IEA 2009b].

relationship with Russia is covered in an additional section, Section 6.4.6, which is not included in other country overviews.

6.4.1 Gas reserves and current gas balance

Iran's gas reserves clock in at 29.61 tcm, some 15.6 percent of the world's total [BP 2009], with a reserves-to-production ration (R/P ratio) of well over 50 years.[259] Iran produced 121 bcm in 2008, 3.8 percent of the world's total [IEA 2008b]. As for oil reserves and production, Iran has 137.6 billion bbls worth of oil reserves (10.9 percent of the world's total), produced 4.3 mb/d in 2008, with an R/P ratio 86.9 years and is a key member of OPEC. Iran's natural gas reserves accounts for just over 50 percent of its fossil fuel reserves [Flower 2008b]. The largest concentration of reserves for Iran is located in its giant South Pars field. Geologically, the field is an extension of Qatar's 25.5 tcm North Field. South Pars was first identified in 1988, and originally appraised at 3.62 tcm in the early 1990s.

Current estimates are that South Pars contains between 8 tcm and 14 tcm (some estimates go as high as 40 tcm) of natural gas, of which a large fraction will be recoverable [Flower 2008b].[260] Other important fields include North Pars (2.27 tcm), Kangan-Nar in the Persian Gulf Basin and Khangiran in the North-East basin. Iran's gas reserves are based mainly on independent gas fields, gas caps and associated gas, produced together with oil [Ghorban 2006]. Thus a most favourable feature of Iran's gas deposits is that around 62 percent are located in non-associated gas fields and have not been developed [US Department of Energy 2009b],[261] meaning that Iran has vast potential for future gas development. The IEA estimates Iran could reach gas production of 139 bcm and 313 bcm by 2015 and 2030, respectively, a yearly rise of some 4.7 percent per annum [IEA 2008c]. Since 2000, the incremental production capacity at South Pars has been larger than that of the North Field in Qatar, with output from phases 6 through 10 to reach 45 bcm.[262] Production in Iran in general rose by 9 percent per year between 2000 and 2007. For a graphical overview of Iran's gas balance, refer to Figure 6.11 below.

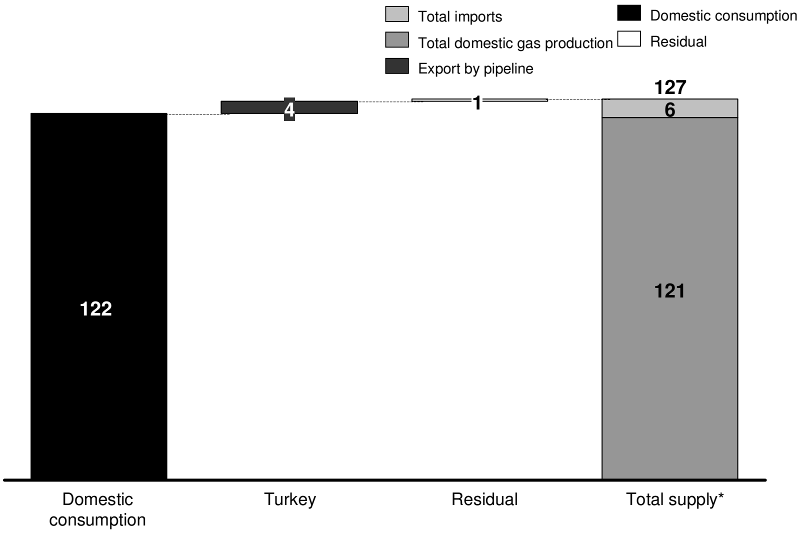
[259] As Ghorban notes: "Iran is producing around 8 percent of their combined gas production and could produce five times the current level, on a par with the US and Russia for over 40 years" [Ghorban 2006].

[260] According to Flower, the North Field/South Pars gas reservoir could hold as much as a stunning amount of 40 tcm, close to 55 percent of total regional Persian Gulf supplies.

[261] As is the case elsewhere, data on oil and gas reserves in Iran have to be taken with caution. For example, all gas fields, associated and un-associated, are put into one basket while their life expectancy is often ill-defined due to bad exploration methods: "Regarding the South Pars field, its best part is done," says Paul Graf, oil engineer and consultant. In his view, the remaining exploration might be of far inferior quality. Such uncertainties and the difficulties with the investment scheme and the available engineering in Iran confront investors with various problems [Kneissl 2006].

[262] Production from the field's first five phases totals 45 bcm/y, compared with Qatar's 28 bcm/y output from its North Field. An additional 9 bcm of incremental production from the existing phases is to come onstream in 2009 [IEA 2009b].

Figure 6.11 Iran's gas balance in 2008



* Iran imported 5.8 bcm from Turkmenistan.
Note: Totals may not add up due to rounding.
Source: own analysis, IEA [2009a].

6.4.2 The Iranian gas sector

1) Background to institutionalisation and strategy

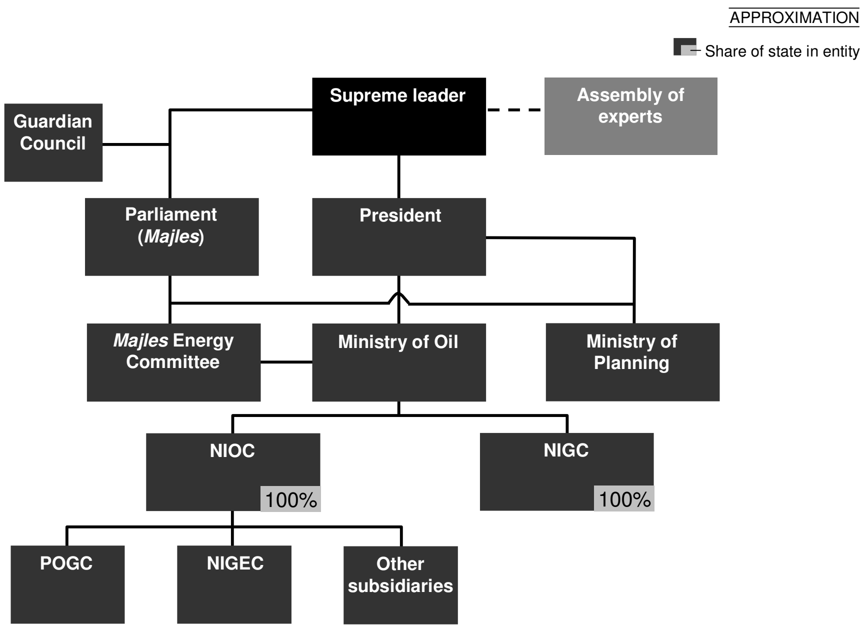
For Iran, oil and gas revenues accounted for roughly 80 percent of export earnings and of government revenues in 2008 [EIU 2009b; CIA 2009]. Just as many Middle Eastern countries, Iran has emerged from an era during which especially the British and, later on, the US maintained extensive influence in Iran's energy sector.[263] The Anglo-Iranian Oil Company (later to become BP) held most of Iran's concessions and operated the oil fields, and the Shah wanted more control over the oil industry [Yergin 1991]. After the 1979 revolution, the new Ministry of Oil cancelled all existing contracts and took control of oil and gas operations through the its own state-owned companies [Marcel 2005]. Since the 1979 Islamic revolution, Iran is regarded by the US as a major threat to regional energy security, while irony has it that the Shah of Iran was a US ally. US policy has since consisted of imposing economic sanctions on Iran, thus greatly discouraging investment in its energy sector. Iran has never had the opportunity to attract foreign investment to as great an extent as some other major Gulf oil and gas producers and exporters have. In terms of path dependency, therefore, this predicament still influences Iran's ability to become a gas exporter today.

[263] In 1920, for example, the British government pushed Iranian officials to accept an 'interpretive agreement' which restricted the Iranian government's entitlement to profits arising in Iran and effectively excluded sales of Iranian oil abroad [Philip 1994].

2) Decision-making

The main actors in the Iranian energy sector are the Iranian parliament, the Majles, (and its Energy Committee), the National Iranian Oil Company (NIOC) and the Iranian Ministry of Oil. Iran's multi-level, multi-polar political system allows indirect recourse to the wider public will, but maintains decision-making power in a fairly small circle dominated by clerical authorities, at the centre of which is the Supreme Leader's office.[264]

Figure 6.12 Gas sector institutionalisation and NIOC



Note: Different MoUs are signed with foreign companies.
Source: own analysis, based on Marcel [2008]; Cedigaz [2008].

NIOC is practically part of the Ministry of Oil: The Minister of Energy is at the same time chairman of NIOC whilst deputies serve as executives in NIOC subsidiaries [IEA 2008d]. The company is clearly under direct control of the executive government, with other institutions, such as parliament and the Guardian Council acting as centrifugal forces outside it [Marcel

[264] Within the Executive Branch, which falls under presidential authority, several bodies influence NIOC directly: the NIOC General Assembly, the Supreme Economic Council and the Petroleum Council. The NIOC General Assembly sets out NIOC's general policy and approves its budget. It includes the President of the Republic, the Vice President, the Oil Minister, the Energy Minister, the Finance Minister and the Director General of the Management and Planning Organisation. The Supreme Economic Council was founded by Khatami to centralise economic decision-making, deciding most of the development contracts in the energy sector, also pertaining to foreign direct investment. NIOC's proposed contracts are thus subject to this council's approval. Ahmadinejad created the Petroleum Council to "protect national interests", seeking greater control over the oil sector [Brumberg and Ahram 2007].

2005]. NIOC has its own host of subsidiaries, which deal with specific geographic regions and fields as well operational tasks such as exploration and production. See Figure 6.12 below for a schematic overview of these relationships.[265] Handling gas, petrochemicals and refining is done by three sister organisations which formally fall under the Ministry of Oil,[266] while in practice they function as subsidiaries of NIOC. Since the oil nationalisation of 1951, NIOC and its gas arm National Iranian Gas Company (NIGC) have clashed with the various Iranian governments over the collection of oil products and gas rent [Ghorban 2006]. The industry is integrated in the government's financial system, and therefore the capital needs of the hydrocarbon sector are frequently traded off for those of other ministries [Marcel 2005].

There are thus several important bodies in the Iranian political complex which ultimately influence decision-making in the Iranian energy sector, which have divergent interests, vastly complicating Iran's gas export plans and ambitions. Iran's energy policy must cope with domestic needs, balancing them with the various export options. For example, NIOC and some in the Majles argue that the country should become a major regional and interregional gas exporter on the one hand.[267] The NIOC and National Iranian Gas Export Company (NIGEC) are committed to developing LNG for export [IEA 2007a]. Besides, as they argue, Iran incurs a significant opportunity cost by denying itself a fully fledged role in the international gas industry. As was mentioned, Iranian gas production estimates diverge widely and with rising gas needs at home, Iran is likely to remain constricted in its exports, should they materialise. Therefore one of NIOC's priorities, after achieving domestic goals, is to become a major gas exporter and enable Iran to become an important gas hub akin to Qatar, filling markets left open by giants such as the latter and Russia [Marcel 2005].[268]

Some type of 'neighbourhood policy' could form the spearhead of Iran's external energy policy, which could manage energy relations with key potential customers and their regulators such as India and Pakistan, but also with significant Central Asian exporters Kazakhstan and

[265] This overview is designed to provide a simplified, perhaps even oversimplified impression of decision-making in the Iranian gas sector. Informal and formal forces may also be at play to such an extent that it is beyond the scope of consideration for this study.

[266] These include the National Iranian Gas Company (NIGC), the National Petrochemical Company (NPC) and the National Iranian Oil Refining and Distribution Company (NIORDC). Pars Oil and Gas Company (POGC) is responsible for upstream development and downstream development is divided amongst various firms including the National Iranian Gas Export Company (NIGEC). Both POGC and NIGEC are subsidiaries of NIOC [IEA 2007a].

[267] Iran will still have a massive 12 to 14 tcm for export after covering domestic needs and gas re-injection for 50 more years [IEA 2007b] Be that as it may, NIOC's plans call for some 100 to 115 bcm to be used for oil injection by 2010, up from 31 bcm per year in 2006 [Flower 2008b]. Part of the development of South Pars is aimed at enhanced oil recovery, namely phases 6 through 8. The new IGAT-5 pipeline will inject gas from South Pars into the large Aghajari oil field of Khuzestan from the large processing plant at Assaluyeh, the landfall point for gas produced from South Pars.

[268] The development of marketing of gas on the world market is central to the government's 20-year plan [IEA 2009b], and NIGC claimed in 2005 that it sought "to achieve 8-10 percent of the world's gas trade and its by-products within 20 years […] It is estimated that by the end of 2010-2015, gas exports could reach 248 bcm/y, both as LNG and through pipelines" [Petroleum Economist 2007c].

Turkmenistan, as far as supply integration and transit is concerned. It will take quite some years to bring Iran's export potential up to speed, according to Nozari, the Minister of Petroleum. Iran must first reach a positive balance in which it can produce enough gas for exports [MEES 2008g]. For Iran to be able to manage these different choices effectively, he argues, Iran is in need of an integrated NEF for oil and gas jointly as well as a gas ministry parallel to its oil ministry. Iran's currently fragmented decision-making process due to the incongruent interests of the actors involved ultimately lead to a number of trade-offs between different priorities. Though Iran does not yet appear to have developed a coherent gas export strategy, it is aware of the external environment in the interregional gas market, and the level of development of important interregional players such as Russia and Qatar, with Iranian oil officials concerned about "established competition" from Algeria, Russia and Qatar. According to one Iranian official "[w]e can't compete with Qatar. We look for markets where Qatar is not able to get easy access, India and Pakistan, for example [see above], where we have land access and the Qatari's would need deepwater pipes in the Indian Ocean and the Oman Sea" [Marcel 2005, p. 166].

3) Foreign investment

Iran's upstream potential suffers from a shortage of experienced international engineering, procurement and construction contractors [IEA 2007a], mainly because of US and international sanctions (i.e., the Iran Sanctions Act)[269] which restrict Iran's access to liquefaction technology and equipment [Flower 2008b] and keep IEFs from becoming involved. NIOC has relied on international sources of capital, for example, foreign investment through the buyback scheme, European and Japanese banks and export credit agencies [Marcel 2005]. Iran's foreign investment policies, based on so-called buyback contracts, are not enticing for foreign investors.[270] Moreover, negotiations between the Iranian bureaucracy and foreign oil and gas companies are generally laborious and unwieldy [Gas Matters 2008d]. Western IEFs are nevertheless prepared to work in Iran but cannot make investment commitments for the aforementioned reasons, which drives Iran to turn to Russian and Chinese firms instead (see below). On paper, the IEFs are still involved in Iran's upstream LNG projects but their actual participation in the field remains a remote possibility, for the time being.

[269] These sanctions were further tightened in 1995 by the Clinton Administration under the Iran Libya Sanctions Act (ILSA), which was aimed at Libya on the same grounds, namely that it funded terrorist organisations. In 2006, Libya was no longer seen as a threat and was thus moved from sanctions list but the Act was extended to 2011 and remained applied to Iran (it was thus renamed the Iran Sanctions Act). The original reasoning behind the Act was that sanctions would curb the strategic threat posed by Iran by hindering its ability to modernize its petroleum sector. American and foreign firms were thus basically barred form investing in Iran.

[270] Under the terms of the contract, which may last as short as 5 to 7 years, foreign investors are required to undertake all upstream development and to bear the cost. In return they receive a fixed portion of production, with a pre-agreed rate of return, but control of the fields in question reverts to the NIOC upon completion of development, further discouraging investment [IEA 2007a].

Iran's prioritisation of gas resource use is as follows: 1) domestic use of gas, including power generation, 2) gas used for oil lifting, 3) gas-based industries including petrochemical and Gas-to-Liquids (GtL) projects for internal use and export and 4) gas export by pipelines and in the form of LNG [Ghorban 2006].

6.4.3 Domestic gas needs and strategy

Iran consumed the 121 bcm it produced in 2008 [IEA 2009a]. Total primary energy consumption in Iran consisted (in mtoe) of 105.8 mtoe of gas, 83.3 mtoe of oil, 1.3 mtoe of coal and 1.7 mtoe of hydropower (respectively, 43 percent, 55 percent and less than 1 percent for coal and hydropower) [BP 2009]. Thus Iran's gas uses consist of household and industrial consumption, power generation, injection and some exports while some gas is also flared. According to the EIA, 65 percent of Iran's gas was marketed, 18 percent was used for reinjection and 17 percent was lost due to flaring [US Department of Energy 2009b]. Mean growth of consumption averages 8.2 percent per year between 2000 and 2007, rising at 7 percent per annum into the foreseeable future. An important factor in Iran's high energy consumption is, as in many net oil and gas-exporting countries, the high level of energy subsidies, amounting in Iran to just over $55 billion, of which roughly one third is composed of subsidies for gas [IEA 2008c]. Below is a brief account of the most important gas uses in Iran, namely power generation, gas-based industries and gas reinjection:

1) *Power generation:* Power generation needs in Iran were 34 bcm in 2007 (one third of its total consumption) [IEA 2008b]. Through two pipelines (Iranian Gas Trunklines, or IGAT, 1 and 2) transport gas from Iran's south to its north, around Tehran, where much of Iran's gas and energy needs, as far as power generation is concerned, is also located in the northeast of the country.[271] This mismatch has led Iran to import gas from Turkmenistan (through the Kurt-Kui pipeline), mainly the Korpedzhe gas field, close to the Iranian borde [Olcott 2006]. Iran imported 0.2 bcm from Azerbaijan in 2007 and has expressed an interest in additional gas imports from Phase 2 development of the Shah Deniz gas field.[272]
2) *Gas-based industries:* Gas for consumed by the petrochemical sector was roughly 16 bcm in 2005, representing some 10 percent of Iran's total gas consumption. Others favour a strategy in which the development of the petrochemical, gas-based industries and other domestic demand needs are given priority [Ghorban 2006].[273] This increase is part of an effort to diversify the economy away from dependency on oil revenues [IEA 2007a].

[271] Developments in the Iranian Gas Trunkline (IGAT) pipeline series, all fed by South Pars development phases, are important to Iran's natural gas transport. IGAT-8 and IGAT-9 will be operational in 2009 and 2014, respectively [US Department of Energy 2009b].
[272] According to Statfor, there are discussions to increase its Azeri imports substantially to 12 bcm in 2012, [IEA 2008d].
[273] At the port of Jask, near the Strait of Hormuz, Iran has recently built one of its largest petrochemical facilities.

3) *Gas reinjection:* Gas reinjection amounted to 30 bcm in 2006. Re-injection is especially attractive when oil prices are high and in the Majles many favour oil lifting, especially in a high oil price environment [IEA 2007a]. According to the IEA, when calculated in $/ per thousand cubic meters ($/mcm), gas used for oil lifting yields $350 when compared to a yield of some $80 from LNG exports to India and almost nil from domestic sales (i.e. subsidies) [Petroleum Economist 2007c]. Gas substitution for oil use in domestic energy consumption is central to the hydrocarbon strategy of Iran, because it frees up lucrative oil for exports [Marcel 2005].

6.4.4 Gas export ambitions and strategy

In developing new greenfields for gas exports, Iran already signed a variety of contracts and memoranda of understanding to supply gas, mainly focusing on its regional neighbours, essentially for politico-strategic reasons [IEA 2008d]. In exporting gas outside the 'near abroad' region, some experts argue that Iran would especially focus (also for political reasons) on South Asian countries like India and Pakistan by pipeline, and by LNG to the rest of the world, but primarily to India and China via a dual export strategy combining pipeline and LNG flows [Ghorban 2006]. Iranian officials are aware that the country's strategic position gives it an advantage over Qatar in that it has the potential to develop a pipeline network to South Asia and, possibly, toward the Mediterranean (and Southeastern Europe) as well [Marcel 2005]. Iran's gas export priorities can be listed as follows:

1) *'Near-abroad': Gas exports westwards to the Caucasus, Syria and Turkey:*[274] Of the volumes exported by Iran, 4 bcm (3.2 percent of Iran's gas production in 2008) was exported to Turkey via the Tabriz-Erzurum gas pipeline in 2008. The deliveries to Turkey have a contractual maximum of 9 bcm/y, although there were significant difficulties in fulfilling this gas contract, with deliveries averaging 4.5 bcm/y overall. In 2007, a memorandum of understanding was signed between both countries to increase its supplies to a maximum amount of 20 bcm/y (possibly based on phases 22-24 of South Pars development).[275] From 2009 onwards, some capacity will be used during summers for gas supplies (3 bcm/y) to Syria. From the end of 2008 onwards, Iran is to supply neighbouring Armenia with 1 bcm per year.[276] In the long-term it could become a potential supplier, also as a result of planned construction of two pipelines (30 bcm/y) that would be linked to the Iranian east-west pipeline system, combined with three phases of South Pars, of which the

[274] If Turkmenistan had significant quantities of spare gas and will not supplying Europe via another (new) pipeline, the Turkmen-Iranian-Turkish (TIT) pipeline proposal (30 bcm/y) could be revived, see also case 1 [IEA 2008c].
[275] Based on IEA [2008d].
[276] Iran is involved in small gas swaps with Azerbaijan (0.8 bcm/y from Azerbaijan) for delivering gas to Nakhichevan and with Armenia (1 bcm to Armenia) in exchange for electricity [IEA 2008d].

Turkish State Petroleum Company (TPAO) had signed a gas production deal that accounts for 20.4 bcm/y [IEA 2009b].

2) *'Near-abroad': exports to the Gulf region:* Rapid urban developments in neighbouring UAE and the industrial gas demand in, for instance Oman, offer regional gas export possibilities within the Gulf and is putting pressure on volumes for export [CIEP 2008]. In 2008, Iran and Oman reached an agreement on the supply of Iranian gas from the Kish gas field (located in the Iranian sector of the Persian Gulf, near the Strait of Hormuz) to Oman's Qalhat liquefaction terminal for further processing (10 bcm/y).[277] Iran may well export humble volumes to other countries in the region as well, including Kuwait (amount yet to be specified),[278] Bahrain (10 bcm/y from 2015 onwards) and the UAE (6 bcm/y from the offshore Salman field) [IEA 2008d]. Most of these volumes will be used for oil recovery.
3) *Potential pipeline gas exports eastwards:* Pakistan and India are important growth markets for gas, lying to Iran's east. The Iran-Pakistan-India (IPI) pipeline itself is Iran's main pipeline gas export possibility eastwards, and a large section of the pipeline is already under construction. This segment will be used for domestic gasification in Iran's south-eastern provinces. The project has been on the drawing board since the early 1990s, and various routes had been conceived, but cross-border tensions kept routes on the drawing board. Iran has been in negotiations with Pakistan and India over pricing and transit tariffs, which in its final of three phases would reach a capacity of just over 50 bcm/y by 2020 to both India and Pakistan, up from an initial capacity of 22 bcm [IEA 2008d]. The IGAT-7 pipeline from Assaluyeh to Iranshar might be connected to the IPI pipeline at 12 bcm/y worth of capacity to supply Turkmen gas (possibly from the Dauletabad gas field), with the IPI fed by South Pars. Instability in Pakistan and its tense relationship with India has definitely also contributed to delaying the project.[279] For now, only Iran and Pakistan are moving ahead with the project. If realised, the IPI project could displace the proposed TAPI pipeline that has been delayed for a number of years due to ongoing instability in Afghanistan (also refer to Chapter 11).
4) *Potential LNG exports:* Next on Iran's export priority list is gas exports through LNG. Iran could enjoy the same advantage as Qatar does (see next section) in being equidistantly positioned between the Atlantic and Pacific LNG basins, meaning it could aim for a wide variety of LNG export diversification. While oil is the primary source of export revenues, LNG and pipeline gas exports are being pursued as long-run development options [Flower 2008b]. Several Iranian LNG export projects have been on the drawing board for a num-

[277] The aim is to bring about joint exports through a planned 20 bcm/y offshore pipeline, though there is of yet no schedule for the project [MEES 2008g].

[278] Iran and Kuwait have recently settled a dispute over the Arash offshore natural gas field in the Gulf, which they will jointly develop and explore [US Department of Energy 2009b].

[279] The project faces delays due to price uncertainties, macro and regional (geo)political forces, cross-border complexities in relation to technicalities and regulatory issues, combined with undeveloped gas markets [Boon von Ochssée and Shahryar 2009].

ber of years but have been stalled, with foreign partners unwilling to commit to Iranian projects due to sanctions and the wider (perceived) political risks. Iran's LNG projects are all centred on development of the South Pars field, the development of which is structured in 24 phases spanning 20 years (phases 1 through 5 are complete, phases 6 through 10 came on-stream behind schedule).[280]

As is mentioned above, despite Iran's challenging investment climate, some foreign players in the form of both IEFs and NEFs are aiming for a stake in Iran's upstream. NIOC has been keen to award new phases of South Pars development that are geared to supplying gas for domestic[281] use (see above), but some phases of South Pars' development are dedicated to eventual exports. Iran's slated LNG projects include Persian LNG, Iran LNG and Pars LNG. Persian LNG (6.5 bcm/y, based on phase 11) is to be developed by NIOC (50 percent) Shell (25 percent) and Repsol (25 percent), but these two companies temporarily withdrew in mid-2008. Pars LNG (7.75 bcm/y, based on phases 13 and 14) was supposed to be developed by NIOC and foreign partners Total and Petronas.[282]

Iran LNG (6.5 bcm/y, based on phase 12) is to be developed by Österreichische Mineralölverwaltung (OMV) and Iran LNG Company but is also experiencing delays, some of its output is already dedicated to Indian buyers. However, like Shell and Repsol, Total was compelled by the US Iran Sanctions Act (ISA) act to refrain from investing in Iran in July 2008, and its 30 percent stake in the project may be awarded to China's CNPC, which has also been negotiating for a stake in the project [WGI 2009c]. In March 2009, China's National Offshore Oil Corporation (CNOOC) and NIOC signed a contract for the development of the North Pars gas field, a deal in which CNOOC receives half the production in exchange for construction of upstream and downstream (it has already begun drilling at the field) [PIGR 2009a].

5) *Potential pipeline gas exports westwards:* From the Iranian point of view, Iranian exports further on to Europe currently have a low priority because of domestic gas needs and gas export priorities to the other markets named above. According to the IEA, it is unlikely that there would be enough production capacity to supply additional volumes to Europe

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[280] Phases 11 to 14 have been allocated to LNG production, although phase 12 will also supply the domestic market [Flower 2008b]. For a complete overview of the phases and the respective production planning of the South Pars field, see [IEA 2009b].

[281] For example, Statoilhydro operated phases 6-8 of South Pars have output dedicated to the domestic market; these have finally come onstream in 2008.

[282] Phase 13 is located close to the maritime border with Qatar, and despite any conclusive evidence to support its claim, NIOC has stated that it is preoccupied that any imbalance between Qatari production from the joint North Field/South Pars reservoir will cause gas migrating to the Qatari side [Gas Matters 2008d].

in the mid-term.[283] According to the IEA's data, the aforementioned commitments add up about 45 bcm/y (58 bcm/y; including LNG production) by 2012 and a further 22 bcm/y (50.08 bcm/y; including LNG production) soon after. According to the IEA [2008c], it is doubtful as such whether Iran, an oft-cited source for potential volumes for the Nabucco pipeline, will have enough production capacity to supply even only phase 1 of Nabucco (earlier Russian activities in the Turkish market may also play a role, Gazprom supplies over half of Turkey's gas needs, see Case study 1, Chapter 9).

6.4.5 Cooperation with other gas-exporting companies

Apart from potential cooperation with IEFs and Chinese NEFs in some of its LNG projects, Iran has increased its cooperation with other NEFs. Cooperation on the following focal points has been discussed, mainly concerning long-run cooperation:

1) *Upstream development:* In August 2003, both Russia and Iran signed an agreement on issues of bilateral cooperation in the sphere of oil and gas [Zhiznin 2007]. Gazprom already completed phases 2 and 3 of South Pars and agreed to participate in future phases of the project [IEA 2009b].
2) *Joint Russo-Iranian ventures:* In July 2008, Gazprom signed a memorandum of understanding with NIOC covering a full package of projects to develop oil and natural gas fields, build processing facilities and transport oil from the Caspian Sea to the Gulf [IEA 2008d]. Both countries agreed to set up a joint venture in the form of an energy company to explore investment opportunities in Iran, Russia and other countries. Also covered in the agreement is a plan for Gazprom's cooperation on developing the IPI and IGAT-7 pipeline projects, gas swaps and the building of a refinery in northern Iran [WGI 2009i]. As mentioned in the section concerning the Caspian Sea, Gazprom and NIOC are discussing potential volumes from Turkmenistan to Iran (under a swap arrangement), this would be supplied in return for Gazprom's access to Iranian LNG from the South Pars field [WGI 2009i]. Iran is also looking to position itself as an important transit corridor for gas from Caspian Sea producers, seeing itself as the logical transfer point for all Caspian Sea energy, a position fully supported by NIOC since it stood to benefit from any direct revenue generated by a trans-Iran pipeline [Brumberg and Ahram 2007]. Therefore Iran is studying possibilities for a 12 bcm/y north-south gas pipeline that could accommodate flows from these producers to the port of Jask, next to the Oman Sea [IEA 2008d].

[283] The only pipeline commitment to a European supplier was made in March 2008 with the Swiss energy company *Elektrizitäts-Gesellschaft Laufenburg AG* (EGL) for gas deliveries (5.5 bcm/y) via the existing Iran-Turkey pipeline and the aforementioned Trans-Adriatic pipeline to EGL's power plants in Italy [IEA 2008d].

3) *The South Pars project:* Remarkably, in November 2008, Russia, Iran and Qatar agreed on setting up a venture to jointly develop other phases of Iran's South Pars field.[284] In an apparent extension of bilateral cooperation already in place between Russia and Iran, it is the first such proposal for trilateral cooperation between the three largest gas reserve holders. Talks encompassed trilateral gas exploration, production, processing and transportation, including LNG, involving the set-up of a joint venture. All three countries' NEFs would take an equal 30 percent share each, and would consider offering the remainder to a fourth partner.[285] The joint venture proposal comes just three weeks after all three countries established the so-called Gas Troika in October 2008 (to be discussed in Chapter 10).

6.4.6 Iran's geopolitical and geo-economic relationship with Russia

Iran's geopolitical role for Russia is an important one that indirectly affects Russia's energy policies with regard to Iran. Even though Iran does not yet play an important role in the interregional gas market, Russia and Iran do have important geopolitical interests within and around the Eurasian gas ellipse. For this reason, Iran's geopolitical relationship with Russia is explained in this section, concerning mainly the following:

1) Russia became more responsive to Iranian interests in the early 1990s as Russia began seeking its own foreign policy course [Dekmejian and Simonian 2003]. Both countries share the Caspian Sea, located on either side (North and South) and have common interests vis-à-vis the other littoral states (also see Chapter 11).[286] Russia has concluded bilateral deals with Kazakhstan and Azerbaijan on the question [Amineh 2003]. Russian and Iranian positions over the legal status of the Caspian Sea only partially coincide [Zhiznin

[284] The joint venture can be seen "as part of the ongoing discussions between Russia, Qatar and Iran on expanding cooperation, Gazprom representatives will participate in meeting of a technical committee that will discuss details of the implementation of the joint South Pars project" [PIGR 2008b].
[285] The project entails producing gas at South Pars, building a pipeline across the Gulf to Qatar and building an LNG plant at the industrial hub of Ras Laffan [PIGR 2008b].
[286] Historically, the Soviet Union agreed with Iran that both countries should equally share the resources under the seabed. The uncertainty surrounding the status of the Caspian Sea as either a very large lake or a small sea has major implications for the distribution between the various littoral states of gas resources under the surface of that body of water's floor. Russia's sector of the coastline has regressed since the collapse of the Soviet Union and both countries now hold smaller coastlines. During the 1990s, IEFs and Western government, the US in the lead, became increasingly involved in attempts to achieve a legal definition of the Caspian Sea as a lake, which would resulted in an equal share for all the littoral states, making it possible to open up the seabed to international investments [International Herald Tribune 2007a]. Both Russia and Iran have since blocked any resolution in an effort to forestall such an outcome and continue to lobby for the definition that will yield hem the greatest possible share of the Caspian Sea's subsoil resources [Klevemann 2003]. If it is a lake, there are no obligations by countries that flank it to grant permits to foreign vessels or drilling companies. But if it is defined as a sea, there are international treaties obliging those countries to an array of permits. In the 'sea' case, the UN Convention on the Law of the Sea of 1982 would be applicable while in the 'lake' case, customary international law concerning border lakes would apply. The Caspian Sea does not seem to be a sea, a lake or a condominium. Its final legal status must be determined by unanimous agreement among all the littoral states [Janusz 2005].

2007]. Iran's aims for its share of the Caspian Sea are 20 percent of the seabed, overlapping with Azerbaijani and Turkmen claims [MEES 2008e].

2) Russia and Iran have important commercial ties in the arms and nuclear energy sectors.[287] Continued access to Iran's ports in the Gulf is also important for Russia [Dekmejian and Simonian 2003].
3) Iran is a rising power in both the Central Asian and Persian Gulf regions. It thus also exerts much influence on the Islamic world in Central Asia and the Caucasus [Amineh 2003].[288] From a geopolitical perspective, Russia sees Iran as an important partner in stabilising Central Asia and the Caucasus, with both countries perceiving one another as strategic partners in the region and requiring coordination [Dekmejian and Simonian 2003; Amineh 2003].[289] Iran fears unrest in its northern border areas and appreciates the presence of Russian military units in the Caucasus and Central Asia [Pannier 1999].
4) A mean feature of Russia's interactions with Iran have been to further advance Russian interests in the two geographical areas that Iran straddles, the Caspian Sea and the Persian Gulf [Lee 2007]. From a purely geo-strategic point of view, Iran acts as a bulwark for Russia against total US hegemony in the Persian Gulf region,[290] and by extension ultimately also in Central Asia [Le Monde Diplomatique 2006]. For Russia, closer cooperation with Iran is a reaction to NATO expansion towards Eastern Europe and the Black Sea, Western aims to secure energy resources in the Caspian Sea region and intensive Turkish activities in Central Asia [Amineh 2003]. Russia also actively supports Iran's membership in the SCO, and sees the US effort isolate Iran as counter-productive [Kommersant 2007]. Both countries see the US as an important rival, and have seen the construction of the BTC and the South Caucasus Pipeline (SCP) as open US challenges to their control of oil and gas flows in the Caspian Sea region.[291] They can thus help one another in excluding or limiting US influence in the region.[292]

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[287] It is widely known that Russia has delivered to Iran various kinds, including surface-to-air missiles, while it also cooperates with Iran on its nuclear programme in which Russian companies have commercial interests [Amineh 2003].

[288] Rather than being one of two non-Arab states on the northern periphery of a predominantly Arab Middle East, Iran now saw the potential to be the centre of gravity of a new enlarged Middle East that included the non-Arab peoples of Central Asia and the South Caucasus [Herzig 2001].

[289] In 1999, Kozyrev had already remarked "a strategic parity had to be established between Iran and Russia to ensure stability in Transcaucasia and Central Asia" [Pannier 1999].

[290] According to a retired Russian General in the Russian foreign intelligence service, Gennady Yefstafiev: "The US long-term goals in Iran are obvious: To engineer a downfall of the current regime, to establish control over Iran's oil and gas, and to use its territory as the shortest route for the transportation of hydrocarbons under US control from the regions of Central Asia and the Caspian Sea bypassing Russia and China, this is not to mention Iran's intrinsic military and strategic significance." Quoted in an interview, titled 'An OPEC for natural gas,' [Radio Free Europe 2007]. In this interview PFC energy analyst Nikos Tsafos and RFE/RL energy analyst Roman Kupchinsky discussed with an RFE/RL briefing what the likelihood is of a natural-gas-producers consortium being formed and what such an organisation might look like.

[291] A US-Turkish-Azerbaijani axis, which arose during the 1990s, made a close Russian-Iranian ties a geopolitical imperative [Dekmejian and Simonian 2003].

[292] Even in 1999, when Yeltsin was still in power, one of his advisors was quoted as saying: "We will not let the West dictate to Russia how far it can go in its relations [with Iran]" [Pannier 1999].

5) Russia has an interest in seeing Iran maintain a status quo in the Gulf and Central Asian regions, even though historically both countries have mostly been rivals.[293]

The geopolitical importance of Iran for Russia reinforces the geo-economic one. Therefore in addition to the points mentioned above, Iran's role for Russia also relates to the following as far as gas is concerned in particular (more geo-economic elements than geopolitical):

1) As will be shown in case studies 1 and 2 in Chapter 9, Iran may be a source of potential competition for gas market share in Europe given the relatively low costs to market and its reserve size. In the long run, Iran could act as an interregional LNG supplier, similar to Qatar, and as a pipeline supplier to Asian markets. Also, it should not be forgotten that both Russia and Iran remain competitors for the transit of Caspian oil and gas [Dekmejian and Simonian 2003].
2) Russia and Iran have an interest in arm's length cooperation to jointly maintain control over Central Asian gas, as they control two of the most important exit routes for gas from the landlocked Central Asian region. For Russia, Iran acts as a 'geo-economic' pivot in that Central Asian gas is forced either northwards to Russia or southwards to Iran.[294] Yet Russia does oppose the transit of Central Asian gas through Iran, especially to Europe [Amineh 2003].
3) By extension, both countries have an interest in limiting US influence in the region. The US acts as a common foe as it attempts to create gas export routes to bypass both Iran and Russia (see below). This includes trans-Caspian gas transport routes from Kazakhstan and Turkmenistan to Azerbaijan and beyond, westwards as well as from Azerbaijan itself (mainly from the Shah Deniz field, see above).

It occupies the most sensitive geo-economic position within the Eurasian gas ellipse, in between the Persian Gulf and Central Asia, forming the ideal transit corridor for gas (and oil) from Central Asia to the Persian Gulf, to Europe via Turkey and East towards South Asia [Noreng 2006]. Under a pro-US regime, an Iran open to foreign direct investment in the same manner as Iraq now is could also act as a major conduit for Central Asian gas, away from Russian control. In the long run, this could expose a vast bulk of the Eurasian gas ellipse to (private) foreign investment, ultimately at Russia's expense.

[293] In October 2007, Putin also visited Iran to show both solidarity with Iran and other neighbouring Caspian Sea countries in wanting to resolve the legal status of the Caspian Sea [International Herald Tribune 2007b] and to warn the US against attacking Iran by using bases in any of the Caspian Sea countries [International Herald Tribune 2007c].
[294] In early 2007, Iran began negotiations with other Caspian Sea littoral states such as Turkmenistan in order to come to swap arrangements.

6.5 Conclusion

The inner integrators are bound to play an important role as far as pipeline gas flows are concerned on the Eurasian continent. Russia, with the largest reserves and in and of itself well-positioned geographically to supply both Europe and China, is an important lynch-pin amongst the inner integrators. Dominated by Gazprom, Russia's domestic gas sector is in transition. The IGPs could play an important role in alleviating the call on Gazprom's investment needs, even as limited attempts have been made at liberalising Russia's domestic gas market. In the meantime, Central Asian gas volumes will remain important for Russia's gas balance. These landlocked gas-exporting countries will, in all likelihood, continue to seek export outlets as alternatives to exporting gas to Russia, an effort in which China increasingly plays an important role as a potential export market. Of these suppliers, Turkmenistan is the most important, potentially holding much more gas reserves than previously expected. Russia sees the latter as part of its own privileged sphere of influence, especially as far as gas is concerned.

As the second largest conventional gas reserve-holder in the world after Russia, Iran has enormous export potential. Like Russia, Iran is also well-positioned to export gas to multiple markets both by pipeline and LNG (to Europe and markets in the Asian subcontinent). In addition, Iran could also develop as an important LNG exporter in a manner similar to Qatar, given its position midway between the Atlantic and Pacific basins. However, US-led sanctions and the corresponding lack of access to advanced technology, capital and know-how, the complex nature of Iran's decision-making process and high domestic gas needs cast a long shadow over Iran's gas export potential. So long as these obstacles remain, Iran's huge gas reserves are not likely to play any significant interregional role, in terms of either pipeline or LNG. Iran and Russia have a special geopolitical and geo-economic relationship. Iran plays an important role in both the Gulf and Central Asia regions. On the one hand Iran is a potential source of competition in the form of alternative pipeline gas flows to Europe; on the other both countries not only have common geopolitical interests but also shared geo-economic ones. Gazprom is expanding its reach in Iran's upstream and is participating in the pipeline project slated to export gas to Pakistan and India.

Chapter 7

The 'outer' gas market integrators

7.1 Introduction

As opposed to the inner integrators, the outer integrators have access to the open seas and are thus able to develop LNG exports, which are subject to a greater degree of freedom than is the case for pipeline gas. While Chapter 6 was a review mostly of pipeline gas exporters with some LNG export ambitions on the whole, Chapter 7 concerns itself with LNG exporters which, in some cases, also export pipeline gas. The path-dependencies of these various countries (i.e., Qatar, Algeria, Norway, Libya, Nigeria, as well as other countries) differ considerably, with each NEF having achieved a different level of vertical integration, facing a different risk profile and diverging levels of export market diversification. The various outer integrators have differing production and export strategies and priorities. Just as is the case for the inner integrators, the outer integrators' (projected future) domestic gas needs in some cases exert considerable pressure on volumes available for export.

Not only do these countries differ in terms of all the aspects named above, they have also evolved during different periods or phases of the interregional gas market's overall evolution. For example, Qatar is a relative newcomer, having become the world's largest LNG exporter in a short amount of time and doing so with a multi-market strategy. Qatari LNG is exported to a wide range of regional and sub-regional gas markets across the globe, making it a truly interregional player. Algeria and Norway have been active gas exporters since the 1950s and 1970s, respectively, and are mainly gas exporters to the European gas market. Nigeria, also a relative newcomer, exports mainly to markets in the Atlantic Basin.

What all these countries have in common is that they are becoming more interregional, with some of their gas exported to new markets farther away, owing to LNG. They must hence increasingly take each other into account, especially because of their global ambitions. For Russia, some of these countries present greater threats in terms of the potential loss of market share than others do, especially in the long run. The flexible nature of LNG and its potential impact on the structure of the European gas market is an issue of concern, particularly given the worldwide rise in liquefaction capacity. Interregional price developments, evolving hand-in-hand with developments in LNG trade, have encouraged countries to exchange information and monitor each other's activities. It seems very timely, therefore, that with such an expansion underway in interregional gas market developments, gas exporting countries have given more salience to venues for further dialogue.

The outer integrators will be covered in the same manner as Russia and Iran were in Chapter 6, i.e., reserves, production, institutionalisation, exports, etc. Qatar is covered in Section 7.2, followed by Algeria in Section 7.3, Norway in Section 7.4, Nigeria and Libya in Section 7.5 and other important gas-exporting countries in Section 7.6. Section 7.7 is a discussion about market power, an effort to assess or measure the extent to which various exporters are able to exert monopoly power both in the European gas market as well as within the Atlantic Basin. Section 7.8 is description of the current platforms for further cooperation and dialogue. Given the chapter's length, the reader may wish to read the sections including country overviews independently.

7.2 Qatar

7.2.1 Gas reserves and current gas balance

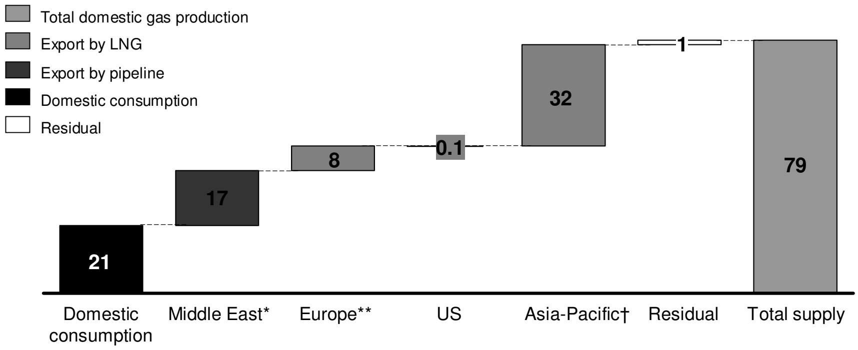
As early as 1990, it was known that Qatar's reserves offered a sufficiently long project life and opportunities to expand annual export volumes over a long period of time [Hashimoto et al. 2006]. Qatar has a reserve base of 25.5 tcm, 13.8 percent of the world's total, with an R/P ratio of roughly a 100 years (based on the likely production as of 2013) [BP 2009].[295] Qatar's gas production totalled 79 bcm in 2008, which amounts to 2.5 percent of the world's total [IEA 2009a]. As far as oil production is concerned, Qatar has small reserves of 27.3 billion bbls (2.2 percent of the world's total), having produced 1.3 mb/d (1.5 percent of the world's total), with an R/P ratio 54 years and is a member of OPEC [BP 2009].

The North Field is to Qatar what South Pars is to Iran, in that the reserves of both countries are part of the same geological structure. For Qatar, however, the North Field represents 99 percent of reserves. Discovered by Shell in 1971, it is the largest single accumulation of non-associated gas reserves in the world, accounting for roughly 20 percent of the world's proven conventional gas reserves (by the early 1980s, proven reserves for the field were already 8.5 tcm). The field forms the lynchpin for Qatar's current and planned LNG activities and for the most advanced of Iran's planned LNG developments as well as it domestic needs (see above). In 2005, fearing potential damage to the North Field's gas reservoir (and potential overproduction); Qatar imposed a moratorium on further investment for the field.[296] By this time,

[295] Qatar's gas reserves will last for over 500 hundred years based on the level of production in 2006, but is essentially already reduced to 100 years when taking into account planned LNG production (i.e., with full ramp-ups).
[296] The moratorium Qatar announced in 2005 involves a 260 bcm/y ceiling on gas output from its North Field [Petroleum Economist 2007c]. There are concerns about the pressure and the effect that further development may be having on the

Qatar officially reached a liquefaction capacity of some 40.5 bcm/y and in the period leading up to 2020, it will bring online an additional 62.4 bcm/y worth of liquefaction capacity.[297] For a graphical overview of Qatar's gas balance, refer to Figure 7.1 below.

Figure 7.1 Qatari gas balance in 2008



* UAE (15.4 bcm); Oman (1.7 bcm).
** Spain (4.9 bcm); Belgium (2.3 bcm); France (0.4 bcm).
† South Korea (11.6 bcm); Japan (11.3 bcm); India (7.8 bcm); Taiwan (1.0 bcm).
Note: Totals may not add up due to rounding.
Source: own analysis, IEA [2009a].

7.2.2 The Qatari gas sector

1) Background to institutionalisation and strategy:

Despite efforts of the Qatari government to diversify the Qatari economy, Qatar is still heavily dependent on oil and gas income, accounting for 50 percent of GDP, roughly 85 percent of export earnings and 70 percent of government revenues in 2008 [EIU 2009b; CIA 2009]. From a historical perspective, Qatar has always been open to Western influence, as long as it suited and suits the interests of the royal family. Only throughout the 1980s and 1990s did it become clear to the Qataris that their long-run economic development could be laid by exporting gas and Qatar is therefore a latecomer to the interregional gas industry. It was the second phase of the North Field's development which was to export gas via a pipeline to nearby Gulf Cooperation Council (GCC) countries, and the political problems surrounding the pipeline (particularly with Saudi Arabia), which motivated Qatar to export gas as LNG

field's structure. Originally taken for three years, the moratorium was extended to 2010 later and there is no certainty about when it would be lifted [IEA 2009b].

[297] Much of this capacity is currently under construction in and around Qatar's liquefaction port, Ras Laffan [Cédigaz 2008a]. In 2006, it outpaced Indonesia as the world's largest LNG exporter up to that time, Indonesia exporting 36.9 bcm in 2005 and Qatar 27.8 bcm, while in 2006 Qatar exported 33 bcm and Indonesia receded to 31.3 bcm as domestic consumption there increased from 35.1 to 38.2 bcm.

[Hashimoto et al. 2006].[298] The current Emir, having been in power since the mid-1990s, is more reform-minded than his predecessors, having given strong support to Qatar's current LNG export drive [Flower 2008b].

Initially, Japan was the most important buyer of Qatari LNG, but Qatar gradually turned towards other regional markets as and when room in the Japanese gas market narrowed. During the early 2000s, some indications pointed to rising import needs in Atlantic basin markets, making them interesting growth markets. The energy price increases of the 1990s had stalled energy demand growth in Japan, just as both the North West Shelf (Australia) and the Qatar LNG Company (Qatargas) projects were mobilizing to secure long-term contracts with Japanese utilities. Qatargas was forced to wait until a new opening for gas deliveries again developed in Japan [Hashimoto et al. 2006]. With the jumpstart of Qatar's first exports, on the back of Japanese state-backed loans and investments from major international energy players and their technical expertise,[299] Qatar's security of demand was ensured and the country made a successful overall LNG export début.

2) Decision-making:
According to the IEA, Qatar's main advantages as an LNG producer and exporter include: its enormous gas reserves with high liquids content, a well-developed port (Ras Laffan) with space for expansion, quick government decision-making, a stable political climate (in an albeit unstable region) which provides for a favourable credit rating, well-coordinated commercial and public policy environment as well as a good geographical location vis-à-vis regional markets [IEA 2007a].[300] Qatari society is ordered largely long tribal lines and is not politically engaged, and against the background of that social fabric the royal family takes the key political and economic decisions [EIU 2009].

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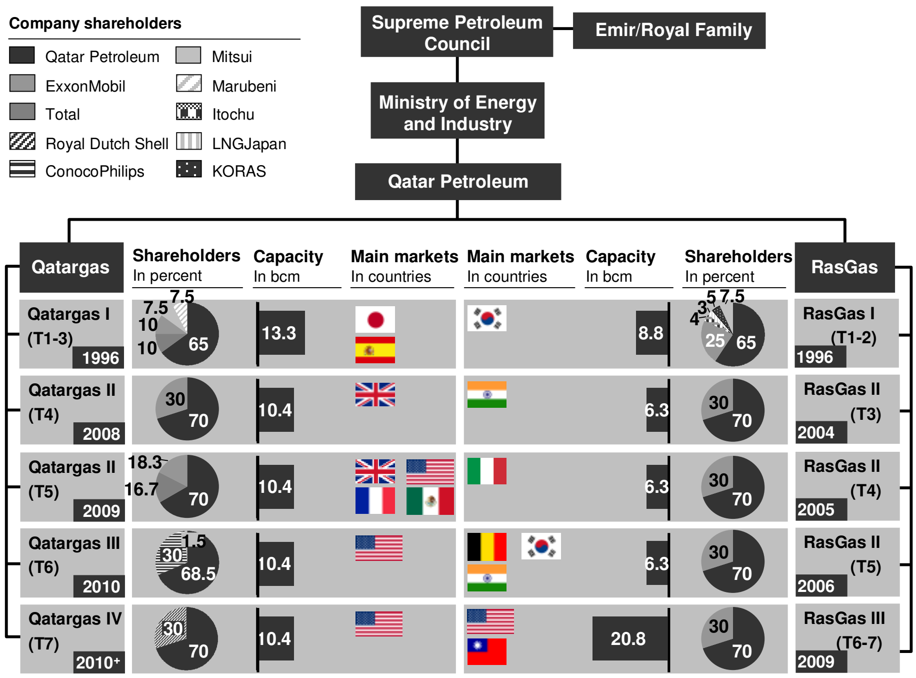
298 Qatar's Dolphin project was originally envisaged a project linking the members of the GCC with a possible extension to Pakistan. However, opposition from Saudi Arabia to the pipeline's transit over its territory meant that Bahrain and Kuwait could not join, while the link to Pakistan was not pursued either. This left the project with extending only from Qatar to the UAE and Oman [Flower 2008b]. In addition, Saudi Arabia made major domestic gas finds of its own in 1990 [Hashimoto et al. 2006].

299 Japanese gas and electric companies garnered government support to bankroll a number of new LNG gas supply projects in the late 1970s and early 1980s, the Japanese government offered favourable financing via loans and export credits. Qatar General Petroleum Company (QGPC) also obtained loans backed by future oil sales [Hashimoto et al. 2006].

300 Qatar's main advantages as an LNG producer and exporter include, besides its enormous gas reserves with high liquids content: (1) a well-developed port (Ras Laffan) with space for expansion, (2) quick government decision-making, (3) only two partners in RasGas 2 and 3 and Qatargas 2, 3 and 4 when investment decisions were taken, (4) a stable political climate (in an albeit unstable region) which provides for a favourable credit rating, (5) a well-coordinated commercial and public environment as well as (6) a good geographical location [IEA 2007a].

Figure 7.2 Gas sector institutionalisation and ownership structure of Qatar Petroleum



Source:own analysis, based on Flower [2008]; Cedigaz [2008].

In most sheikhdoms, such as Qatar, which by definition have a traditional monarchic regime, the political leader or the crown prince chairs the Supreme Petroleum Council, reflecting a highly centralised decision-making structure, where formal procedures concerning the management of the company do not correspond to the true centres of power [Marcel 2005]. The main actors in Qatar's gas sector are the royal family, the Ministry of Energy and Industry, and Qatar Petroleum (QP) as well as QP's main subsidiaries. In the case of Qatar, the Deputy Prime Minister, who also acts as Minister of Energy and Industry, chairs the broad of directors *and* is general manager. QP's operations are therefore linked with state planning agencies, regulatory authorities and policy-making bodies [US Department of Energy 2007b]. Ultimately, all key decisions are approved by the Emir. See Figure 7.2 above for a schematic overview of these relationships.[301]

[301] This overview is designed to provide a simplified, perhaps even oversimplified impression of decision-making in the Algerian gas sector. Informal and formal forces may also be at play to such an extent that it is beyond the scope of consideration for this study.

3) Foreign participation:

The key to Qatar's institutionalisation has been attracting the technological know-how and capital necessary to develop its gas resources and balancing its success in doing so with preserving control over its resources through its own NEF, Qatar Petroleum (QP), which it fully owns.[302] The result has thus far been embodied by Qatar's massive liquefaction projects and their global each in various regional markets, predicated on a favourable ownership structure for both its foreign partners and QP (QP takes 70 percent in all its liquefaction projects, see below). Its major partners in its new liquefaction projects include some of the biggest and most conspicuous IEFs: ExxonMobil, Total, ConocoPhilips and Shell. The result of several years' worth of development has led to the establishment of two subsidiaries: Qatar LNG Company (Qatargas) in 1984 and Ras Laffan LNG Company (RasGas) in 1993.[303] Each company serves as an umbrella for a number of liquefaction projects, and each project has its own ownership structure serving as an umbrella or holding for the various numbers of trains per project (also see Figure 8.2 below).

Of the foreign partners involved in Qatargas and RasGas, ExxonMobil is by far the foreign partner with the largest stake in all the projects combined: it owns almost 20 percent of both companies combined, corresponding with some 20.6 bcm/y worth of liquefaction capacity, compared with some 2.5 percent share for Shell, or 4.3 bcm/y of liquefaction capacity (in Qatargas 4, which is yet to come on-stream). During the mid-1990s, Mobil's involvement first in Qatargas and then in the newly established RasGas had paved the way for ExxonMobil's close relationship with QP. Though Qatargas and RasGas fall under the same mother company, QP, they identify themselves as totally different companies and, while they compete efficiently, they also compete with one another [Petroleum Economist 2008a]. RasGas is driven more by ExxonMobil while Qatargas is driven more by Qatargas.

[302] In 1974, Qatar followed the trend toward nationalisation with other OPEC producers, establishing state-owned Qatar General Petroleum Corporation, with responsibility for exploration, production, refining, transportation and sales of oil and gas from Qatar [Hashimoto et al. 2006].

[303] Qatar has been heavily dependent on foreign investors, both the major international energy firms and financial consortia, especially from Japan, to achieve its position as a major LNG exporter. Qatargas was the first Qatari LNG project to materialise as a partnership between QP (70 percent), BP and Total (7.5 percent each) and Marubeni and Mitsui (7.5 percent each). Qatar's first major waves of LNG exports went to Asian gas markets, primarily Japan and South Korea. Japan's Chubu Electric Power Company in Japan was a major factor in the purchase of the entire 5.3 bcm/y initial output from Qatargas' first two trains. In 1992, BP's withdrawal, motivated by a perceived lack of profitability of the Qatargas project for the energy major, was followed by Mobil's possible entry in the project. For Mobil 7.5 percent ownership in the Qatargas project was insufficient to generate sufficient returns, inducing QP to set up a wholly new Greenfield venture, RasGas, while Mobil accepted a 10 percent ownership in Qatargas. By the time RasGas came onstream in 1999, Mobil had merged with Exxon to become ExxonMobil, where the latter's share was 30 percent initially but was reduced to 25 percent, to include upstream shares of large Japanese and Korean buyers [Flower 2008b].

The development of Qatar's gas resources was organised along three priorities: 1) develop gas production for domestic consumption (see below), 2) build an export pipeline gas to Dubai, Bahrain, Saudi Arabia and Kuwait and 3) build LNG export facilities [Hashimoto et al. 2006].

7.2.3 Domestic gas needs and strategy

Despite its vast export potential (see below) Qatar is likely to maintain a desire to balance exports (pipeline and LNG) and domestic market needs. Qatar's energy mix consisted 81.2 percent of natural gas (some 20 bcm in 2008) and 18.1 percent worth of oil. Qatar's domestic gas needs, 21.4 bcm are considerable when compared to its gas exports (57 bcm), accounting for 26 percent of its production (according to the IEA). Gas demand has increased substantially in the region with most of this rise in demand coming from the new industrial base, but there is also rising demand for power generation and desalination. Below is a brief account of the most important gas uses in Qatar, namely Gas-to-Liquids (GtL) production, petrochemicals and power generation:

1) GtL: Part of Qatar's gas strategy is developing GtL, a highly profitable gas product, particularly with high oil prices.[304] Currently Qatar has two GtL plants: the Oryx GtL plant, which came into operation in 2006 (in cooperation with a South African company), while Shell's Pearl project is due to come on-stream in 2010-2011 [Flower 2008b]. Upon completion both Oryx and Pearl will require 18.25 bcm/y [US Department of Energy 2007b].
2) Petrochemicals: Just as in Iran's case, Qatar has a petrochemicals programme, though on a much smaller scale. The second phase of the Al Khaleej project will produce 12.9 bcm/y of dry gas for local use in a range of petrochemical plants in and around Ras Laffan [Flower 2008b].
3) Power generation: Gas for power generation amounted in Qatar to some 5 bcm in 2006, likely to rise in line with the country's continued industrial development. Qatar is restructuring its power sector and encouraging foreign investment to expand power generating capacity [US Department of Energy 2007b]. Part of the so-called Barzan project's gas output (to come on-stream in 2012 at 14.2 bcm/y) is to be allocated to domestic gas use [Flower 2008b].

7.2.4 Gas export ambitions and strategy

Regional tensions played an important part in Qatar's gas export strategy, as well as the sheikhdom's desire to become more independent of Saudi Arabia (which had developed a dominant position in the world oil market) by becoming a major gas exporter and no longer being a merely marginal oil exporter [Hashimoto et al. 2006]. Qatar is obviously an ambitious

[304] At $50/bbl, annual revenue from the Pearl project would be $4.5 billion, yielding a payback period for Shell of just four years, with a CAPEX of $15 billion [Petroleum Economist 2008c].

exporter by volume, having grown to access different regional markets across the globe in a very short amount of time, by industry standards. The economic advisor to the Emir (and vice-chairman of RasGas), believed that only by accessing all major LNG markets could Qatar make the most of its resources [Petroleum Economist 2007a]. Qatargas also is fully aware that none of the major regional gas markets, Asia-Pacific, Europe or the US, could absorb the 100 bcm/y Qatar is capable of producing after all its trains come on-stream [WGI 2009g]. Hence their multi-market export strategy. Qatar exported 57 bcm in 2008,[305] intending to have an export or liquefaction capacity of some 105 bcm/y by 2013 by bringing on-stream trains with, in most cases, 10.5 bcm/y worth of capacity each (see Figure 7.2). After these additions, Qatar is expected to halt expansion owing to the North Field moratorium, which is likely to stay in place until all the planned trains currently under construction have been brought fully on-stream (possibly by 2013) [IEA 2009c].

Flower [2008] estimates that the share of Qatar's LNG exports going to Asian markets totalled 80.6 percent, to Europe 19.1 percent and merely 0.2 percent to the US in 2006, likely to shift roughly to 30.2 percent, 31 percent and 38.8 percent by 2012 as Qatar's new export projects, mostly from RasGas 2 and 3 and Qatargas 2, 3 and 4 come on-stream. Below is an account of Qatar's current and potential export flows by region:

1) *Regional exports to Gulf countries:* Just as Iran aims to expand its exports reach regionally, Qatar is tapping into regional markets in the Gulf. For Qatar, Kuwait may perhaps become a customer, possibly supplying LNG to an offshore floating re-gasification terminal [Gas Matters 2008a].[306] Qatar currently also supplies the UAE and Oman through the roughly 20.7 bcm/y sub-sea Dolphin pipeline, running from Ras Laffan in Qatar to the UAE and onwards to Oman, while both of these countries are themselves actually considerable LNG exporters. Plans for the pipeline's capacity to be expanded to 33 bcm/y are on hold due to the moratorium on the North Field. In April 2008, Qatargas and Shell agreed with the UAE to supply over 4 bcm/y worth of LNG output from Qatargas 4 as well [MEES 2008f].
2) *Exports and potential exports to Asia:* Qatari LNG exports to Asia began in the 1990s, with Korea and Japan as the main (and powerful) buyers of Qatari output, being the largest LNG importers. Exports to Asian (Asia Pacific) markets amounted to 32 bcm in 2008 (53 percent of Qatari output), with LNG provided by the Qatargas 1, RasGas 1 and part of RasGas 2 as well as the RasGas 3 projects. As for new exports to Asian markets, Qatargas 2 will provide some 2.66 bcm to CNOOC directly from 2009 onwards while 4 bcm worth

[305] Since year's end 2008, Qatar's gas exports have continued to rise still further, with the ongoing completion of the RasGas 3, Qatargas 2 and 3 projects, respectively.
[306] Kuwait signed a $150 million deal with a US company, Excelerate, to build a floating re-gasification terminal.

of LNG supply to China's PetroChina (CNPC) is sold through Shell from Qatargas 4 as well, starting in 2010 [MEES 2008f]. Korea Gas has signed up for 2.66 bcm from 2009 onwards [Cédigaz 2008b]. Much of the bulk of the remainder of Qatar's Asia-oriented volumes has already been contracted for by Japan, Korea and India.

3) *Exports and potential exports to Europe:* A dramatic shift in the relative share of Qatari volumes exported to Europe will occur in 2009- 2012 (as well as the US, see below). Qatar's LNG exports to Europe have come on-stream piecemeal between 2005 and 2009, consisting mainly of output from Qatargas and RasGas earmarked mostly for Spain, Italy, France, the UK and Belgium. Qatargas as well as RasGas 2 will provide further volumes to the European market. Starting in 2009-2011, Total, Exxon and Shell are scheduled to begin supplying 2.46 bcm, 13.8 bcm and 6.3 bcm, respectively to the UK and other European markets from these companies [Cédigaz 2008b]. In April 2009, Qatargas signed a Sales and Purchase Agreement (SPA) with Poland's Polish Petroleum and Gas Mining (PGNiG) for 1.25 bcm to start in 2014 [WGI 2009e].
4) *Exports and potential exports to the US:* Qatari exports to the US have only just begun to materialise: only 0.1 bcm worth of Qatari LNG arrived in US re-gasification terminals in 2008. This is due to the fact that Qatar has engaged in LNG sales on the US market under certain pricing conditions (see below), but no long-term flows have yet been brought on-stream. From 2008-2009 onwards, however, Qatargas 2, 3 and 4 are slated to respectively ship 16.3 bcm, 10.4 bcm and 6.3 bcm to the US market while Rasgas 3 is to ship 28.75 worth of bcm to the US market. The buyers of these volumes destined for the US are the IEF stakeholders themselves: Exxon, Conoco, Shell and Total, as well as a US energy firm further downstream.

7.2.5 Qatar's sales strategy

Building on its early successes, Qatar has replicated the upstream business model in the form of other projects which aim at access to the world's major regional gas markets. In so doing, Qatar has established a firm position throughout much of its entire value chain, owing in large part to the level of vertical integration and marketing expertise of its foreign partners. Qatar's approach is clearly predicated on the belief that only by achieving vast economies of scale in production and shipping can Qatar compete effectively with pipeline gas and other sources of LNG [Petroleum Economist 2007a]. The large size of Qatar's North Field, low production costs form the North Field (see section on market power), the large capacities of Qatar's liquefaction terminals and Qatar's Q-max tankers have all combined to provide Qatar with substantial economies of scale (see also section on market power) [Flower 2008b]. Correspondingly, Qatar's gas sales strategy hinges on the level of value chain integration of both QP and its foreign partners. Several key aspects can be highlighted:

1) *Traditional long-term tape-or-pay contracts:* The bulk of Qatar's LNG exports flow to regional markets under long-term contracts.
2) *Market-or-pay:* The Qatari strategy is to rely on the IEFs and their marketing experience to ensure enough volumes are sold while it engages in its own trades, enticing the IEFs with access to ample (low cost) reserves.[307] Qatar's interregional contracting strategy is aimed at maximising arbitrage gains in the short-term whilst securing demand through long-term contracts. Indeed, Qatar's marketing strategy over the last few years has created a position where it has options to trade its LNG and enter into contracts with new purchasers on a short-, medium- or long-term basis [Flower 2008b]. Together with its foreign partners, QP owns capacity in a number of downstream re-gasification terminals in the US and Europe, and in the future, possibly other markets as well. The IEFs buy output from Qatar's liquefaction plants (which they jointly own), mostly on a long-term basis (market-or-pay) [Boon von Ochssée 2009a], and then sell the output on a long-term and/or short-term basis (i.e., business models, also refer to Chapter 5). In the mean time QP itself does the same.
3) *Combining long- and short-term sales:* Arbitrage or diversion and short-term selling of LNG cargoes are combined with longer-term trade to optimise revenues. By owning re-gasification capacity in markets in Europe and the US, QP and its partners are able to sell uncommitted LNG or divert LNG originally sold under long-term contracts to other markets.[308] Diversions are always part of Qatar's sales strategy in order to assure that the flexibility exists to always get the best price for LNG cargoes [WGI 2009e]. Hence the LNG output from all of Qatar's projects may be earmarked for various regional markets according to pre-agreed allocations under long-term contracts; however these allocations may not represent the ultimate destination of all cargoes. The outcome of the share of different regional markets in Qatar's export portfolio after 2012 could be very different from the shares currently in place in medium- to long-term contracts [Flower 2008b]. Qatari officials do not expect the practice of short-term trading to become very widespread [WGI 2008c].
4) *Establishing a short-term selling platform:* In order to further benefit from a seller's market for LNG, Qatar established an exchange, International Mercantile Exchange (IMEX), a pricing system designed to 1) develop real first-time ever LNG spot trading and 2) become the leading driver of market liquidity with the creation of an LNG financial derivative and facilities for trading a cargo-based contract. This IMEX system basically boils down to es-

[307] For example, Conoco Philips has also entered into an agreement in which in would acquire a position in Qatar's North Field in return for a contract to buy from Qatargas for the US market [Jensen 2004].
[308] As for re-gas capacity in Europe, QP owns 45 percent, ExxonMobil 45 percent and Edison 10 percent of the capacity of the Isola di Porto Levante terminal, Italy. QP owns 67.5 percent, Exxon 24.15 percent and Total 8.35 percent in the South Hook (Milford Haven) terminal and its expansion, in the UK. In the US, QP owns 70 percent, while Exxon and Conoco Phillips are yet to take a share as well in the Golden Pass re-gas terminal in Texas.

tablishing an LNG or energy bourse *à la* NYMEX to trade LNG spot cargoes [LNG Journal 2007]. This is in line with an overall process in which the LNG industry is witnessing increased hub-based, short-term trading, thus facilitating the short-term auctioning of interregional LNG cargoes. With Asian some buyers,[309] Qatar has agreed to a fixed price in $/million British thermal units ($/mmbtu) terms and then lets the contract price revert gradually to indexation with the oil price, as is the case for LNG prices elsewhere in Asia [Flower 2008b]. In the US and the UK, Qatar sells on the basis of Henry Hub and/or NBP prices or a combination hereof elsewhere in Europe, where diverting cargoes to alternative markets can be easily arranged.

It should be noted that a sales strategy based on reserving gas in the form of LNG and pipeline gas for flexible trade, either regionally or on an interregional basis, carries with it significant downside price risks since these volumes are uncommitted in any market through take-or-pay contracts. The 2008-2009 economic and financial crisis highlights this risk.

7.2.6 Cooperation with other gas-exporting companies

Qatar obviously has strong business links with important IEFs, which have played an instrumental role in propelling Qatar to the position it is now as a major LNG exporter, having the technological know-how, organisational capabilities and access to capital. Qatar is already an important supplier to Asia. Now that it is also becoming an ever more important LNG exporter on a considerable scale to Europe and the US, discussion with other important gas-exporting countries becomes more relevant. Qatar is interested, as Saudi Arabia is in the oil market, with market stability as well as short-term profits [The Economist 2009a]. Cooperation on the following focal points has been or is being discussed, mainly concerning long-run cooperation:

1) *Large-scale pipeline gas-for-LNG swaps:* In July 2007, the *World Gas Intelligence* reported that Qatar has discussed with Russia the potential for multi-year swaps of LNG for European pipeline gas and associated spot trading arrangements. In a broader sense, Gazprom would create a 'pool' of flexible pipeline gas in storage in Europe while QP would create a similar 'pool' of LNG in the Gulf that would each be available for spot trading.[310] The aim

[309] Most Asian LNG importers (mainly Japanese and Korean utilities) buy Qatar's output on Free on Board (FOB) terms.

[310] When gas prices in Europe are weak, Gazprom would make pipeline gas available to QP to satisfy its contractual commitments, allowing QP to transfer more LNG to higher-value markets outside Europe, sharing the benefits with Gazprom. Conversely, when European prices are high (and especially should Russian supply be tight, e.g., during the winter of 2005-2006), QP would ensure that adequate LNG is available to Gazprom in Europe to make up for possible shortages in supply needed to fulfil contractual obligations in Europe [WGI 2007a]. Though no apparent swaps of such kind have yet taken place and nothing more was heard about this possible form of Russian-Qatari cooperation, the rationale is clear and could serve as a means of optimising revenues in the long-term for both countries. It reflects how both Russia as an important, large pipeline gas 'inner integrator' and Qatar as a large LNG 'outer integrator' could act strategically vis-à-vis one another in

would be to ensure that both NEFs attain the benefits of arbitrage trading profits resulting from disparities in gas pricing in different regions and to minimise transport costs in the short-term. The 2008-2009 global economic and financial has created a situation in which short-term gas prices on spot markets (in the US and Europe) have dipped below oil parity levels, and scarcity has given way to oversupply. This appears to have encouraged both Russia and Qatar to explore "adjusting their gas sales strategies to ease head-to-head competition that could undermine the oil-indexed pricing both still support for their base load long-term sales" [WGI 2010d], also refer to Case study 3 in Chapter 9 and to Chapter 10.

2) *The South Pars project:* At a concrete project level, Qatar is discussing the South Pars project already mentioned in the previous section, where its discussion with Russia and Qatar "studied ways to employ existing infrastructures for production, transport and export of natural gas and sharing infrastructures with reasonable tariffs. Investing in development of regional and international gas fields, producing and marketing for the natural gas was another major issue discussed by the Iranian, Russian and Qatari officials" [WGI 2008b].
3) *Bilateral Russian-Qatari cooperation:* In early 2010, Qatar and Russia have expressed mtutal interest in investing in each other's upstream sectors: Gazprom is said to be interested in bidding for development of Block D of Qatar's North field, while QP may invest in the Yamal peninsula, including an LNG scheme [WGI 2010d].

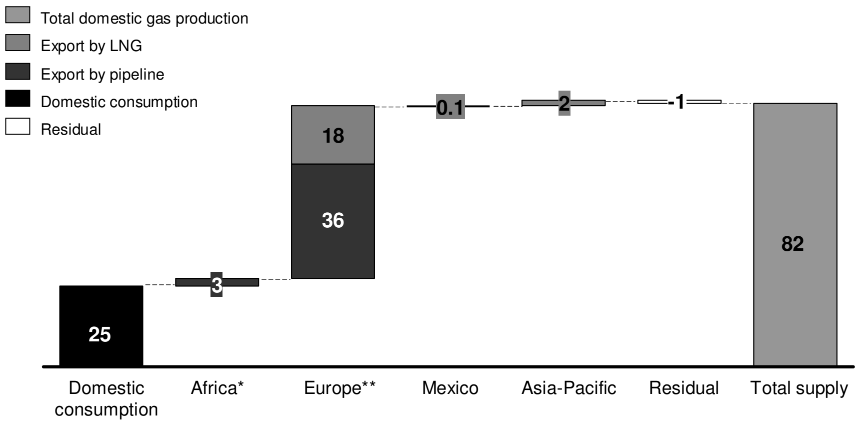
7.3 Algeria

7.3.1 Gas reserves and current gas balance

Algeria's total proven conventional gas reserves amounted to 4.5 tcm in 2008, which is 2.4 percent of the world total, with an R/P ratio of 52.1 years [BP 2009]. Algeria produced 82 bcm/y in 2008, which was 1.7 percent of the world's total gas production [IEA 2009a]. Algeria is also a significant oil exporter, possessing 12.2 billion bbls worth of oil reserves (1 percent of the world's total), producing 1.9 mb/d (2.2 percent of the world's total), with an R/P ratio 16.7 years and is an important member of OPEC [BP 2009]. Discovered in 1956, the Hassi R'Mel gas field (2.55 tcm) forms over half of Algeria's reserves and provides a quarter of Algeria's gas, while fields in eastern and southern Algeria, in the In Salah and In Amenas basins, account for much of the remainder of Algeria's reserves [US Department of Energy 2009a]. These include a mixture of associated and non-associated gas fields. As recently as late 2008, various new gas discoveries were made in Algeria's southeast (in the Illizi Basin) and in central Algeria (in the Gourara Basin) [MEES 2008k]. For a graphical overview of Algeria's gas balance, refer to Figure 7.3 below.

complementary ways. The GECF and the Gas Troika (see chapters 10 and 11) could act as forum where such cooperation is agreed upon behind closed doors.

Figure 7.3 Algeria's gas balance in 2008



* Tunisia (2.0 bcm); Morocco (0.6 bcm).
** Pipeline export: Italy (24.4 bcm); Spain (8.8 bcm); Portugal (2.0 bcm); Slovenia (0.3 bcm). LNG export: France (7.3 bcm); Spain (4.3 bcm); Turkey (4.1 bcm); Italy (1.6 bcm); Greece (0.6 bcm); UK (0.3 bcm).
† Japan (0.7 bcm); India (0.5 bcm); South Korea (0.4 bcm); China (0.2 bcm); Taiwan (0.1 bcm).
Note: Totals may not add up due to rounding.
Source: own analysis, IEA [2009a].

7.3.2 The Algerian gas sector

1) Background to institutionalisation and strategy

For Algeria, oil and gas income accounted for 30 percent of GDP (45.1 percent according to the Economist Intelligence Unit), roughly 95 percent of export earnings and 60 percent of government revenues in 2008 [EIU 2009b; CIA 2009]. With its heritage as a former French colony and its proximity to the (southern) European market, Algeria's gas export development has historically always been geared towards exports to that market, both by pipeline and LNG.[311] Before 1979, the goal for Sonatrach was to build and hold markets in southern Europe [Hayes 2006]. Algeria is one of the 'classic' examples of Middle Eastern oil and gas producers breaking free from colonial rule during an era of decolonisation across the Middle East. The creation of the state-owned Algerian NEF, the *Société Nationale pour le Transport et la Commercialisation des Hydrocarbures* (Sonatrach) took place against the backdrop of French efforts to preserve France's advantageous position in the Algerian energy sector [Marcel 2005].

Throughout the 1970s and 1980s, the fear of risking large sums of public funds led Sonatrach to export LNG, which brought more immediate revenues for the state [Marcel 2005]. Pipelines to bring Algerian gas to Spain and France were first proposed as early as 1963 by French companies, with French government backing [Pawera 1964]. Algeria later built the Transmed

[311] French interests in Algeria were maintained through state and private French companies participating in a number of upstream and pipeline companies, most of which had some foreign private sector participation.

and Maghreb pipelines to Italy and Spain, and these two countries became Algeria's first pipeline export markets, representing Algeria's first major pipeline gas push into the southern European market during the 1980s and 1990s. Historically, Algeria has been prone to aggressive pricing behaviour in its long-term agreements, particularly vis-à-vis ENI with the building of the Transmed pipeline during the early 1980s, a dispute also known as the 'gas battle'.[312] Algeria is now a mature gas exporter and will continue to play an important role in the European gas market and beyond (also see below).

2) Decision-making

Key decisions in the Algerian energy sector are made by the state (which fully owns Sonatrach), with the Algerian Ministry of Energy and Mines being the principal government agency dealing with Sonatrach.[313] During the early 1980s, Sonatrach was to be restructured to ensure that the fossil fuel sector would be controlled at the "suitable political level" [Benachenou 1980; Aïssaoui 2001]. The General Assembly is the main government decision-making body in the Algerian energy sector, which includes the governor of the Algerian central bank, a presidential representative and three leading ministers and is subsequently chaired by the Minister of Energy and Mines. In this manner, the General Assembly acts as a supreme petroleum council (as in the Gulf producing countries). The board of directors of Sonatrach acts as a buffer between the General Assembly and the company's executive committee. Ultimately, all key decisions are taken by the General Assembly. See Figure 7.4 below for a schematic overview of these relationships.[314]

Sonatrach dominates natural gas production and wholesale distribution in Algeria while state-owned *Socièté Nationale de l'Electricité et du Gaz* (Sonelgaz), a separate entity, controls domestic retail distribution [US Department of Energy 2009a]. Sonatrach's subsidiaries handle transport, upstream, downstream and marketing and sales activities (including sales made abroad). Until recently, it even controlled regulatory aspects of Algeria's energy sector. However, during the early 2000s, the government initiated a set of reforms which created two regulatory bodies, the *Autorité de Régulation des Hydrocarbures* and the *Agence Nationale pour la Valorisation des Resources en Hydrocarbures* (ALNAFT), which awards and regulate oil and gas

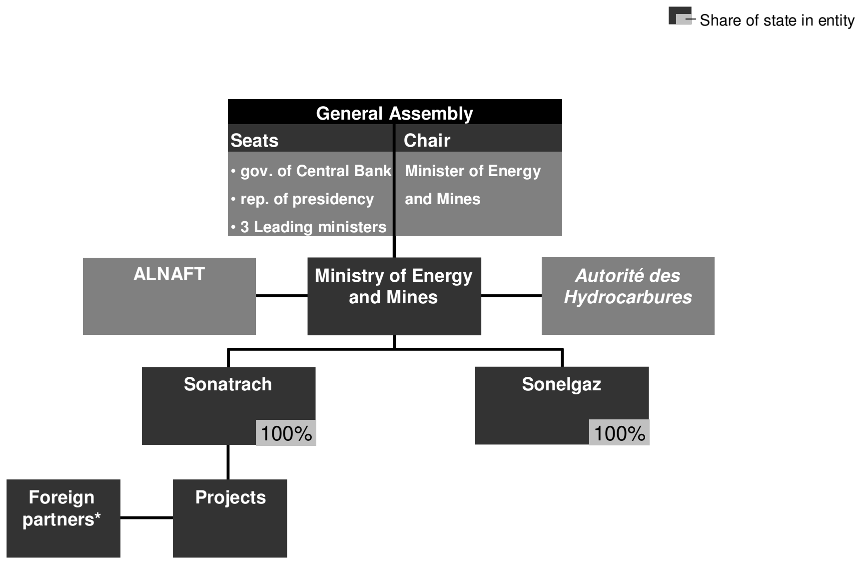
[312] The fact that ENI had fronted much of the capital invested in the Transmed project yielded Sonatrach immense bargaining power once the pipeline was completed [Aïssaoui 1999; Hayes 2006].

[313] The National Energy Council, established in 1981, takes charge of both energy policy and strategy, at times restricting Sonatrach's market flexibility, and it lost powers to the ministry after various reforms. When a law is drafted, the Ministry of Energy and Mines sends it to Sonatrach for review, usually approaching the relevant managers for comments and feedback [Marcel 2005].

[314] This overview is designed to provide a simplified, perhaps even oversimplified impression of decision-making in the Algerian gas sector. Informal and formal forces may also be at play to such an extent that it is beyond the scope of consideration for this study.

exploration contracts.[315] This ended Sonatrach's monopoly over pipelines and the downstream business, taking away regulatory responsibilities from it while it also takes away its control over the awards of exploration and production contracts. In this way the Algerian government hopes to make the bidding and award process more transparent and less centralised. In commercial negotiations with European customers, the energy minister has been prone to interfering with and sometimes taking the lead in pricing negotiations.[316]

Figure 7.4 Gas sector institutionalisation in Algeria



* These include amongst others: Total, GdF, Suez, StatoilHydro (see below), Repsol, BHP-Billiton and ENI
Source: own analysis, based on: Marcel [2005]

3) Foreign participation

Under the new 2006 amendment, Sonatrach takes a minimum of 51 percent in any oil and gas exploration agreement made with foreign companies [MEES 2008c]. The Algerian government encourages IEFs, in participation with Sonatrach, to spend more on finding and developing new reserves [Marcel 2005]. Algeria ties much importance to foreign participations in an

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[315] These two agencies include one agency to audit the industry's health and the other to handle the promotion of exploration in Algeria. The *Commission de Régulation de l'Électricité et du Gaz* (CREG) was established in 2002 to further buttress regulation.

[316] New price demands for gas through the Transmed pipeline, for example, were part of a broader shift in gas pricing policy sought by Minister of Energy Nabi. The new political leadership of Sonatrach would demonstrate unprecedented willingness to withhold supplies in order to achieve price demands. Algerian Energy Minister Nabi directed Sonatrach to demand from gas buyers an immediate increase to FOB parity with Algeria's own high-grade crude oil in long-term contracts [Hayes 2006].

effort to optimise exploration and production activities, and through bidding rounds it attempts to entice IEFs to invest in exploration and production activities both through PSAs and as contractors. Having said that, Algeria has always been quite open to foreign investment and upstream activity is teeming with international energy firms, including, of course, French firms such as Total, *Gaz de France Suez* (GdF Suez), as well as from other countries, e.g., StatoilHydro from Norway (see below), Repsol from Spain, BHP-Billiton and ENI from Italy [US Department of Energy 2009a; IEA 2009b].

Algeria's energy strategy priorities are: 1) gasification of Algeria's domestic market, 2) exporting the remainder of its volumes by both pipeline and LNG in a way that optimises gas export revenues and 3) the domestic use of gas for oil lifting.

7.3.3 Domestic gas needs and strategy

As in the case of many gas exporting countries, Algeria consumes much of the gas it produces (at subsidised prices) and the government encourages gasification of the Algerian energy mix. The domestic pipeline network is centred on the Hassi R'Mel field, which is the hub of Algeria's entire natural gas transport network. The field is linked to domestic transport pipelines going northwards, finally linking up with the Transmed pipeline to Italy and Algeria's liquefaction terminals. The domestic pipeline network suffers from ageing infrastructure and is in need of modernisation, which Sonatrach is currently working on [IEA 2009b]. Algeria's energy mix closely resembles that of Iran and Qatar: 37.2 percent originated form the use of oil, 60.6 percent form gas, 1.8 percent from coal and less than 1 percent from hydropower [BP 2009]. Algeria's domestic consumption of natural gas was some 25 bcm in 2008, thus consuming a significant share of its production (some 33 percent). Thus domestic gas use is significant, with end-uses domestically consisting of: power generation (11 bcm in 2006, 40 percent of domestic demand), seawater desalination plants, petrochemicals and gas-based industry, with industrial customers taking off 7.3 bcm (27 percent of domestic consumption) [IEA 2008a]. Gas substitution is a key part of Algeria's hydrocarbon strategy [Marcel 2005]. Past Algerian governments have changed their policies frequently on the basis of domestic pressures [Hayes 2006].

7.3.4 Gas export ambitions and strategy

Though Algeria is an important oil producer, the Algerian leadership sees Algeria's energy potential in gas, and has corresponding ambitions [MEES 2008c]. In the long run, Algeria wants to develop itself as a transport centre for gas to Europe while maintaining and pursuing a strong LNG export position as it seeks stakes in re-gasification terminals in various markets. Algeria had a total export capacity of 77 bcm/y in 2008 (some 28 bcm/y of which consists of liquefaction capacity) [IEA 2008b]. Algeria exported some 57 bcm worth of gas in 2008, of which 39 bcm was exported through Algeria's 39 bcm/y pipeline network linking it to Spain and Italy, while some 21.1 bcm was exported as LNG. Algeria's main export markets consist mostly of southern European countries around the Mediterranean: France, Turkey, Spain and Italy while it also supplies the US and Asian markets to much more limited extent. Algeria has remained mostly a regional European player, with some of its LNG exports going to the US and markets in Asia. Europe accounted for 94.7 percent of Algeria's total exports in 2008 (see the gas balance in Figure 7.3 above).

Algeria's export flows to various European countries together with its LNG export flows provide it with a significantly diversified export portfolio. Algeria's choice for focussing on gas exports and the importance of a gas export strategy came in 1990 when a study prepared by the ministry and Sonelgaz in which they assessed expected gas export revenues, forecasts of national energy demand and the potential for new oil discoveries to offset declining reserves [Marcel 2005]. Algeria's goal is to increase its production capacity for additional pipeline and LNG sales in Europe and other regional markets to 85 bcm/y by 2012 and 100 bcm by 2015 [IEA 2008a]. Below is an account of Algeria's export flows in 2007, categorised first by pipeline and then by LNG flows.

1) Pipeline exports:

a. *Spain, Portugal and Morocco:* Algeria's pipeline exports to Spain amounted to 8.8 bcm, to Portugal 2 bcm and to Morocco 0.6 bcm in 2008. These exports were transported through the Maghreb pipeline, which has a 12 bcm/y capacity.[317] Algeria aims to further expand export capacity to these markets in 2009 by completing the Medgaz pipeline with an initial capacity of 8 bcm/y, which interconnects directly with the Spanish network in such a way so as to be enable further flows to France and skirting Morocco in the process [IEA 2008a].[318] It is also designed to deliver gas to LNG and Liquid-to-Gas (LtG) plants in Arzez. Sonatrach renewed contracts or signed new ones with buyers in Spain and Portugal for pipeline gas deliveries (starting in 2008-2013 and lasting 10 years or more) [Cédigaz 2008c].
b. *Italy, Slovenia and Tunisia:* To Italy, Slovenia, and Tunisia, Algeria exported 24.4 bcm, 0.3 bcm and 2 bcm respectively. Algeria exported these gas volumes through the 33.5

[317] The Maghreb pipeline, built in 1996 and revamped in 2004, runs from Hassi R'mel through Morocco and onwards to Spain and Portugal is owned by Enagas, Sonatrach and the Moroccan state [IEA 2008a].
[318] Stakeholders in the Medgaz pipeline are Sonatrach (26.2 percent), Cepsa (20 percent), Iberdola (20 percent), GdF Suez (12 percent) and Endesa (12 percent).

bcm/y Transmed pipeline.[319] Sonatrach aims to expand its pipeline export capacity to Italy by constructing the Gasdotto Algeria Sardegna Italia (GALSI) pipeline, initiated in 2003, a pipeline which would further enable Algerian gas to flow directly to Italy through Sardinia and onwards further to Livorno in Italy, with a design capacity of 8 bcm/y and likely to be operational by 2010-2012 (and skirting Tunisia in the process).[320] Sonatrach has signed or renewed contracts or signed new ones with buyers in Italy, Slovenia and Tunisia for pipeline gas deliveries (starting in 2008-2013 and lasting 10 years or more) [Cédigaz 2008c].

Uncertainties about domestic demand and Algerian desires to maximise revenues from LNG sales in other regional markets may reduce the availability of additional (pipeline) exports to Europe [CIEP 2008; OME 2007]. In developing its export ambitions, Algeria is not likely to exceed its export level as described above.

2) LNG exports:[321]

a. *European markets:* Of Algeria's LNG exports to Europe, 7.3 bcm went to France, 4.3 bcm to Spain, 4.1 bcm to Turkey, 1.6 bcm to Italy, 0.6 bcm to Greece and 0.3 bcm to the UK. Sonatrach has various long-term contracts currently in place and accounting for volumes traded with buyers in France, Spain, Turkey, Italy and Greece for volumes of between 0.45 bcm and 4 bcm [Cédigaz 2008b].
b. *Asian and US markets:* Of LNG flows to non-European markets, LNG exports made their way to Japan (0.7 bcm), India (0.5 bcm), China (0.2 bcm), South Korea (0.4 bcm) and Taiwan (0.1 bcm). In 2008, Algeria exported LNG to various markets beyond the ones mentioned above. Sonatrach has various LNG contracts in place for LNG deliveries to buyers in the US and India of between 0.59 bcm and 1.25 bcm [Cédigaz 2008b].

Sonatrach operates 5 LNG terminals at Arzew and Skikda, on its Mediterranean coast. Arzew terminals GL4Z, GL1Z, GL2Z have capacities of 1.5 bcm/y, 10.4 bcm/y and 10.4 bcm/y, respectively.[322] Skikda terminals GL1K-I and GL1K-II have 3.73 bcm/y and 4 bcm/y worth of

[319] During the 1980s, Algeria, Tunisia and Italy and their respective state companies built the Transmed, of which an extension delivers gas from Algeria to Slovenia. The pipeline's capacity was increased piecemeal to 33.5-34 bcm/y by the end of 2008 [CIEP 2008].
[320] Sonatrach partners with four Italian companies in constructing the pipeline: 41.6 percent is to be owned by Sonatrach, 20.8 percent by Edison, 15.6 percent by Enel, 11.6 percent by Sfirs and 10.4 percent by Hera Trading, [IEA 2008a]. The final investment decision has been delayed several times due to rising costs and difficulty in planning the route, while its completion also depends on competition from 86 bcm of planned/under construction liquefaction capacity [IEA 2009b]. Gazprom is reported to have been interested in taking a stake in the GALSI pipeline as part of an agreement between Sonatrach and Gazprom.
[321] Based on [IEA 2008b] and [Cédigaz 2008a].
[322] The GL4Z, GL1Z, GL2Z terminals were built in 1964, 1974 and 1981, respectively.

capacity.[323] Sonatrach is constructing a replacement train at its Skikda location, with a due liquefaction capacity of 6 bcm/y, to be completed originally by 2011 but now delayed until 2013.[324] Sonatrach is also constructing a new 6.5 bcm/y train at Arzew for gas from the Gassi Touil field, due for operation in 2012 [IEA 2009b]. Both projects would up Algeria's liquefaction capacity from 28 bcm/y to 40.5 bcm/y by 2013. Sonatrach further aims to become an important LNG supplier to the US.

7.3.5 Algeria's sales strategy

Today, Algeria's gas sales strategy is driven by a search for further sales depth in the southern European markets it currently supplies while (further) diversifying its exports by means of LNG. It is also driven by the European Gas Directive with the most obvious resulting bone of contention being the destination clause. Strategists at Sonatrach have felt that since the removal of the destination clause for European customers, "margins are made at Sonatrach's expense", with concerns also that its LNG could be reshipped from Europe to the US, for example [Marcel 2005]. Several key aspects Algeria's sales strategy can be highlighted:

1) *Traditional long-term take-or-pay contracts:* The bulk of Algeria's gas volumes (both pipeline and LNG) to its European customers are traded under long-term take-or-pay contracts, with roughly some 90 percent of volumes traded in this manner.
2) *Direct sales in Europe:* For several years, Sonatrach has had plans to establish marketing companies in Italy and France [IEA 2007a] Sonatrach is looking to secure its demand by acquiring downstream assets, a strategy of vertical integration similar to that of Gazprom. Algeria is also pressing importing countries to provide it with direct access to their domestic markets in return for a share in developing Algeria's gas reserves [IEA 2008a]. In the UK, Sonatrach's London subsidiary, *Sonatrach Gas Marketing*, sold 4.4 bcm/y (since between July 2006 and mid-2008) on the basis of a 20-year contract directly to British customers through the Isle of Grain re-gas terminal. In Spain it has likewise opened an office at the beginning of 2008 while in Italy *Sonatrach Gas Italia* is responsible for marketing Algerian gas directly to Italian end-users [MEES 2008l]. As part of its direct sales strategy, Algeria aims to pursue further diversification of its re-gas capacity holdings. Already having re-gas interests in the UK, France and Spain,[325] Sonatrach aims to continue establishing minority stakes in re-gasification terminals in these markets, in Italy and in the US.
3) *Combining long- and short-term sales:* Sonatrach combines its long-term gas contracts with short-term or 'spot' trade as well, either through swaps (including pipeline gas-for-LNG swaps) or diversion of LNG cargoes originally sold under long-term contracts. The com-

[323] The GL1K-I and GL1K-II terminals were built in 1972 and 1981, respectively.
[324] This train is being built to replace three trains destroyed at the Skikda plant in an explosion in January 2004.
[325] Sonatrach owns 2.5 bcm/y worth of re-gasification capacity in the Isle of Grain, in the UK, and has already bought 3.4 bcm/y worth of capacity in this terminal's expansion [IEA 2008a].

pany appears to see a share of 15 percent of its total gas volume as a suitable share designated for short-term trade.[326] Indeed, Sonatrach has claimed that the share of its LNG traded in short-term, spot-type deals has risen to 12 percent in 2008, up from 8 percent in earlier years, corresponding with three spot LNG cargoes per month [MEES 2008l]. Indeed, in early 2008, with the prevalence of a tight seller's market for LNG in the Atlantic and Pacific, and between both basins, Sonatrach was reported to be much in favour of medium-term contracts and spot trade of individual cargoes.[327]

According to Algerian energy minsiter Mr. Khelil, having amortised much of its LNG export capacity and infrastructure, Algeria is in a position to more easily engage in arbitrage and short-term sales, even with refurbishment costs to the old LNG plants Algeria's liquefaction exports-to-capacity ratio is at 90 percent) [MEES 2008d]. Maintaining flexible exports is part also of a vision in which Khelil foresees rising domestic gas needs. Eventually, Sonatrach may also engage in more pipeline arbitrage (c.f. Norway, see section on Norway) between the various southern European markets, through this strongly depends on the development of hub trade in this region. According to expert interviews, even now, Algeria's low exports-to-capacity ratio (68.6 percent utilisation in 2007)[328] in its export pipeline system (i.e., the Transmed and Maghreb pipelines) points to use of possible arbitrage on the basis of medium-term contracts. With the slowdown in gas demand in its gas export markets, Algeria, has had re-consider its position on increasing its shorter term sales (given downside demand risks of uncommitted volumes), conceding the utility of long-term take-or-pay contracts [WGI 2009k].

It should be noted that a sales strategy based on reserving gas in the form of LNG and pipeline gas for flexible trade, either regionally or on an interregional basis, carries with it significant downside price risks since these volumes are uncommitted in any market through take-or-pay contracts.

7.3.6 Cooperation with other gas-exporting companies

Algeria not only cooperates with IEFs such as ENI (in its own upstream), but also with fellow NEFs. Cooperation on the following focal points has been or is being discussed, mainly concerning long-run cooperation:

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[326] A Sonatrach manager was quoted as saying this strategy may "add value. We use the spot [market] when we can sell the volumes at a good price" [Marcel 2005, p. 202].

[327] Minister of Energy and Mines, Chakib Khelil explained that, as far as long-term contracts with buyers in Europe are concerned, Algeria "does not have an option to terminate the contract, except to wait for another 15 years to do so, while in a short-term contract, it suffices to wait for just a year or two to renegotiate the price in an open and transparent manner" quoted in [MEES 2008l].

[328] Higher utilisation of pipelines has been recorded in 2008-2009 [Petroleum Economist 2009c].

1) *Up- and downstream cooperation with StatoilHydro:* Sonatrach cooperates with Norway's Statoilhydro in Algeria's upstream where StaoilHydro has made gas discoveries and jointly operates with Sonatrach in gas production [MEES 2008k]. On the downstream side, Sonatrach agreed in March 2008 with the Norwegian firm to supply 3 bcm/y worth of LNG to Cove Point LNG terminal in the US from 2009 (where StatoilHydro owns capacity) [IEA 2008a].
2) *Up- and midstream cooperation with the Nigerian National Petroleum Corporation (NNPC):* Algeria also cooperates with Nigeria's NNPC on the possible construction of the Trans Sahara Gas (TSGP) pipeline, which would feed Nigerian gas (at 20-30 bcm/y) to Europe through the Sahara from around 2015 (see also Section 7.4 on Nigeria).[329] For Algeria, the TSGP could supply additional gas requirements and provide transit fees.
3) *Up-, mid- and downstream cooperation with Gazprom:* Algeria enjoys historically close ties with Russia, both countries have achieved a great deal of technical cooperation [Marcel 2005]. Both countries have cooperated on building pipelines and carrying out gas swaps. In August 2006, Gazprom and Sonatrach signed a memorandum of understanding on "joint businesses in the oil and gas sector" and "the possibility of implementing joint prospects in international energy markets" [MEES 2006]. In exchange for a cancellation of Soviet era debts, Russia has ostensibly been given interests in Algeria's upstream after the signing of two memoranda of understanding in 2006 and 2007 [RIA Novosti 2006]. Gazprom's interests are primarily driven by an appetite for Algeria's strategic gas assets, particularly as far as LNG is concerned and participation in key pipeline projects linking Algeria to Europe (GALSI in particular) [RIA Novosti 2007a].[330] Though in the end that agreement fizzled out and not much in the way of concrete results have been reached since then, Algeria and Russia look forward to developing a network of joint oil and gas projects in North Africa. By way of asset swaps, both companies may engage in portfolio optimisation through swapping pipeline gas for LNG deliveries and swapping amongst LNG cargoes (probably on a larger scale than seen thus far) [PIGR 2008a].

7.4 Norway

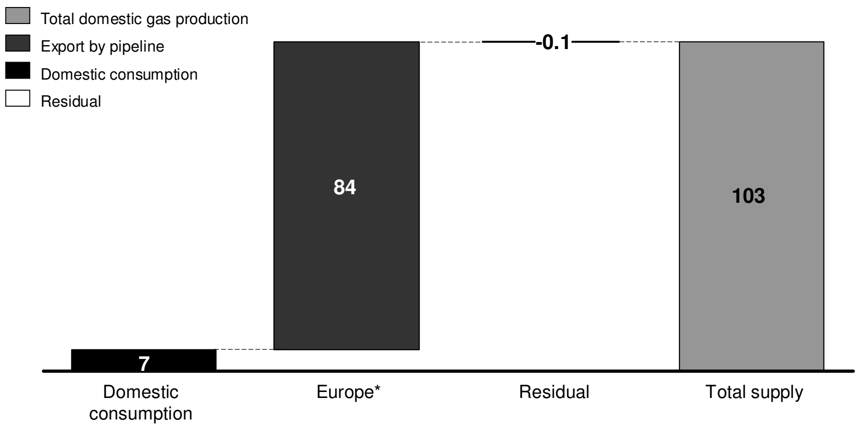
7.4.1 Gas reserves and current gas balance

Norway's proven reserves amounted to 2.91 tcm in 2008, 1.6 percent of the world total with an R/P ratio of 29.3 years [BP 2009]. Production amounted to 103 bcm in 2008 (rising from only 49.7 bcm in 2000), some 3.2 percent of the world total. Norway is also an important oil producer, having 7.5 billion bbls worth of reserves (0.6 percent of the world's total), with oil

[329] The availability of gas in the Algerian gas system could increase if the Trans-Saharan Gas Pipeline from Brass in Nigeria via Niger to Algeria would be built [IEA 2008a].
[330] Russia may wish to have access to commercial information by being part of the pipeline consortia in question.

production amounting to 2.4 mb/d (2.9 percent of the world's total), with an R/P ratio of 8.3 years and is an observer to OPEC [BP 2009]. Norway's reserves are located mostly offshore in three main areas on the Norwegian Continental Shelf (NCS): in the North, the Norwegian and Barents seas. Other major gas fields include Troll (1.3 tcm) and Ormen Lange (0.420 tcm) in the Norwegian Sea and Snøvit (0.193 tcm) in the Barents Sea [US Department of Energy 2006].[331] Troll alone accounts for 30 bcm worth of output, roughly one third of Norway's production, containing over half of the proved remaining gas reserves of the Norwegian Continental Shelf (NCS).[332] The Norwegian Ministry of Petroleum and Energy foresees a Norwegian production level not exceeding 140 bcm/y by around 2015 [IEA 2009b].[333] The fact that the government has placed such an emphasis on oil recovery and not traded gas provides Norway's producers with relatively short-term reservoir optimisation decisions [Gas Matters 2008c]. For a graphical overview of Norway's gas balance, refer to Figure 7.5 below.

Figure 7.5 Norway's gas balance in 2008



* Germany (27.5 bcm); UK (25.5 bcm); France (14.1 bcm); Italy (6.3 bcm); Belgium (5.7 bcm); Czech Republic (2.1 bcm); Spain (1.6 bcm); Austria (1.3 bcm); others (12.1 bcm; defined by total export minus exports on country level)
Note: Totals may not add up due to rounding.
Source: own analysis, IEA [2009a].

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[331] Still other fields include Statfjord and Eldfisk in the North Sea. Other important fields include Sleipner East, Asgard and Oseberg which, together with Troll, account for almost 70 percent of Norway's gas production (e.g., in 2006 they produced some 59.5 bcm). New gas finds are reported every so often: in 2005, for example, Shell made an important 0.7 tcm discovery in the Onyx prospect in the North Sea. Norway has brought a number of other satellite fields into production which has greatly helped it maintain and even increase output. The Troll East structure is estimated to contain reserves of 0.979 tcm [Petroleum Economist 2007b].

[332] The Troll East structure is estimated to contain reserves of 0.979 tcm [Petroleum Economist 2007b].

[333] Upstream activity, mainly at Ormen Lange and Snøhvit, may boost Norwegian production to 115 bcm/y by 2012 [CIEP 2008].

7.4.2 The Norwegian gas sector

1) Background to institutionalisation and strategy:
Oil and gas income in Norway accounted for 25 percent of GDP, roughly 50 percent of export earnings and 30 percent of government revenues in 2008 [EIU 2009b; CIA 2009]. Norway is an oil and gas exporter with a completely different background to Iran, Qatar or Algeria. It is politically more integrated with the EU, being a European Economic Area (EEA) member and a member of the OECD. In Norway, just as in other oil and gas producing and exporting countries, state participation is seen as a necessary prerequisite for a stable and proper functioning of the energy sector [Bartsch 1999]. Norway's petroleum and gas activities have evolved with what Gordon and Stenvoll refer to as successful 'political entrepreneurship', cooperation between public and private sectors [Gordon and Stenvoll 2007]. Norway first began producing oil during the 1960s, while gas exports took off during the 1970s and 1980s, propelling Norway to its current position as an important gas exporter to the European gas market [Bartsch 1999].

Norway's development as a gas exporter evolved through and was centred on exports to the UK and continental Europe with the building for the first pipelines to these markets from the Ekofisk, Frigg and Statfjord associated gas fields. Tremendous importance lies in the large Troll field, which has brought about a major shift in Norway's marketing strategy during the late 1980s and 1990s. The field's importance lies in the size of reserves and the possibility of using Troll as a swing producing field to bring smaller, more risky fields and associated gas from oil fields into production [Bartsch 1999]. The Norwegian authorities have therefore played a strong role in determining that Troll should not only provide security of supply to buyers, but also give Norway the flexibility to enable sale of gas from other fields whenever suitable.[334] During the late 1990s, the build-up of gas production from the Troll and Oseberg fields had been reduced in order to safeguard liquids production from these fields [Bartsch 1999]. Recently, gas production from the Troll field has again been postponed, because its development for gas exports would "would reduce the possibility to recover large volumes of oil from the field" [Norwegian Ministry of Petroleum and Energy 2007].

In a report by the ministry to the *Storting* in 1986, it was concluded that the aim of Norway's gas selling policy should be maximisation of the value of Norway's gas resources (in combination with oil) with the greatest possible level of coordination [Oil and Energy Department

[334] This is made clear and transparent in a report of the ministry to the Storting: [Oil and Energy Department 1986]. It was also discovered that Troll contained important oil liquids, meaning gas production at Troll became a function of oil production as well, thus limiting Troll's swing factor. The flexibility to produce associated gas was achieved with the Troll/Sleipner Gas Agreements, which included right-of-way for associated gas from other fields. The *Troll Further Development* project is a Norwegian-led programme especially designed to further develop Troll's resources [Bartsch 1999].

1986]. This in part led Norway to centralise its gas exports in a Norwegian Gas Sales Committee (*Gassforhandlingsvutvalget*, or GFU), especially in view of the high concentration and coordination of buyers' interests in the European market.[335] Norway must comply with EU competition regulations while 'in return' the country has access to the EU internal gas market. Before the GFU's disbandment pursuant to EU pressure,[336] the ministry appointed GFU to negotiate volumes and prices, with field allocations done in cooperation with the upstream partners [Bartsch 1999]. It also decided on the allocation of contracts to fields, ensuring the most profitable fields are allocated first; ultimately these are integrated with oil production.

2) Decision-making:

Despite its abstention from integration with the EU, short of membership, its membership of the EEA *does* compel Norway to apply a number of EU guidelines regarding liberalisation in the gas sector and privatisation.[337] In late 2007, Norway merged *Norske Stats Oljeselskap AS* (Statoil) and Norsk Hydro into one entity, one national champion, StatoilHydro.[338] The Norwegian state, owning 67 percent of StatoilHydro, has allowed the company to become commercial and flexible because it removed some of the financial interests of the state from StatoilHydro (see below).[339] This holding is now managed by Petoro, a separate state-owned entity. StatoilHydro has the responsibility to make the government aware of market and technical issues, enabling it to can make informed decisions about the depletion rate and prices [Marcel 2005]. This effectively relieves Statoil of its duty as a revenue collector typical of most NEFs.

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[335] The committee was set up by the Norwegian government to negotiate contracts on behalf of the participating gas companies, consisting of representatives of the then three Norwegian companies Statoil, Norsk Hydro and Saga. It excluded foreign players on the NCS for two reasons: a strong desire of the Norwegian state for control over resource development and because of important up- and downstream interests of most of the foreign partners, meaning gas sellers could be buyers at the same time, e.g., Shell's interest in Ruhrgas, which could lead to gas-to-gas competition could arise, leading to downward pressure on Norwegian gas prices [Bartsch 1999].

[336] Ultimately, the EU demanded and compelled Norway to end the practice carried out by the GFU, because it was considered a violation of EU antitrust rules, i.e., as a price-fixing cartel, and the committee was abandoned in 2001 when Norway was faced with pressure and fines on the part of the EU Competition authorities. The disbandment of the GFU left producers on the NCS free to market their own gas, and because Olso had adopted the EU Gas Directive, it had to design a system that allowed gas buyers (not only producers) access to its sub-sea pipeline network [WGI 2002].

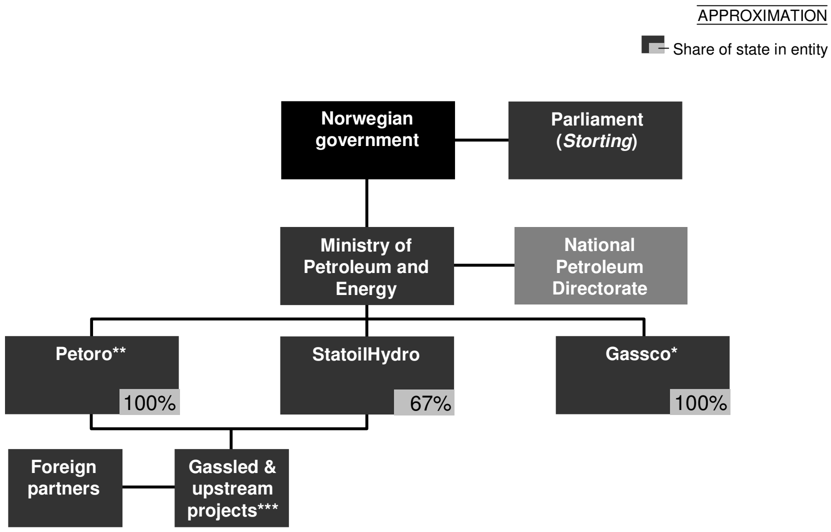
[337] Over time, Norway's economy became more closely intertwined with the EU economy. Norway never joined the EU, preferring instead to maintain its status as a member of the EEA, which was established in 1994. Pursuant to EU guidelines in 2000 which prescribed privatisation, the Norwegian government had already reduced its stake in Statoil from full to 70.9 percent ownership and 43.82 percent of Norsk Hydro. Norsk Hydro is exactly between public and private, having an easy access to capital.

[338] Coordination of action and policies takes place with regard to CIS countries, Russia and the Caspian region in a triangular relationship between StatoilHydro, the Ministry of Petroleum and Energy and the Ministry of Foreign Affairs, which has a special sub-division in the Ministry of Petroleum and Energy [Zhiznin 2007].

[339] This is the result of the creation of the State Direct Financial Interest (SDFI) in 1984, which absorbed part of the production interests of Statoil into a separate holding. Today, StatoilHydro (formerly Statoil), formally retains a high percentage by administering the SDFI on the basis of a bilateral Statoil-government arrangement [Bartsch 1999]. StatoilHydro dominates the market through its own equity shares and because it also sells the state's shares [Petroleum Economist 2009c].

With the state as the largest shareholder, the Norwegian Ministry of Petroleum and Energy manages the state's ownership interests in StatoilHydro. Ultimately the ministry is accountable to the *Storting*, the Norwegian parliament, which maintains legislative sway over governance and ownership of the state in StatoilHydro. The National Petroleum Directorate (NPD) is a regulatory body, designed to provide guide the management of the Norwegian oil and gas sector, giving the ministry the role of defining targets and setting standards through making policy.[340] Gassco is a state-owned entity which manages transport capacity. It operatores Norway's pipeline network and ships gas from the NCS to Norway's processing facilities and export markets (comparable in its role to continental Independent Transport Service Operators) on behalf of the owners in Gassled (see Figure 7.6 below for a schematic overview of these relationships).[341]

Figure 7.6 Gas sector institutionalisation and ownership structure of StatoilHydro



* Transmission capacity allocator.
** Petoro serves as the licensee for the Norwegian state's direct financial interest (SDFI) in petroleum activities.
*** Petoro AS (38,459%); StatoilHydro Petroleum AS (32,102%); Total E&P Norge AS (7,783%); ExxonMobil Expl. & Prod. Norway AS (5,286%); Mobil Development Norway AS (4,142%); Norske Shell Pipelines AS (3,974%); Norsea Gas AS (2,726%); ConocoPhillips Skandinavia AS (1,996%); Eni Norge AS (1,525%); A/S Norske Shell (1,345%); and Dong E&P Norge AS (0,662%).
Source: own analysis, based on: StatoilHydro information; Norwegian Ministry of Petroleum and Energy

[340] The NPD looks to StatoilHydro for 'objective', loyal advice, and the NEF continues to carry national responsibility for the resource [Marcel 2005].

[341] This overview is designed to provide a simplified, perhaps even oversimplified impression of decision-making in the Norwegian gas sector. Informal and formal forces may also be at play to such an extent that it is beyond the scope of consideration for this study.

3) Foreign participation:
Foreign participation has been crucial to the early development of Norway's oil and gas resources in the 1960s. Norway has always been open to foreign participation; however, the high share of the state in revenue streams of the entire sector reflects the fact that Norway has a tough fiscal regime for foreign companies.[342] Oil and gas are owned by the state, and private, international companies are merely allowed to help in the exploitation in return for a level of profit deemed adequate to maintain their interest. An array of foreign partners such as Shell, GdF Suez, Total and other firms participate in Norway's offshore production projects. Norway's energy strategy priorities are: 1) using gas for domestic gas usage for oil lifting and 2) exporting the remainder of its volumes in a way that optimises gas export revenues.

7.4.3 Domestic gas needs and strategy

In 2008 Norway's energy mix consisted of hydroelectricity by almost 70 percent, 21.3 percent for oil, 8.6 percent for gas and 1 percent for coal [BP 2009]. Norway's domestic pipeline system is a set of various interconnected pipelines transporting gas from fields in the North and Norwegian seas to processing facilities ashore.[343] The cheap availability of hydropower, owing to Norway's geographical blessings, enables Norway to export some 95 percent of the gas it produces with low domestic gas needs. Domestic gas uses include:

1) Gas re-injection: Gas re-injection for enhanced oil production is central to Norway's energy strategy, as it is in many other oil and gas producing countries. The Troll Oseberg Gas Re-injection (TOGI) scheme, for example, is designed to help coordinate gas and oil production from the Troll and Oseberg fields. According to expert interviews, though these injection needs rise as high as 30-35 bcm/y, much of the injected gas is eventually produced.
2) Methanol production: Apart from gas re-injection, Norway's domestic gas consumption consists of feed gas for a methanol plant (Tejldbergodden) [IEA 2009b].

7.4.4 Gas export ambitions and strategy

Like Algeria, Norway's future energy clout lies in gas and not oil, and it is a regional gas player as well, and public opinion is increasingly focussed on boosting revenues from sales of gas with exports [Petroleum Economist 2009c]. In 2008 all of Norway's 84 bcm worth of gas exports went to European markets, (except for LNG from Snøhvit, which officially began flowing in late 2007 but has experienced significant technical problems and delays). A major player in the European pipeline business, StatoilHydro is expanding its LNG assets by beginning with ex-

[342] The licensing terms specified a sliding scale, which means that the state could increase its participation in a find (after it was found to be commercially viable) to 80 percent in some cases [Bartsch 1999].
[343] For example, the Asgard Transport and Statpipe systems feed gas into a treatment plant terminal in Karsto on the Norwegian west coast, where natural gas liquids are separated and exported by ship [US Department of Energy 2006].

ports from Snøhvit, acquiring re-gas capacity in the US (Cove Point) and entering the Shtokman project (see below) [IEA 2008a]. While Algeria plays an important role in southern Europe, Norway plays an important role in northern and Northwestern Europe.

The Norwegian export system pipeline system was designed gradually, with cumulative investments made in such a way so as to maintain flexibility, using riser platforms as hubs, mostly from the North and Norwegian seas to Norway's west coast, interconnecting gas fields with both processing facilities and markets [Bartsch 1999]. Its exports flow to continental Europe through an elaborate network of five sub-sea pipelines, with a combined capacity of 86.3 bcm/y, while two pipelines with a combined 36 bcm/y link it to the UK, total export capacity being 127 bcm/y in 2008 [CIEP 2008].[344] According to expert interviews, Norway aims to have an export capacity to European markets of between 175 bcm/y and 200 bcm/y by 2015. With the development of Snøhvit LNG, it is clear that Norway is aiming to develop export capacities to new markets beyond Europe in the medium- to long-run. For now, however, Norway's sphere of gas exports mostly extends to NWE, with its gas exports broken down as follows:

1) Pipeline exports:

   a. *The UK:* Norwegian exports to the UK amounted to 25.5 bcm in 2008, roughly 30 percent of its total exports). Volumes to the UK were transported through the Frigg pipeline to St. Fergus (12 bcm/y), which was built in 1977. As recently as 2006-2007, the Langeled pipeline (25 bcm/y) began exporting gas from the Ormen Lange field to Easington while the Tempen Link/Flags pipeline (11 bcm/y) began flowing gas from the Troll area to St. Fergus at that as well. Contracts with buyers in the UK have been signed in the early 2000s, most of which come to an end in the early 2010s and include delivery at the NBP [Cédigaz 2008c].

   b. *Continental Europe:* Some 58.5 bcm of Norway's export went to continental Europe (70 percent of Norway's total exports). Exports to Germany amounted in 2007 to 27.5 bcm, to France 14.1 bcm, to Belgium 5.7 bcm, and to the Czech Republic 2.1 bcm. These volumes largely came through Norpipe, running from Draupner to Emden, one of the first pipelines built in 1977. It had a capacity in 2008 of 10 bcm/y. Pipeline gas also flowed through the Zeepipe to Zeebrugge (14 bcm/y), which started flowing gas in 1993. The Europipe 1 (18 bcm/y) and Europipe 2 (24 bcm/y) pipe-

[344] Norway also brought into operation its Snøhvit liquefaction terminal in October 2007, of which 2.39 bcm/y and 3.9 bcm/y worth if LNG has been contracted to buyers in the US and Europe until the late 2020s [Cédigaz 2008b]. These figures are not included in the IEA statistics for 2007. Much of the export capacity to Europe was boosted with the building of the Statpipe system in the North Sea.

lines to northern Germany started gas flows in 1993 and 1998, respectively. The Norfra (or Franpipe) pipeline, running from the North Sea (Draupner) to Dunkerque (17 bcm/y), began flowing gas in 1998. Further exports included flows to Italy (6.3 bcm), Austria (1.3 bcm) and Spain (1.6 bcm). Norway (and its producers, which include foreign companies) has a range of contracts in place, some still dating from the late 1970s and the Troll Agreements of 1986 [Cédigaz 2008c].

2) *LNG exports:* Norway's Snøhvit project[345] is Norway's first proper venture into the LNG business and became operational only in late 2007. Norway is therefore relatively new to the world of LNG. The terminal, possessing one train, has a 5.6 bcm/y liquefaction capacity and may be expanded to 10 bcm/y by 2012, pending the addition of new gas reserves for the project [Cédigaz 2008a]. The project is centred on the Snøhvit gas field in the Barents Sea, having experienced start-up problems since it began operations, with large cost overruns involved in bringing the terminal to full operating capacity.[346] Snøhvit LNG is contracted long-term to buyers in the US (2.39 bcm/y) and some 3 bcm/y to Europe (including Spain and France) [Cédigaz 2008b].

7.4.5 Norway's sales strategy

Norway's gas sales strategy hinges on the flexibility of its pipeline transport system and the accompanying production systems, which can be used to produce both oil and gas and interchange easily between the two on the one hand and between different gas fields linked to the system on the other. Contracts with early buyers enabled Norway to build new pipelines, and the return on those investments subsequently fuelled further pipeline development. The Troll gas field discovery reshaped Norway's gas export strategy (as explained above). Several key aspects of Norway's sales strategy can be highlighted:

1) *Traditional long-term tape-or-pay contracts:* Just as in the case of Algeria, the bulk of Norway's gas to continental Europe is sold through long-term contracts with oil-indexation (some 85 percent of its exports). Norway's pricing strategy is based on the LRMC of its Troll field, which is included in its pricing formulae and that of other gas sellers in Europe (see also Chapter 5).
2) *Direct sales in Europe:* Unlike Sonatrach and Gazprom, StatoilHydro does not have any direct subsidiaries to conduct direct sales in Europe. Norwegian gas to the UK is sold on the NBP spot market through short- to mid-term contracts indexed to the NBP. Statoil-

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[345] The Snøhvit project is owned 33.53 percent by StatoilHydro, 30 percent by Petoro, 18.4 percent by Total, 12 percent by Gaz de France and the remainder by other parties. The construction of Snøhvit is seen as the only option for exploiting the gas resources of the northern Norwegian waters, especially in the Barents Sea [Bartsch 1999].

[346] The latest cost overruns put the price tag of the facility 74 percent higher than the original budget approved by the Norwegian government in 2002 [PIGR 2008e].

Hydro jointly owned a subsidiary with Wingas in the UK, HydroWingas, but sold its share in that company to Gazprom in 2007.

3) *Combining long- and short-term sales:* Just as Algeria conducts arbitrage, mostly with LNG cargoes, Norway conducts arbitrage between the various markets it exports to by means of its export pipelines. With its diversified export routes and flexible export infrastructure (including the accompanying upstream flexibility, see above), Norway is able to use arbitrage between the various markets. Norway can use its export-to-capacity ratio (69.2 percent utilisation in 2007 according to expert interviews) in the pipeline system to conduct arbitrage between all the various markets in question by maintaining excess capacity in the pipeline system. Norway can thus conduct arbitrage between the UK's NBP and short-term markets in continental Europe, including both other spot markets (such as TTF) and short- to medium-term contracts. The strategy of retaining aside volumes for arbitrage may carry downside risks, particularly in view of further potential LNG exports to the UK and continental Europe [Gas Matters 2008c].[347]

7.4.6 Cooperation with other gas-exporting companies

Norway cooperates extensively with foreign partners in Norway's upstream sector. StatoilHydro is also internationally active with similar partners in upstream projects across the world, namely in Algeria, Angola, Venezuela, Brazil, Canada. The company is also active in various mid-stream projects. The most notable and relevant projects in Norway's sphere of cooperation with other NEFs (and IEFs, in some cases) are listed below, categorised by upstream and mid-stream projects:

1) Upstream projects:
   a. *Upstream development of Shtokman:* As mentioned in the section on Russia, StatoilHydro has been selected to help Russia develop the giant 3.6 tcm Shtokman gas field in the Barents Sea. For Norway, participation in the Shtokman project is of long-run economic importance, and it was therefore decided at both corporate and political levels that Norway's participation in the project was essential.[348] Because of the fact that Norway shares the Barents Sea with Russia and both countries are Arctic neighbors, both countries have regular consultations at a ministerial level [Zhiznin 2007].

[347] It should be noted that a sales strategy based on reserving gas in the form of LNG and pipeline gas for flexible trade, either regionally or on an interregional basis, carries with it significant downside price risks since these volumes are uncommitted in any market through take-or-pay contracts.

[348] Based on expert interviews. Gazprom, Total and StatoilHydro formed the *Shtokman Development Company*, where Gazprom is the main shareholder (51 percent) and Total (25 percent) and StatoilHydro (24 percent) have minority stakes.

b. *Upstream development of Shah Deniz:* As mentioned in the section on Caspian Sea countries, StatoilHydro participates in the development of the Shah Deniz field in Azerbaijan's offshore, being part of the BP-led consortium.
c. *Upstream development of reserves in Algeria:* As is mentioned in the section on Algeria, StatoilHydro is one of several upstream partners operating in Algeria in cooperation with Sonatrach.

2) *Mid-stream projects:*
   a. StatoilHydro owns a third of the 10.4 bcm/y re-gas capacity at the Cove Point re-gas terminal in the US. StatoilHydro cooperates with Sonatrach in delivering LNG there, with Sonatrach providing LNG to StatoilHydro at Cove Point.
   b. StatoilHydro holds a 50 percent interest in the Trans-Adriatic Pipeline (TAP), with an initial capacity of 10 bcm/y (up to 20 bcm/y).[349] StatoilHydro's participation in Azeri Shah Deniz field, combined with its share in the TAP pipeline, may improve project's bargaining power in acquiring Azeri supplies [IEA 2008d].

7.5 Libya and Nigeria

Two other countries of further strategic importance to both the European and US gas markets are Libya and Nigeria. The former is more important for the southern European gas market while the latter plays a more interregional role through its LNG exports. In 2008, Libya's gas reserves amounted to 1.54 tcm (0.8 percent of the world's total) [BP 2009],[350] producing 17 bcm and consuming 7 bcm, 41 percent of its production [IEA 2008b].[351] Its proximity to the European gas market, as in the case of Algeria, makes of Europe a natural export market for Libya, which exported 10 bcm in total in 2008, refer to Figure 7.7 below for an overview of Libya's gas balance. The Libyan National Oil Company (NOC) supplies gas to Italy through the Greenstream pipeline (which came online in 2004 and traverses the Mediterranean Sea to Italy), which has a capacity of 8 bcm/y and is to be expanded to 11 bcm/y as part of a supply agreement between Libya and Italy [IEA 2008a]. Libyan LNG exports amounted roughly to 1 bcm, which flowed to Spain, amongst other countries.[352]

[349] The final investment decision is planned in the second half of 2009 and the pipeline would connect Greece to Italy via Albania, estimated to be operated in 2012.

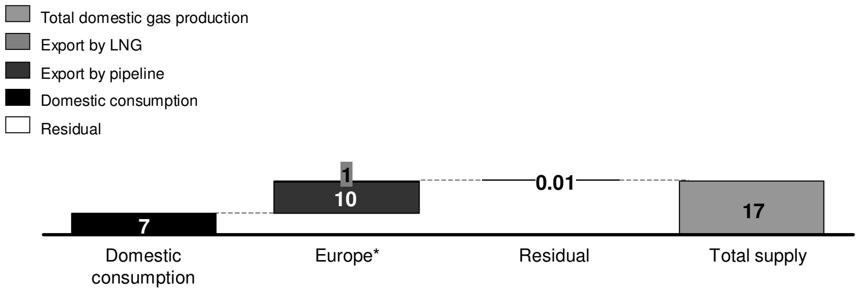
[350] Very little exploration work has been done, it is estimated that Libya could possess more than twice as many gas reserves as currently and officially recognised [Petroleum Economist 2008b].

[351] Libya is an important OPEC oil producer, having 43 billion bbls worth of oil reserves and producing 1.8 mb/d in 2008, 2.2 percent of the world's total [IEA 2009b]. Freeing up oil for export by substituting in gas plays an important role in Libya's gas strategy, with growing domestic demand to put pressure on available volumes for export [IEA 2009b].

[352] Libya's Marsa El-Brega LNG export terminal has an export capacity of 4.4 bcm/y [Cédigaz 2008a]. Libya's LNG exports have remained low largely due to technical limitations, in part caused by US and international sanctions which have for many years deprived Libya of the technology needed to extract liquefied petroleum gas from its natural gas. In September 2003, the UN Security Council lifted its sanctions over Libya [US Department of Energy 2007a].

As in a number of autocratic gas-exporting countries, the NOC in Libya and its key decisions fall under the auspices of the political leader (in this case, Colonel Gaddafi), reflecting a highly centralised system of decision-making. A number of actors are active in Libya's upstream: Royal Dutch Shell is upgrading Libya's liquefaction plant, the expansion of which has been delayed to 2013 [Cédigaz 2008a]. Engaged in exploration and production activities in Libya are Repsol, Wintershall, BP, ENI, OMV and Total [US Department of Energy 2007a]. Italy as historically always played an important role in Libyan affairs [Financial Times 2008d] and ENI is one of the leading foreign mid-streamers present in the country: ENI may develop a 5 bcm/y LNG export terminal at Metillah as well as participate in the Greenstream [IEA 2008a].[353] Additional pipeline supplies from Libya are uncertain as a result of domestic demand and pipeline competition that may dedicate a priority to LNG supplies [CIEP 2008]. Russia has taken a significant interest in oil and gas cooperation with Libya in a manner similar to that seen in the Algerian case. Gazprom and Libya's leader, have discussed Gazprom's role in expanding Libya's refining capacity and its gas export infrastructure, possibly taking a 50 percent in the Greenstream pipeline [AGC 2007c].[354] Further discussion included cooperation between NOC and Gazprom in the all areas of the gas value chain: production, processing and marketing (crude oil) and gas. In mid-2008 Gazprom also offered to buy all of Libya's gas, oil and LNG at competitive prices [PIGR 2008b].[355] The Libyan Investment Authority and Gazprom expect to establish a joint venture for activities outside Libya.[356]

Figure 7.7 Libya's gas balance in 2008



* Pipeline export: Italy (9.9 bcm); LNG export: Spain (0.5 bcm).
Note: Totals may not add up due to rounding.
Source: own analysis, IEA [2009a].

[353] ENI is to own 75 percent of the pipeline's expansion [IEA 2009b].

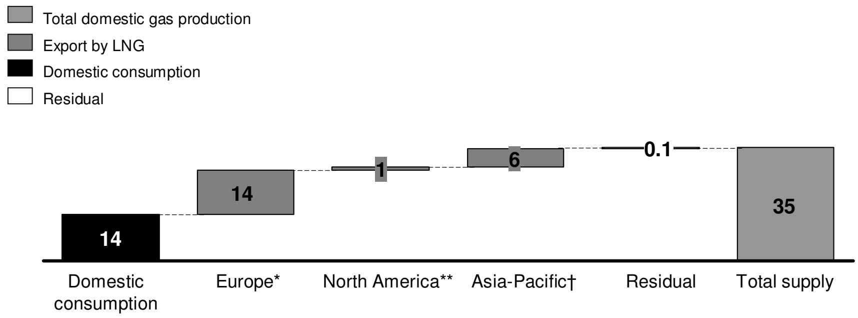
[354] Gazprom has been awarded several potential gas production blocks in Libya's Ghadames Basin during Libya's first licensing round in late 2007. This may be one important reason for seeking a stake in the Greenstream pipeline [Gas Matters 2008b].

[355] In late 2007, Gazprom obtained 49 percent stakes in C96 and C97 oil concessions held by Germany's Wintershall through an asset swap with parent company BASF. Gazprom is to enter a partnership with ENI in the latter's gas exploration and production blocks, pending approval from the Libya authorities.

[356] As in the Algerian case, Russia agreed to cancel the Soviet-era debt owed to it by Libya in return for interests for Russian energy companies, i.e., Gazprom, amongst others [PIGR 2008a].

Nigeria had gas reserves of 5.2 tcm in 2008, 2.8 percent of the world's total (and the largest in Africa). It produced 35 bcm and consumed 14 bcm, some 40 percent of its production [IEA 2009a].[357] Much of Nigeria's associated gas is flared; with the level of its flaring is the second highest in the world after Russia.[358] Nigeria's National Petroleum Corporation (NNPC) is the country's NEF, which conducts its business under the auspices of the Nigerian president. Its relatively remote location from major, regional gas export markets has encouraged Nigeria to develop an LNG export strategy. It is an important player in the Atlantic Basin. Together with and through its IEF partners, Nigeria exported LNG to European markets (14 bcm in total),[359] to the US (0.3 bcm) and Mexico (0.8 bcm) and markets in the Asia-Pacific region (6 bcm in total).[360] See Figure 7.8 below for an overview Nigeria's gas balance.

Figure 7.8 Nigeria's gas balance in 2008



* Spain (7.9 bcm); Portugal (2.7 bcm); France (2.3 bcm); Turkey (1.0 bcm).
** Mexico (0.8 bcm); US (0.3 bcm).
† Japan (2.5 bcm); Taiwan (2.2 bcm); India (0.4 bcm); South Korea (0.4 bcm); China (0.2 bcm).
Note: Totals may not add up due to rounding.
Source: own analysis, IEA [2009a].

Nigeria's Nigeria LNG project, which has a 27.6 bcm/y liquefaction capacity with 6 trains, is jointly owned by NNPC (49 percent) and its foreign partners, including Royal Dutch Shell (25.6 percent), Total (15 percent) and ENI (10.4 percent).[361] Production from Nigeria's Seven Plus expansion of Nigeria LNG will likely not come on-stream (with a super-mega train capacity of 10.9 bcm/y) until 2014 at the earliest [IEA 2009b]. Brass LNG, a new Nigerian LNG project with a slated capacity of 13.6 bcm/y from 2 trains, is also targeting 2014 for first out-

[357] Also an OPEC member, Nigeria possessed 36.2 billion bbls worth of oil reserves in 2008 and produced 2.1 mb/d, 2.7 percent of the world's total [BP 2009].
[358] Nigeria's president claimed in 2008 that satisfying domestic gas should be prioritised over exports, with the government potentially requiring producers to set aside as much as 25 – 30 percent of gas for Nigerian use [IEA 2008a]. Because many of Nigeria's oil fields lack the infrastructure to produce and market associated gas, much of the gas is often flared (some 17 bcm in 2007), costing the country $1.46 billion in revenues [US Department of Energy 2009d].
[359] In 2008, Nigeria exported 7.9 bcm to Spain, 2.3 bcm to France, 2.7 bcm Portugal and 1 bcm to Turkey.
[360] In 2008, Nigeria exported 2.5 bcm to Japan, 0.4 bcm to India, 0.4 to South Korea, 2.2 bcm to Taiwan, 0.2 bcm to China.
[361] NNPC owns 49 percent of Nigeria LNG, Royal Dutch Shell 25.6 percent, Total 15 percent and ENI 10.4 percent.

put.[362] Portfolio buyers of output from Brass LNG include BG, GdF Suez, BP, ConocoPhillips and ENI. These delays are caused by concerns over security on the part of the IEFs and uncertainty over the government's policies. Planned and proposed also are OK LNG and Progress LNG.[363]

Nigeria may potentially become a pipeline gas supplier to Europe from 2015 onwards through the planned TSGP (with a maximum capacity of 20-30 bcm/y). Gazprom, Total and Sonatrach have expressed an interest to participate in this ambitious pipeline project, possibly in order to gain access to Nigeria's considerable gas reserves.[364] Nigeria claims it has set aside 450 bcm worth of reserves for the project [MEES 2008b]. However, the realisation of this project and the availability of Nigerian reserves for pipeline supplies are very uncertain due to domestic Nigerian demand, possible transit risks and priorities to LNG developments [CIEP 2008]. Furthermore, the advancement of its LNG projects makes one question the commercial fundamentals of such a daunting pipeline project [Petroleum Economist 2009a]. Gazprom also offered Nigeria to cooperate on gas exploration, production and transportation in a late 2008 memorandum of understanding [Financial Times 2008a]. In mid-2009, NNPC and Gazprom formed the 50/50 Nigaz joint venture, which will aim to explore for gas, build infrastructure for domestic development and gas-fired power stations, including a section of pipeline that could form part of the TSGP pipeline [Financial Times 2009a].

7.6 Other important countries

For Russia, the Caspian Sea producers, Iran, Qatar, Algeria, Norway, Libya and Nigeria, a number of other gas exporting or potential gas exporting countries are or may become important interregional players; and are likely to play important regional roles as well. Qatar has truly global potential, but always on limited basis when seen in regional terms. Other countries are also noteworthy, especially as far as LNG is concerned. Traditional LNG suppliers such as Indonesia, Malaysia, Brunei, and Trinidad and Tobago may face competition in terms of LNG supply from Australia and Egypt in the Pacific and Atlantic basins, respectively. These are joined by the UAE, Oman and, as of 2009, Yemen. Egypt and Iraq may perhaps become important suppliers to Europe by pipeline. Other important regional gas exporters include, for example, Canada in the North American market and the Netherlands in the European market,

[362] Brass LNG is owned by NNPC (49 percent), ConocoPhillips (17 percent), ENI (17 percent) and Total (17 percent).

[363] OK LNG would be owned by NNPC (49.5 percent), Royal Dutch Shell (18.5), Chevron (18.5 percent) and British Gas (BG) (13.5 percent). Progress LNG would see Flex LNG, Mitsubishi and Peak Petroleum as participants [Petroleum Economist 2009a].

[364] From Gazprom's perspective, it may have principally economic strategic value in order to attain control over some of Nigeria's gas production [Financial Times 2009h], as is ostensibly the case for Gazprom in Algeria and Libya. Indeed Gazprom is clearly keen to get stakes in transportation which may feed into Europe in case it attains its own gas supplies in those countries [Gas Matters 2008b]. Gazprom and Sonatrach signed an MoU about the pipeline in 2009.

which still play a significant regional role without necessarily being net interregional LNG exporters. For an overview, refer to Map 5.1 in Chapter 5.

The Pacific players of Indonesia, Brunei and Malaysia have formed the backbone of LNG production and exports to the Pacific Basin for several decades now. Indonesia's reserves clock in at 3 tcm (1.7 percent of the world's total), Malaysia at 2.48 tcm, and Brunei at 0.34 tcm. Indonesia is a considerable LNG exporter, producing 76.8 bcm in 2008, consuming 43.2 bcm, exporting 34 bcm [IEA 2009a].[365] However, its exports have been in decline due to a rise in domestic needs. Malaysia produced 61.5 bcm in 2008, consumed 43.5 bcm, exports being 34.1 by LNG to the same markets as Indonesia caters.[366] With consumption of only 2.5 bcm, Brunei is a much smaller player, producing 12 bcm in 2008, of which it exported 9.8 bcm.[367] Trinidad and Tobago is a traditional LNG exporter to the Atlantic Basin. In 2008, it had reserves of only 0.48 tcm, producing 34.7 bcm and exporting 17 bcm, mostly to the US, but also to Spain, Mexico, Japan, Korea and the UK.

Egypt had a reserve base of 2.17 tcm in 2008, 1.2 percent of the world's total [BP 2009], producing 58.4 bcm and consuming 40.7 bcm in 2008. With a liquefaction capacity of 16 bcm/y in 2008, Egypt exported 17.7 bcm worth of LNG to various Atlantic Basin LNG markets (the US and Spain) but also to the Pacific (Japan and South Korea) in 2008 [IEA 2009a]. If gas could be transported through the Arab Gas Pipeline (AGP), Egypt would become a pipeline supplier to Europe. This pipeline has a maximum capacity of 10 bcm/y and links Syria via Jordan to Egypt, and could then be extended to Turkey and Iraq by 2009. Egypt could potentially deliver up to 2 bcm/y at the Turkish border. However, Egyptian pipeline gas supplies to Europe are very uncertain given increasing domestic demand in Egypt and planned LNG liquefaction capacity [CIEP 2008]. The country may add another 11.8 bcm/y worth of liquefaction capacity in the medium-term [Cédigaz 2008a]. Upstream investors include BG, Petronas and GdF Suez. For a more complete overview of potential flows from these countries to the Southeastern European gas market (also see Case study 2 in Chapter 9).

Iraq is perhaps the one gas-rich country with the most untapped gas (and oil) reserves in the Persian Gulf region (and the Middle East more broadly), apart from its neighbour Iran. It possesses an estimated 3.7 tcm worth of gas reserves, 1.7 percent of the world's total [BP 2009], though due to underdevelopment and under-exploration of its oil and gas reserves more gas may yet be discovered. The large IEFs have long hoped to enter Iraq to access its oil and gas reserves [Financial Times 2009d]. After the fall of Saddam Hussein, post-2003 hopes for such

[365] In 2008, Indonesia exported 27.5 bcm in 2007 to Japan (19.5 bcm), South Korea (4.1 bcm) and to Taiwan (3.9 bcm).
[366] In 2008, Malaysia exported LNG to Japan (18.7 bcm), South Korea (8.4 bcm) and Taiwan (3.6 bcm).
[367] In 2008, Brunei's exports went to Japan (8.5 bcm), South Korea (0.7 bcm), India (0.2 bcm) and China (3.5 bcm).

a return of the IEFs may have been dampened by Iraq's tough upstream bid terms in June 2009 [Financial Times 2009c]. Iraq produced and consumed 1.4 bcm in 2009 [IEA 2009a], mostly gas from associated gas fields located in the country's Basra area, 60 percent of it is flared due to insufficiently available infrastructure on site to utilise the gas [US Department of Energy 2009c].[368] Iraqi gas available for exports is still subject to great uncertainty due to country and legal risks and increasing domestic demand.[369] Iraq has signed a memorandum of understanding with Syria for possible gas supply and transit to the Arab Gas Pipeline [IEA 2008a]. In the long run, Iraq could become a pipeline supplier to Europe, but this remains purely speculative [CIEP 2008].[370]

The Middle East as a whole, including the UAE, Oman and Yemen, will essentially remain an important LNG supply region well in to the long-run. For economic and strategic reasons, Middle Eastern suppliers may opt for exporting primarily by means of LNG. From an economic point of view, the only pipeline gas supplier to Europe in the medium-term is Iraq [CIEP 2008].[371] Other potentially noteworthy but by no means major LNG exporters in the region include the UAE, Oman and, in the future, Yemen. The UAE had sizeable gas reserves of 6.4 tcm in 2008 (3.5 percent of the world's total) [BP 2009], producing 51 bcm and consumed 59 bcm. The UAE's LNG exports flowed mostly to Japan in 2008 (the UAE's LNG exports totalled 6.9 bcm), itself importing gas from Qatar.[372] Oman had gas reserves of just less than 1 tcm in 2008 [BP 2009], producing 25.7 bcm and consuming 19 bcm. Oman's LNG exports amounted to 10.8 bcm, flowing mostly to Japan, India and China.[373] Yemen's LNG is to come on-stream in 2009 with capacity of some 9 bcm/y with flows going to South Korea and the US [Cédigaz 2008b].

A relatively new player in the Pacific Basin and of increasing importance in interregional LNG terms is Australia. In 2008, it possessed (mostly offshore) gas reserves of 2.5 tcm, which is 1.4

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[368] Shell has entered into a Heads of Agreement (HoA) in September 20008 for the development of LNG exports from Iraq using associated gas from the Basra area as a feed gas (replacing its current fate through flaring) [MEES 2008i]. There are also plans involving Shell possibly drawing Iraqi gas as a feed into the vaunted Nabucco pipeline project through Turkey, which is subject to great uncertainty [MEES 2008j]. Iraq also aims to build a gas pipeline to Syria, possibly connecting it to the Arab Gas Pipeline, and in late 2008, Turkish state-owned Botas and TPAO formed a gas exploration and marketing partnership with Shell in Iraq [Petroleum Economist 2009b].

[369] Iraq produced 14 bcm in 2006 according to the Iraqi Ministry of Oil, with some 8 bcm being flared. The immediate aim is to end flaring and free up more gas for domestic use, mainly for power generation and industry. Iraq plans to increase production to 70 bcm/y with exports beginning after 2012, according to the Iraqi Oil Minister [Petroleum Economist 2009b].

[370] In mid-2008, European mid-streamers OMV and MOL signed an agreement with the Kurdish regional government in Iraq to begin gas exploration and production, circumventing the Iraqi government in Baghdad, which immediately blocked any such agreement [Financial Times 2008c].

[371] In the long run, other Middle Eastern gas exporting countries (e.g. Qatar, Oman and UAE, combined with Iran and Iraq) may become also a pipeline supplier to Europe.

[372] The UAE's total liquefaction capacity amounted to 6.4 bcm/y in 2008 [Cédigaz 2008a].

[373] Oman's total liquefaction capacity amounted to some 13 bcm/y in 2008 [Cédigaz 2008a].

percent of the world's total [BP 2009]. Australia is a relative newcomer to the LNG industry when compared to some of the countries mentioned above (beginning with exports in 1990 while the traditional LNG exporters referred to above predate this year in terms of first exports). It produced 45.2 bcm in 2008 and consumed 34.2 bcm, exporting 19.4 bcm worth of LNG [IEA 2009a].[374] By 2020, Australia could overtake Qatar's 2012 LNG output target of 102 bcm/y [WGI 2009k]. Notable in Australia's upstream is the extensive participation of IEFs in the various existing and planned liquefaction projects.[375] This reflects a completely different institutionalisation as far as decision-making is concerned.

7.7 Market power in the Atlantic Basin and the European gas market

Existing and potentially new gas flows from Russia, Iran, Qatar, the Caspian region, Algeria, Norway, Libya, Nigeria as well as other countries reach the major markets described in Chapter 5 (in the form of pipeline gas or LNG) at a certain cost. These gas flows are produced, transported and distributed through infrastructures which require a long lead time to build.[376] From a theoretical point of view, the LRMC, see Chapter 8 for a more complete definition) therefore need to be taken into account, i.e., the full cost of bringing an additional cubic meter to market. The LRMC determine, regardless of pricing in oil-indexation versus spot terms, the floor price for gas: "Growing production and transportation costs will always determine the minimal level of wholesale gas prices" [MEES 2009a]. Chapter 4 contains a theoretical account of market power both in terms of market share and cost (based on the LRMC), and it is applied here to provide an overview of the market power given current and future export potential of the most important gas-exporting countries (refer to it when interpreting the figures below). Large fields, large-diameter pipelines, large shipping capacity in LNG help breed economies of scale in gas flows, as large volumes of gas lower per-unit costs for each cubic meter. While the LRMC to bring these cubic meters to market include economies of scale, LRMC also encompass other costs which are fixed in the short run, such as capital costs.

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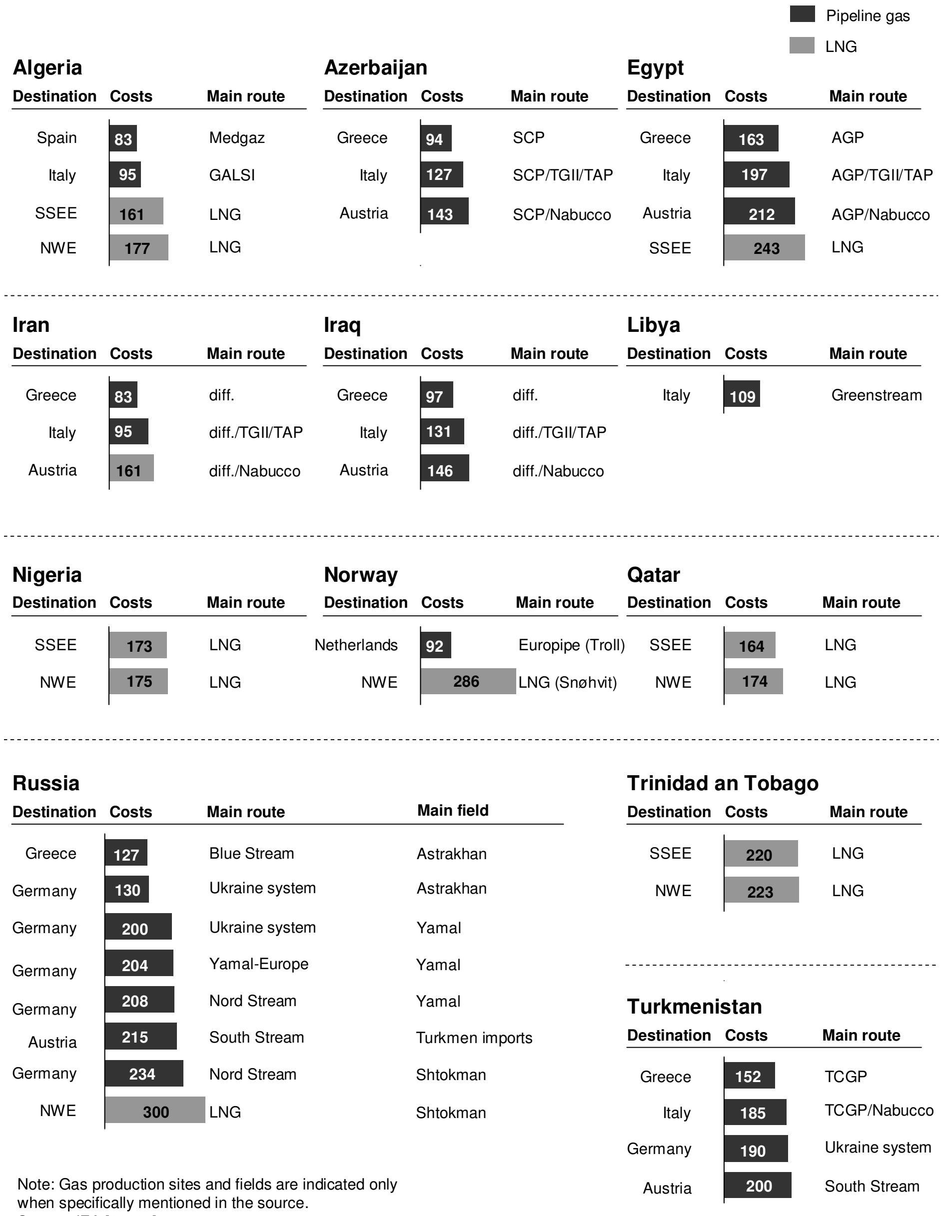
[374] Australia exported a total of 21.3 bcm worth of LNG to Japan (17 bcm), China (3.5 bcm), India (0.16 bcm) and South Korea (0.669 bcm) [IEA 2009a].

[375] Australia's LNG projects, NorthWest Shelf with a capacity of 19.2 bcm/y and Darwin LNG with 4 bcm/y have already accounted for 20.8 bcm worth of Australia's LNG exports in 2007 [IEA 2008b]. Foreign IEFs and upstream companies in Australia include Woodside, BHP, BP and Chevron amongst others for NorthWest Shelf while ConocoPhillips, ENI, Santos and Inpex are involved in Darwin LNG. Some 5.7 bcm/y, 6.6 bcm/y and 5.3 bcm/y may be added by Pluto LNG (involving Woodside, Tokyo Gas and Kansai), Ichthys LNG (involving Origin and ConocoPhillips) and the Gorgon Project (involving Chevron, ExxonMobil and Shell), by 2011 2014 and 2015, respectively [Cédigaz 2008a]. More LNG projects, albeit with no clear start-up date are also slated, totaling almost 20 bcm/y worth of liquefaction capacity. Even if Pluto LNG, Ichthys LNG and the Gorgon Project come onstream, Australia's liquefaction capacity would be brought to 41 bcm/y by 2015, if the projects do not experience the likely slippage incurred by the financial and economic crisis.

[376] As is explained in Chapter 2 in [Smeenk 2010], the realisation of these projects requires long-term gas contracts, which play a crucial role as far as the financing of the entire value chain is concerned.

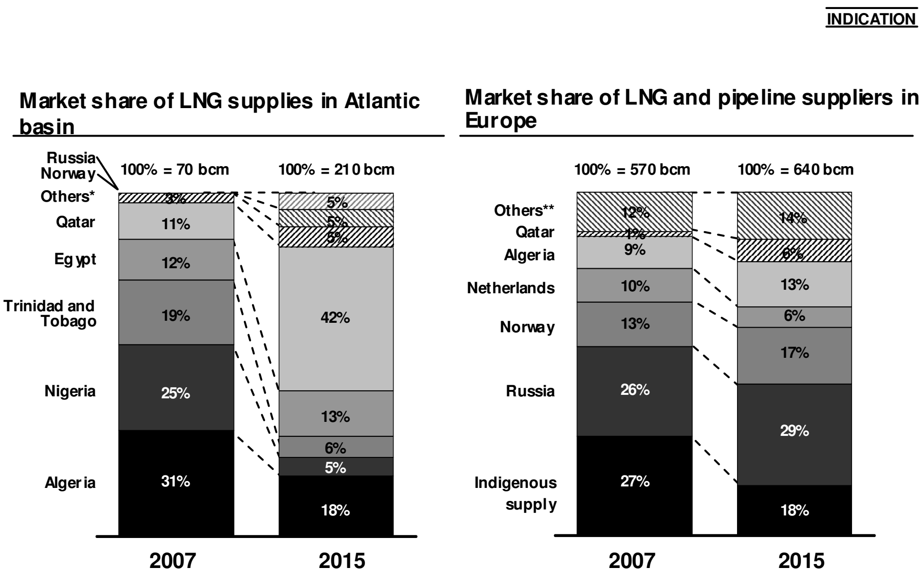
Figure 7.9 LRMC estimates for gas delivered to Europe in 2020 (in $/mcm)



Note: Gas production sites and fields are indicated only when specifically mentioned in the source.
Source: IEA [2009c].

Gas transportation, whether by pipeline or LNG, remains very expensive and usually represents an important share of the overall cost of gas delivered to consumers [IEA 2008c]. Despite the potential for LNG to affect different regional markets on an interregional basis, pipeline gas, especially in Europe, can still greatly affect the competitiveness of LNG due to lower economies of scale. Attaining a clear grasp of the market power gas suppliers in question requires a LRMC overview (including costs incurred from gas production, transportation as well as from transit fees and royalties) of the different gas suppliers. These costs are based on the various potential routes from these various gas suppliers to the different (sub-)regional markets by both pipeline and LNG. The importance of these figures lies more in their relative than absolute differences. An overview is provided in Figure 7.9 above, which includes LRMC estimates for 2020, based on existing as well as future gas value chains to Europe, involving gas fields and provinces not yet currently in use.

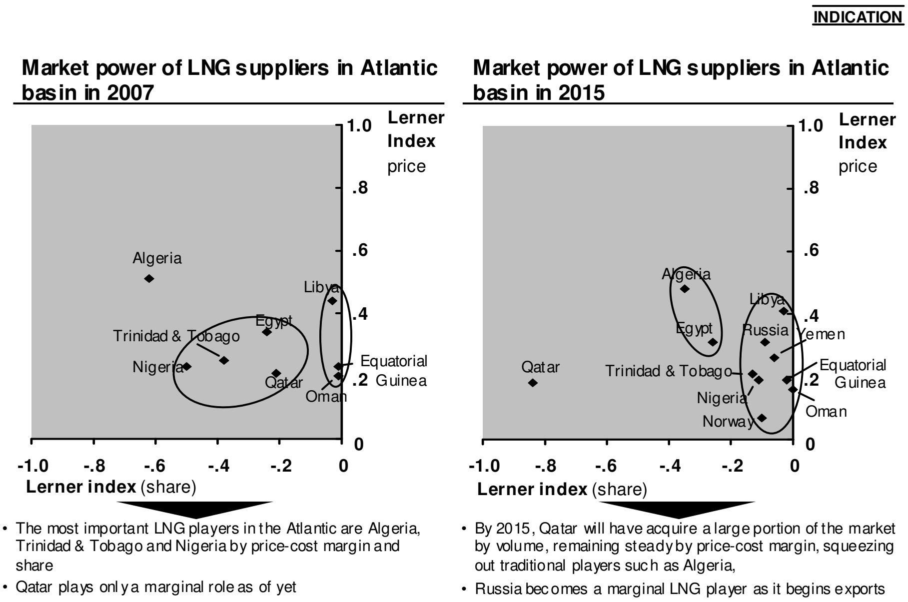
Figure 7.10 Market shares of the various gas suppliers in the Atlantic Basin and Europe in 2007, compared with 2015 (LNG and pipeline)



* Europe is defined by all European countries, including Turkey, excluding CIS. Totals may not add up due to rounding.
Source: own analysis; IEA [2008] for 2007; CIEP [2008] and privately disclosed company data for traditional pipeline (incl. LNG) suppliers to Europe in 2015, based on export ambitions (Russia LNG supplies in 2015 based on Argus Connection); Cedigaz [2008] for other LNG suppliers in 2015.

In Figure 7.10 above, the market shares of the various gas suppliers to both the Atlantic LNG Basin (the US and the LNG-importing countries in Europe) and Europe are shown. The bottom line in this figure is that the market structures of the Atlantic Basin and Europe and the market shares of the players on these markets differ substantially amongst one another. For example, Russia has a large share of the European market as a whole but plays no role at all in the Atlantic Basin market directly. Conversely, Qatar plays a significant role in the Atlantic Basin market today but will enlarge its market share significantly by 2015 when its new liquefaction plants come on-stream. The available LRMC information for the various supply routes to Europe and the US from a range of *existing* pipeline and LNG suppliers is combined with the figure above to provide a rough estimate of market power in figures 7.11 and 7.12 below.

Figure 7.11 The Lerner index for the Atlantic Basin market for LNG

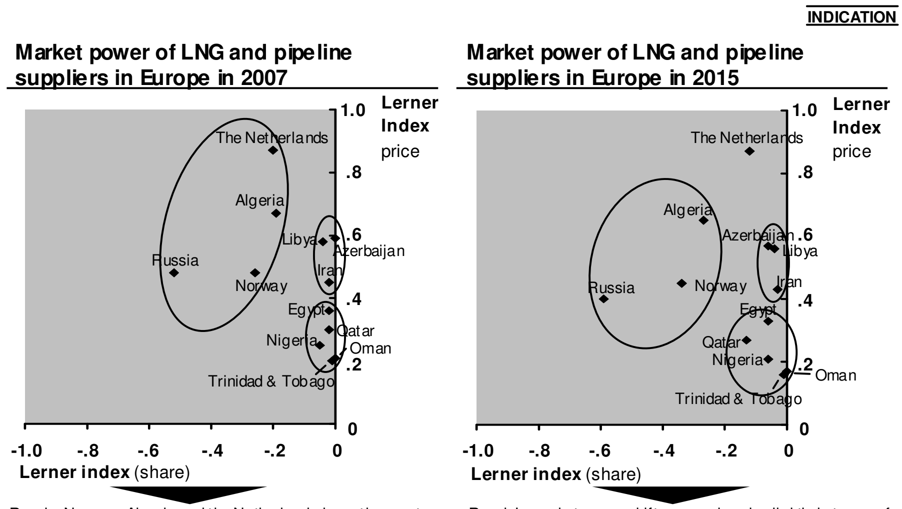


Source: own analysis, IEA [2008] for 2007; CIEP [2008] and privately disclosed company data for traditional pipeline (incl. LNG) suppliers to Europe in 2015, based on export ambitions (Russia LNG supplies in 2015 based on Argus Connection); Cedigaz [2008] for other LNG suppliers in 2015.

Market power can be measured in terms of price and marginal costs as well as in terms of market shares (see Chapter 4). This is done on a regional basis level (i.e., European market) as well as an interregional level or Atlantic Basin level in Figure 7.10. An interesting observation is that in terms of market share, using the Lerner yardstick, LNG players such as Nigeria and Algeria are pushed aside in 2015 by Qatar in the Atlantic Basin, where it gains immensely in terms of market power as measure by market share in that basin. In other words, Qatar gains in terms of market power in a market where the European LNG importers and their LNG import shares are assumed to form one single market together with the share of LNG imports on the US side (Qatar attains a Lerner value of 0.21 in 2007, but this figure rises to 0.85 in 2015), while Algeria's market power decreases from 0.62 to 0.35, as indicated in Figure 7.11 above. In terms of market power when using the price yardstick, the changes from an interregional perspective are only slight when comparing 2007 with the projections for 2015, except for Qatar's giant push between 2010 and 2015.

At the regional European level, refer to Figure 7.12 below, Qatar plays an almost insignificant role in terms of market share in 2007 (0.02), improving slightly to 0.13 in 2015. By contrast, Russia has a Lerner index of 0.48 in 2007 when measured by price-cost margin and 0.52 when Lerner is measured by market share, making it a significant player in the European market. When its future increased LRMC (because of costly investments in new, greenfield supply sources) are factored into the price-cost margin index, the Lerner value falls from 0.48 to 0.40. In terms of market share, though, Russia's Lerner index rises from 0.52 to 0.59 because it brings on-stream more volumes to the European market.

Figure 7.12 The Lerner index for the European gas market



- Russia, Norway, Algeria and the Netherlands have the most market power in terms of both market share and price-cost margin
- Some important LNG exporters play only a marginal role, e.g., Qatar, Nigeria and Trinidad & Tobago

- Russia's market power shifts upwards only slightly in terms of share and actually falls by price-cost margin, similarly for Algeria and Norway
- The roles of Qatar and Egypt become somewhat more important

Note: other indigenous EU producers are not incorporated, because they do not export.
Source: own analysis, IEA [2008] for 2007; CIEP [2008] and privately disclosed company data for traditional pipeline (incl. LNG) suppliers to Europe in 2015, based on export ambitions (Russia LNG supplies in 2015 based on Argus Connection); Cedigaz [2008] for other LNG suppliers in 2015.

Thus in a sense, Russia and Qatar are fully complementary, because on the interregional side Qatar is set to become the most important player in terms of market power, already being a significant player today while Russia plays no role yet whatsoever at the interregional level. Conversely, Russia has a strong position in the European market and will continue to build on that while Qatar plays only a marginal role from this perspective. It is worth noting that in both markets and towards 2015, Algeria remains a significant player by all accounts, while interestingly the Netherlands actually has almost as much market power in the European market as Norway and Algeria, when comparing the price-cost margin component of the index with the market share component of the index. Libya is an important regional gas exporter to Europe in terms of price-cost margin (0.4) despite its low level of production.

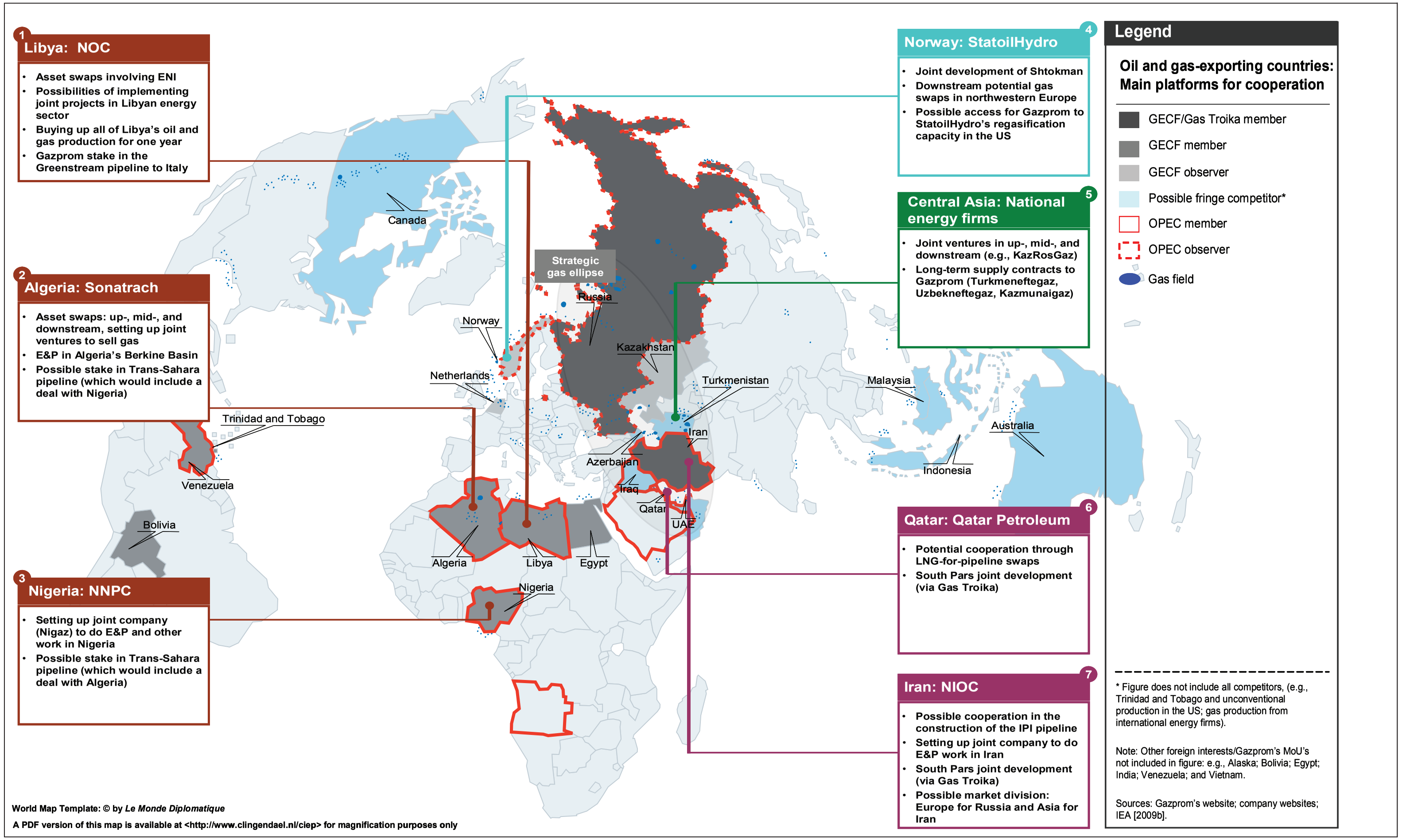
7.8 The GECF and the 'Gas Troika'

Ultimately, also part of Russia's integrated gas strategy is company and state-level cooperation with other gas-exporting countries, as evidenced by the increased substance of the GECF and the establishment of a so-called 'Gas Troika' (in Chapter 8, these will be referred to as horizontal energy diplomacy at the state level). Only in recent years has collusion in the interregional gas market become a topic of discussion. Empirical attention is paid to the GECF and the Troika in this chapter, while Part IV aims to further investigate the scope and shape of potential cooperation amongst gas-exporting countries. For an overview of the GECF and Troika membership, as well as commercial cooperation at the project level between Russia and key gas-exporting countries, see Map 7.1 below.

For a number of years the GECF was perceived as a 'talking shop' or forum, dismissed as an organisation with little to no coherence and one in which Russia appeared not to behold any interest. Until recently the lack of a real decision-making body led the GECF not to be taken seriously as an influential body in the gas market [Hallouche 2006]. From early 2006 onwards, however, when Russia and Algeria began discussing further cooperation in the form of asset swaps against the backdrop of the Ukraine gas row with Russia, the organisation began to gather attention in the broader media. Meetings of the GECF have since been labelled as 'gas-OPEC' meetings, and by extension referred to as a gas cartel in the making. In early 2007, Stern even referred to the excessive media hype surrounding the GECF as a "media furore" [Stern 2007]. Many observers in and outside the gas industry, including policy-makers and academics, argue that a gas cartel could never possibly succeed due to the nature of gas trade; others claim that the GECF already embodies such an organisation.[377] Whatever the validity of their arguments, attention to and developments in joint ventures and cooperation between the various gas-exporting countries have gained momentum. From an economic as well as a political point of view, gas-exporting countries, including Russia, may indeed desire joint management of supply capacity and trade flows [CIEP 2008]. The various gas-producing and exporting countries which are members of the organisation have nevertheless expressed diverging visions of the functioning and purpose of the GECF.

[377] For some articles on the matter see for example [Forbes 2009], [Gas Matters 2009].

Map 7.1 GECF, OPEC, selected shared investments and cooperation along the gas value chain



The GECF

The GECF was founded in 2001. The member states of the GECF together hold around two thirds of the world's gas reserves. The GECF member states include Algeria, Bolivia, Egypt, Equatorial Guinea, Iran, Libya, Nigeria, Qatar, Russia, Trinidad and Tobago and Venezuela. Observer countries include Kazakhstan, Norway and the Netherlands; refer to Map 7.1 above for a complete overview of both the GECF member and observer states. Though long seen as an informal club with little to no cohesion, which Russia was reticent about taking part in [Hallouche 2006], the GECF has gained much traction since 2006 and, in December 2008, decided to transform into an international organisation [IEA 2009b]. The GECF helped catalyse the formation of a working group led by Russia and Algeria,[378] which sought to resist EU attempts to ban destination clauses that prevent buyers from reselling gas [Barnes et al. 2006]. The organisation became more formal with the set-up of a secretariat in late 2008 and the election of a secretary general in mid-2009, taking office in March 2010.

According to its mission statement, "[t]he GECF was set up with the objective to increase the level of coordination and strengthen the collaboration between member countries. The forum also seeks to promote dialogue between gas producers and consumers" [GECF 2009]. Indeed, a theme within the GECF has been to examine pricing formulas that link gas prices to oil and how to 'de-link' the pricing of these two strategic commodities [Bahgat 2009]. The group had several significant meetings in 2006-2008, most notably one which involved the formation of a high level 'pricing group' (see below). The potential of the GECF as a pricing group was demonstrated by the implicit cooperation between sellers of Middle East LNG into Japan and South Korea over 2006-2008, when none broke the line on relatively strict oil price indexation [WGI 2009k]. Cooperation between gas-exporting countries is aimed further at recovering for gas the same or greater value per unit of energy as oil, i.e., what they perceive to be the intrinsic value of their gas resources.

The aspect of differences of opinion over the charter appears to reflect some disparity between the interests of the member states.[379] Sergei Shmatko, Russia's minister of energy said in 2009

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[378] In 2007, the member states accounted for 36 percent of total gas production, which is expected to rise to 42 percent in 2030, according to the reference scenario of the IEA [2008b]. Together, they are responsible for almost 50 percent of the total exports [IEA 2009].

[379] Venezuela and Iran, for example, favour a charter resembling that of OPEC, while Russia and Qatar wish to avoid allowing the GECF to resemble OPEC and appear to take a more commercial position rather than a political anti-Western one. Russia, Iran and Algeria appear ready to attempt coordination of long-term gas development and marketing strategies through the GECF [WGI 2009b]. Certainly one of the more hawkish countries within the GECF, Algeria openly advocates an organisation that calibrates long-run gas supplies to avoid large oversupplies over the long-term. Algeria became the first gas-exporting country to advocate the formation of an 'OGEC' in order to duplicate OPEC's past ostensible successes [Davis 1984]. Putin claimed that "we do not intend to set up a cartel, but I think it is right to coordinate our activities;" in February 2007, in an address to the Duma, he said "we do not reject the idea of creating a gas cartel," also saying that the idea of creating "a 'gas OPEC' is an interesting idea. We will think about it" and the "era of cheap energy resources, of cheap

that "energy and gas markets are such that no one of the participants can go on its own way. It is necessary to seek ways to enhance cooperation and coordinate activities based on mutually accepted principles. These countries will be able to find a wise balance between competition and harmonisation of their energy policies" [WGI 2009b]. Algeria's energy minister, Chalkib Khelil called in March 2010 on other gas-exporting countries for a coordinated effort to restrict gas production amidst historically low spot prices in Europe and the US [Financial Times 2010a]. At the GECF meeting in Oran, Algeria, on 19 April, 2010, a recent meeting as of this writing, the GECF countries agreed to "continue to support the linking of gas to oil parity" [WGI 2010e] in light of the oversupplied market from 2009 onward. Algeria's proposal to attempt a reduction in gas production to limit spot volumes was rejected by Russia and Qatar on the grounds that it may lead to a loss in market share, amidst Russian calls for the support of long-term contracts [WGI 2010e].

Against the background of the 2008-2009 global economic and financial crisis, Russian and Qatari gas delegations met ahead of the April 2010 GECF meeting and expressed their commitment to greater coordination and agreed to come up with a strategy to minimise price competition out to 2025, according to Russian reports [WGI 2010d]. Russia and Qatar both agreed to *explore* the idea of increased coordination in the interregional gas market in early 2007 [The Moscow Times 2007].[380] According to some sources, both of these important players have at least agreed to avoid competing for market share [WGI 2009e], a commitment which was strengthened in early 2010 [WGI 2010d]. Both are important suppliers by pipeline on the one hand and LNG on the other, and are thus critical to interregional gas flows, appearing more explicit and motivated to cooperate openly because of the onslaught of the regional and interregional gas oversupplies.[381] Both countries reiterated their intent on gas trading, competition and potential cross investment, explicitly including the development of gas reserves in Russia's Yamal peninsula and Qatar's North Field [WGI 2010e].

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gas, is of course coming to an end" [RIA Novosti 2007c]. In his speech, Putin continued with the idea that "at the first stage, we agree with Iranian experts, partners and some other countries which produce and supply hydrocarbons to world markets in large volumes. We are already trying to coordinate our actions on developing markets and we intend to do so in the future" [RIA Novosti 2007c]. Valery Yazev, head of the Duma Energy Committee, has been of the most fervent advocates of creating a gas OPEC. Then Russian Energy and Industry Minister Viktor Khristenko dismissed suspicions of establishing a gas cartel: "a decision on forming a gas cartel has not been adopted" [RIA Novosti 2007b].

380 Mr. Attiyah, Qatar's minister of energy and industry (see Section 7.2) also expressed similar ambivalence: "forming a gas cartel would be difficult, but it cannot be ruled out," quoted in [Bahgat 2009]. There is thus no clear vision of how or what cooperation would look like from the view of political leaders.

381 When the Russian and Qatari gas delegations met, Putin was quoted as saying "[w]e have a common vision that Russia and Qatar have significant resources to intensify cooperation and can do a lot in this direction. […] The new agency [the GECF] is now making its first steps, and we are interested in it as a really operational, effective instrument for coordinating the global gas market" [WGI 2010d].

Russia appears more interested in avoiding intense LNG competition and cooperating with LNG producers to swap LNG for pipeline gas in optimising short-term trades.[382] Unlike Algeria and Qatar, which have export flexibility and diversity, owing to LNG, Russia is attached to both long-term contracts and oil indexation as necessary underpinnings for capital commitments to new projects and domestic infrastructure. During the April 2007 Doha meeting of the GECF, Russia also supported the formation of a high-level pricing group within the GECF to study a common approach to pricing (particularly in view of the great worldwide disparity in gas prices at the time) [The Moscow Times 2007].[383] This view is particularly influenced by the idea that the EU acts as a monopsony buyer of Russian gas. Qatar's position is characterised by an interest limited to tracking other exporter's efforts to enter the LNG market, keeping itself informed of intentions of future market entrants in terms of capacities, especially those eyeing LNG investments [WGI 2009b].[384]

A core group within the GECF: the 'Gas Troika'

In what has been called an effort to further reshape the GECF, Russia, Iran and Qatar established the Gas Troika (or simply, the Troika) in late 2008 (these are the largest gas reserve-holders, holding more than half of the world's gas reserves [BP 2009]). The aim of the Troika is, at least officially, to hold up to four meetings annually to discuss gas policy, including cooperation between the three countries, covering exploration, gas processing, transportation and sale of gas in an effort to create to "create a fair market for producers and consumers" and discuss "the most important gas market developments that are of mutual interest" [PIGR 2008f]. According to Gazprom, the Troika is to act as a "locomotive" for the GECF, which suggests the spearheading of the three largest gas reserve-holders in shaping long-run gas market developments [Nefte Compass 2008].[385]

While Russia and Qatar both prefer to avoid the term 'cartel' per reference to the Troika, Iran claims that the Troika is a successful attempt at reaching "consensus to set up a gas OPEC" [MEES 2008a]. At sub-regional and regional levels, the Troika may act as a core group, or 'locomotive', in Gazprom's terms, where the most important decisions are taken that affect the

[382] Russia wants 15 member states of the GECF to adopt a charter that will enable them to hammer out a universal pricing formula, coordinate construction of new pipelines and use spot deliveries to compensate for possible shortfalls in long-term supply contracts. Russia's draft charter is less stringent than Iran's proposal [The Moscow Times 2008].

[383] Inadvertently, the Soviet Union, the Netherlands and Algeria raised gas prices jointly when faced with the issue of pricing at or above or under crude parity during the 1980s and 1990s, which is at a more regional level [Hayes 2006].

[384] Qatar is more reticent about the GECF and the Troika, never having fully embarked on the latter, and seeing the GECF as a "forum with different thoughts and challenges" [WGI 2009d].

[385] According to Gazprom's annual report the 'Big Gas Troika' is designed to "coordinate energy policies of the powers that jointly account for some 60 percent of the global natural gas reserves [which] will contribute to the reliability and stability of energy resources supplies in the whole world" [Gazprom 2009a]. Gazprom's CEO, Miller, explains that the purpose of the Troika is to "discuss the most important and mutually interesting issues of gas market development… We hope that this meeting can help establish cooperation and be a locomotive for activities of the gas exporting countries in a formal organisation" [MEES 2008a].

largest pipeline gas and LNG flows in different regions while other members of the GECF and non-members act more as followers, either cooperatively or as a competitive fringe. Qatar and Russia have discussed bilateral swaps or trilateral investments also involving Iran (also see Section 7.2 and Chapter 6), all ostensibly aimed at curtailing long-run competition and maximising profits [WGI 2008f].

Together with Algeria, Iran, Qatar and Russia form the political and economic core of the GECF [IEA 2009b]. For example, Iran and Russia may cooperate on a shared pipeline to any imaginable market, agreeing with Qatar on a certain long-term level of supply, while LNG from any other imaginable third party gas exporter acts as a competing source of gas in that market. While this possibility is not explicitly pursued in the cases, it is however implicit in the sense that shared investments may compete with individual projects from other countries. The Troika may be more a political phenomenon than strictly economic. In any case, the Troika is "likely to have a strong influence over the path that the Forum will follow only from a political point of view as Iran is not going to become a significant gas exporter for many years" [IEA 2009b, p. 43].

Not a "gas OPEC" in the making just yet

As long ago as 1984, it was foreseen that the constraints of supply distribution in the US and Europe will necessitate an increasing reliance on natural gas from Russia and Central Asia or from countries that are either members of or are ideologically aligned with OPEC [Davis 1984]. Algeria was the first to propose cartelisation of the gas market during the 1960s. Today, the energy ministers in the GECF know each other personally through OPEC, which strengthens their potential cooperation on gas issues [Hallouche 2006]. Algerian Energy Minister Khelil has said that "in the long-term we are moving toward a gas OPEC… It will take a long time" [The Moscow Times 2007]. Nevertheless, for now, a direct comparison between OPEC and any form of cooperation in the interregional gas market is erroneous.

With the current structure and functioning of the interregional gas market, exporters' short-term abilities to limit production are constrained by the predominance in the gas industry of long-term take-or-pay contracts. Cooperation in the gas market is unlikely to involve the control of output or influencing prices in the same manner as OPEC does [Bahgat 2009]. The functioning of a group examining the common interests of gas exporting countries (e.g., GECF, the Troika) is not the same as a quota-based OPEC, which regulates prices in a global and liquid oil market [Jaffe and Soligo 2006; Zhiznin 2007]. The term "gas OPEC" is inappropriate in serious professional discussions about the topic of cooperation in the gas market

[Feygin and Revenkov 2007].[386] There is no mechanism by which the GECF, or Troika for that matter, can restrain production in the short run. Even Khelil concedes that the GECF is "more forward looking. It cannot control the volumes and price for the next ten years because it's locked into long-term contracts and also the price of gas is locked to oil" [IEA 2009b, p. 43].

The complexity of the interregional gas market and the gas value chain, both for pipeline gas and LNG projects and the requirement of long-term stability of flows are an important driver for tacit cooperation and an impediment for formal cooperation. These factors decrease the possibilities of OPEC cartel-like behaviour from the perspective of an interregional gas market [IEA 2009b]. Indeed, an opportunity for gas-exporting countries to create some form of capacity distribution and/or allocation is imaginable [Van der Linde 2005b]. In the Atlantic Basin especially, LNG exporters have an incentive to cooperate [Wagbara 2007]. It should be noted that the GECF has been keen to see long-term contracts maintained in order to assist with the underwriting of large capital projects and to provide stable incomes to its members [Bahgat 2009].

Indeed, "a more likely focus of GECF deliberations is the changing structure and supply of gas markets over a ten- to fifteen-year horizon, i.e., towards 2020 and beyond […] While the imperative to keep gas competitive with other fuels would still provide a formidable obstacle to any short-term market manipulation, the GECF could look to coordinate medium-term investment plans among its member countries" [IEA 2009b, p. 43]. This is a fundamentally different functioning than typical OPEC, cartel-type behaviour, which involves formal collusion by quota administration, on a short-term rather than a long-term basis. Stern points out that the overall message about the functioning of the GECF, primarily from Russia, is that "rather than control of export prices and volumes, what is under discussion is the possibility of cooperation and coordination between gas exporters principally to prevent competition" [Stern 2007].

In other words, gas-exporting countries may have room for *collusion* as a form of cooperation rather than outright cartelisation, in light especially of the nature of gas trade. Gas-producing and exporting countries may decide to further alter the GECF principles and its institutional character in order to protect their (market) interests [Zhiznin 2007]. The effects of the demand destruction may compel or even force gas-exporting countries to cooperate in one way or another, especially in the face of low short-term gas prices and their pressure on long-term, oil-indexed contracts. The economic and geopolitical reasoning behind greater cooperation

[386] Important contributions to this debate were made amongst others in Hallouche [2006], Wagbara [2007], Finon [2007], Stern [2007], Jaffe dand Soligo [2006], IEA [2009b].

between gas-exporting countries is dealt with in chapters 10 and 11, respectively. This topic is covered further in Chapter 10.

7.9 Conclusion

The internationalisation of various key and potentially pivotal gas-exporting countries and their NEFs will shape the future geography of the interregional gas market, both by pipeline and LNG. It is mainly from within the outer integrators that a great bulk of future interregional gas flows will originate by means of LNG. Each country has its own gas export ambitions and strategy, with domestic needs and constraints invariably acting as an important constraint on these ambitions. Also, the various countries differ substantially in terms of vertical integration, extent of cooperation with IEFs and sales strategies. Indeed, in some cases domestic needs are projected to exceed export potential. In the aftermath of the financial and economic crisis of 2008-2009, some countries' gas export and sales strategies may be profoundly affected by the fall in gas demand worldwide (and the development of unconventional gas in the US).

A trend that should not be overlooked is Gazprom's appetite for cooperation with foreign NEFs, particularly in North Africa and Nigeria, amongst others. Possibilities for cooperation also exist with Iran and Qatar, though deeper cooperation with Iran is a longer run prospect. In most cases, the pattern of Gazprom's investments along the value chain in Nigeria, Libya and other countries fits the broader trend of greater, long-term cooperation betweens NEFs. For the time being, there appears to be a clear difference between Gazprom's approach to regional gas exporters to the European gas markets (e.g., Libya and Algeria) and truly interregional exporters such as Qatar as far as joint projects are concerned.

The asymmetric pipeline and LNG flows to various regional rather than a global gas markets bears witness to the rigid nature of the interregional gas market (especially when compared to the oil market). Drawing the inner integrators into this conclusion, the long-run balance between flows in the form of pipeline gas flows from the inner integrators on the one hand, and LNG flows from the outer integrators on the other, will help shape regional gas market structures. This is the case at least in theory. In practice, a number of challenges ensure that a great deal of these flows have not yet and will likely not materialise for the foreseeable future. In the medium term, towards the late 2010s, Russia will expand exports mainly by pipeline while Qatar will continue to pursue LNG exports in its multi-market strategy. In the long run, these two gas market integrators are–based on observations concerning existing and potential market power–capable of balancing a future interregional gas market by both pipeline and LNG, where economies of scale will play a key role. To one degree or another, and pending the resolution of a number of conundrums, Iran may well be able to join this small group of countries able to profoundly affect regional gas market structures. While these uncertainties remain, important gas-exporting countries are pursuing a number of joint projects, both regionally and more globally.

Parallel but not strictly related to more on-the-ground cooperation in the form of projects, these countries have also given further shape to the institutionalisation of cooperation in the interregional gas market. The main vehicles for this cooperation are the GECF and the Troika. These vehicles can hardly be compared to OPEC, but rather, mirror an effort to find common ground in the face of the myriad developments in a dynamic and uncertain interregional gas market. What type of cooperation is likely to arise in the long run and how the institutions mentioned above are likely to continue to evolve, depends to a large extent on the evolution of the interregional gas market, in particular as it shifts from one phase of development to the next (i.e., towards more interregional expansion). As the interregional gas market continues to expand over the medium to long term, up to and beyond 2020, incentives for increased coordination of some sort appear warranted.

PART III

Chapter 8

A real-option game approach to valuing gas value chain investments*

8.1 Introduction

The merit order of investments in Russia's large gas resource base will shape the future of regional markets and the interregional gas market for decades to come. In order to assess what factors have an impact on gas infrastructure investments and to define this merit order, a hybrid approach is employed in this research, consisting of a qualitative and a quantitative framework. Capturing the full value creation in an uncertain and competitive environment requires valuation tools from corporate finance theory that can be integrated with the ideas and principles of strategic management theory and industrial organisation. The goal is to ultimately value investments under market uncertainty and competition [Smit and Trigeorgis 2004].

The qualitative framework is essentially a 'toolbox' of concepts, while the quantitative framework consists of an application of the stylised real-option game model developed by Smit and Trigeorgis [2004]. The quantitative framework aims to value strategic investments in gas infrastructure, linking this valuation process with market structures and outcomes in the commodity market. The market outcomes determine the nature of competition as well as the boundary solutions for cooperation, which in turn influence the timing of investment decisions (and thus also the merit order). A stylised model, in this sense, is insufficient to explain the complex decision making in gas infrastructure. The model is centred on the notion of a volume-driven strategy through transport capacity extensions. Therefore, the toolbox acts as a supplement to the quantitative approach in that it aims to cover aspects and/or factors, which cannot be analysed directly in the quantitative approach. These include market structure, volume and price uncertainty, likelihood and nature of competition, general investment climate, transit and geopolitical factors, regulatory uncertainty, amongst others.[387] Prices will be discussed in a qualitative manner.

As was described in Chapter 6, Gazprom aims to become an increasingly interregional gas exporter rather than merely a regional one. The company aims to do so both by means of newly

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* This chapter was co-authored with Tom Smeenk.

[387] Russia's gas export path-dependency and how it influences Russia's current strategy is also taken into account in the conceptual approach.

emerging pipeline gas as well as LNG exports to new regional gas markets. For vertically integrated companies, infrastructures such as pipelines and LNG trains (i.e., the midstream gas transportation components of the value chain) act as options to gain access to new markets or consolidate positions in an existing one. In addition, in the case of long-distance transport in general, the largest part of the total costs in the value chain is located in the transport component. Therefore, the economies of scale in this section help decrease the average cost of gas vis-à-vis competition both in relative and absolute terms. This relative cost advantage can endow gas infrastructure with a certain strategic value with regard to possible competitors, i.e., entry deterrence. Downside demand risk, amongst other factors, may encourage a wait-and-see approach. As a result, the corresponding investment decisions involve a trade-off between the values of postponement and pre-commitment [Smit and Trigeorgis 2004].

The quantitative model finds its foundations in a combination of game-theoretical concepts and corporate finance-oriented project valuation, in particular using real-options. Together with the conceptual toolbox, these are used to ascertain the value of a strategic investment from Gazprom's point of view. Section 8.2 is an overview of the three-step theoretical foundation for the real-option game model in valuing gas transport infrastructure, consisting of the Discounted Cash Flow (DCF) approach, real options and a game theoretical approach to entry deterrence. Section 8.3 is an overview of the conceptual toolbox while Section 8.4 contains the real-option game model developed by Smit and Trigeorgis [2004]. Section 8.6 contains an appendix to the information presented in this chapter. The content of this chapter is based and has been verified by interviews with experts.

8.2 Valuing gas transport infrastructure: Theoretical underpinning

Entry deterrence models are a key topic in game-theoretic thinking.[388] A possibility in sequential games is for one player to act early, investing in capacity on big scale so as to deter potential entry of rivals or establish a strong market position in general. An important feature of this research is that firms are able, if they choose to, to make strategic pre-commitments in order to alter the conditions of future competition in a manner that is favourable to them. Entry deterrence and the sunk costs associated with certain 'strategic' investments are by definition a multi-period phenomenon. These investments are strategic in that they are not designed purely for cost-minimisation purposes, but also for deterring entry by possible entrants [Tirole 1988]. For the firm, acting strategically early on, i.e., creating a first mover's advantage, it may deter entry because it becomes unprofitable for the entrant to invest. These investments could

[388] Game theory, as a branch of mathematics and economics, has allowed for the study of the behaviour of economic agents in a broad range of economic phenomena such as bargaining, market entry, and conflicts of interest amongst many others. It has also served as a useful instrument in analysing the strategic behaviour of agents in non-economic circumstances. For an introductory text to game theory, see for example Dixit and Nalebuff [1991].

alter the structure of the market at some future point or to draw the structure of the market to their advantage [Schmalensee 1988].

Long-term contracts in the natural gas industry, the economies of scale involved and the capital intensive nature of the gas industry call for strategies that involve long-run investments with long-run potential to affect access to a market. Of particular interest in this framework are two-stage models involving strategic investment with sunk costs, such as the pipelines in the natural gas industry and other natural gas transportation infrastructure such LNG liquefaction, re-gasification terminals and tankers. The importance of existing contracts, which are used to underpin these infrastructures, may lie less in the benefit of their enforceability but, rather, in their ability to tap a first-mover advantage. In addition, existing relationships through sunk infrastructural costs act as a deterrent to others [Barnes *et al.* 2006]. One should hasten to add that in a dynamic context, a firm might want to 'pull its punches' because an aggressive action or long-term commitment by an opponent will induce it to behave likewise [Tirole 1988].

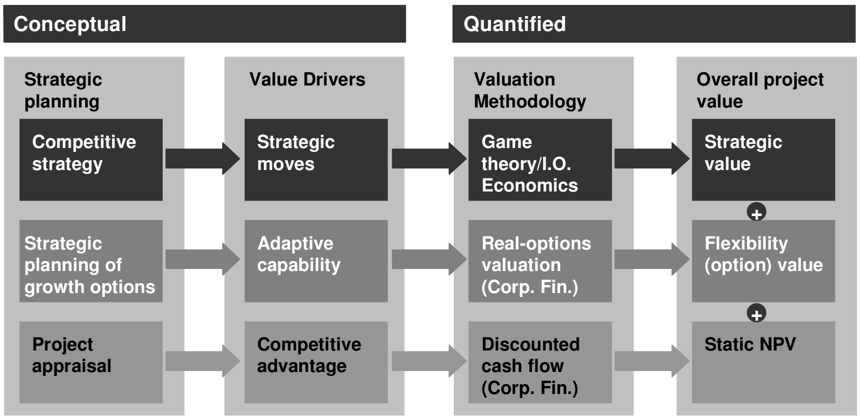
As Colell *et al.* [1995] note, in two-stage models, entrants must sink fixed costs prior to competing. While in one-stage models players can compete for sales while retaining the option not to sink these costs if a player does not make any sales. These types of investment enable firms to make use of capacities, or transport capacities in the case of natural gas markets. The aim in this setting is to show that in the natural gas industry it is possible to deter or pre-empt other suppliers by making such investment or sunk costs. An incumbent in one natural gas market can reduce the scale of entry of a rival firm, which is a barrier to mobility [Caves and Porter 1977]. The key aspects of sunk costs in models of industrial organisation are their commitment value. If the capital investment is to have commitment value, then the capital investment must be somewhat difficult to reverse [Tirole 1988].

Because few investment opportunities exist in a vacuum, they must be considered in their strategic and competitive context [Smit 2003]. We therefore argue that in order to ascertain the overall value of gas transport infrastructure, account must be taken of both demand uncertainty and possible competition through a strategic-economic approach. The real-option game model, developed by Smit and Trigeorgis [2001], is a two-stage entry deterrence model that captures, from an incumbent's perspective, both the aspect of potential entry and the prevailing uncertainty in gas market demand. This real-option game model, as the name suggests, also discounts the overall value of gas transport infrastructure to the beginning of the game as a function of market outcomes at the end of the second stage. The framework of the real-option game is based on three levels of planning that have an effect on the overall value of a firm's project:

- the project appraisal from corporate finance, which aims to determine the effect on the net present value of the projected cash flows resulting from the establishment of a competitive advantage. It assumes that all operating decisions are set in advance and defines an investment decision as a 'now or never' choice [Shapiro 2005; Smit and Trigeorgis 2004].
- the strategic planning of growth opportunities, which aims to capture the the flexibility (option) values, resulting from the firm's adaptive capabilities through real-option valuation [Smit and Trigeorgis 2004].
- the competitive strategy, which aims to capture the strategic (commitment) value[389] from establishing, enhancing, or deferring a strategic position vis-à-vis possible competitor(s) based. This value is derived using game theoretic analysis and the industrial organisation economics. This approach captures the notion of an early mover's advantage.[390]

Thus by integrating real-options valuation with game-theoretic principles, we can make a more thorough assessment of strategic growth options value in an interactive, competitive setting [Smit 2003]. See Figure 8.1 below for schematic overview.

Figure 8.1 Impact of business strategic planning on the overall project value



Source: adapted from Smit & Trigeorgis (2004).

[389] The sub-components, which make up the strategic value, include the direct, and the strategic reaction and pre-emption values (achieving economies of scale, and influencing a potential competitor's reaction and market structure, respectively).
[390] In a duopolistic setting with only two players, say an incumbent and a potential entrant, an incumbent is able to affect the entrant's ability to and profitability in entering a market by committing to that market through an early strategic investment. Sunk costs in models of industrial organisation have a high commitment value. If the capital investment is to have commitment value, then the capital investment must be somewhat difficult to reverse (Tirole, 1988). One should hasten to add that in a dynamic context, a firm may want to 'pull its punches' because an aggressive action or long-term commitment by an opponent will induce it to behave likewise [Tirole 1988].

The framework above takes a step towards closing the gap between traditional finance theory and strategic planning [Smit and Trigeorgis 2001]. Given demand uncertainty and possible actions taken by entrants, a firm may thus choose to invest early (pre-commitment) to pre-empt a potential competitor. However, a fundamental aspect of the real-option game approach is that the combination between downside demand risk and potential entry may in, various scenarios, warrant a wait-and-see approach, i.e., a postponement of investment in gas transport infrastructure. As a result, the corresponding investment decisions involve a trade-off between the values of postponement and pre-commitment [Smit and Trigeorgis 2004]. According to Smit and Trigeorgis [2004], the decision to invest in accordance with the aforementioned three levels of planning is therefore based on an overall NPV criterion that integrates the strategic and the flexibility value. Both values pertain to the impact on profitability of demand uncertainty and competitive interactions.

In line with the real-option game model as developed by Smit and Trigeorgis [2004], we can distinguish between the value of *having a strategic option* to compete (strategic 'option-game' value) and *foregoing* this option to compete now (the value of the option to postpone strategically). The strategic (option-game) value is the value of 'contingent' strategic investing commitment. Hence exercising this strategic option means committing oneself, and *not* exercising the option to postpone strategically. The strategic (option-game) value includes the option value of postponing commercial investments after committing.[391] This implies exercising the option to postpone means postponing to commit oneself, waiting-and-seeing strategically. Collectively, these values are an addition to the traditional direct (static) NPV, which is equal to the expected cash flows from investing immediately, that is:

The overall net project value = 'direct' (static) NPV + flexibility (option) value
+ strategic (game-theoretic) value (8.1)

The value components of expression (8.1) are illustrated in Figure 8.1. A firm should invest in a strategic project when the total sum of the overall net project value is positive, whereby the strategic option-game value is higher than the value from the strategic option to postpone (of making a strategic investment).

The strategic commitment and postponement values

Non-regulated gas markets infrastructures, such as pipelines and LNG trains, hence act as options for vertically integrated firms in to gaining, maintaining or expanding access to new

[391] This option is a so-called embedded option, i.e., managerial flexibility at a tactical level (see Chapter 3 in Smeenk [2010]). In practice, managerial flexibility exists when a decision is taken to proceed (or not do so) with the installation of compressor facilities, after an initial pipeline investment has been made.

markets or consolidate positions in existing ones. Thus for vertically integrated gas firms, producer's commodity trade largely ensures midstream investments. In order for this to be the case, it is the exclusive ownership of the capacity (i.e., no TPA), which ensures that these investments may be seen as an option today in order to expand commodity trade in the future. The model, which will be discussed in the next sections, focuses on this specific case of strategic and irreversible investments in a competitive, uncertain environment. The emphasis in the model lies on the value of the option to postpone strategically versus the strategic (option-game) value. Given the uncertainty of the value of the underlying assets, i.e., profits from demand, and potential entry, an early commitment provides a strategic option on future growth. When no early commitment is made, no option on future growth is created. By committing early, an incumbent creates an option that potentially enables it to capture intrinsic value over time by anticipating possible entry. Alternatively, a certain value derived from the option to postpone strategically is present whenever any combination between downside demand risk and the scale of entry potentially proves to be detrimental to the value of the underlying asset, a so-called wait-and-see value.

8.3 Whether or not to invest strategically: A conceptual toolbox

The conceptual toolbox is essentially a supplemental instrument to the model in Section 8.4. The combination between the toolbox and the model is employed on the basis of various levels of geographical analysis, and in different parts of the gas value chain, especially gas transport infrastructure, with a focus primarily on export strategy and market orientation. Gazprom's investment strategy will be the empirical focus point. This involves exploring and prioritising Gazprom's investment programme. It provides an overview of Gazprom's (historical) growth opportunities in relation to the export markets, which in the various cases can consist of countries and sub-regions such as Northwest Europe or a combination of these. Given the various market expansions in terms of demand and import-dependency, there are certain export growth options involved, which are subject to a range of complexities. This section develops a conceptual toolbox, which accounts for such complexities, i.e., a range of factors not accounted for in the model included in this section. It is therefore designed as a bridge between the quantitative approach and the real world.

8.3.1 Some definitions

Before embarking on a description of the conceptual factors influencing strategic investment decisions, it is necessary to first review a number of definitions with regard to value chain investments:[392]

[392] These definitions are originally used by Smit [1996] and Smit and Trigeorgis [2004] and adapted to fit the conceptual framework of the natural gas industry.

- *Economies of scale:* According to Smit [1996], so-called value drivers can result from strategic investments (see below), ranging from absolute cost advantages to developing innovative products as well as capacity expansions possessing (enhanced) economies of scale. In the case of natural gas, LRMC are a key determinant of market power and can be brought to fruition in different sections in the value chain. The LRMC are theoretically determined mainly by economies of scale upstream and in transport (and also include other costs such as transit fees). While economies of scale bring down unit costs, it depends in practice on the utilisation rate of pipelines whether these unit costs are indeed achieved.

  Once infrastructures have been constructed, (especially mature) suppliers have committed themselves to market, and are set to supply on the basis of short-run marginal costs (SRMC), selling gas volumes in order to recover SRMC in the short run. We assume that these pertain to the operational expenditures made for gas transport infrastructures (see Section 8.4.5). This is pursuant to the standard short-run marginal cost definition in microeconomics in which one or more cost factors of production cannot be changed, i.e., fixed inputs [Pindyck and Rubinfeld 2001]. The capital expenditures made for gas transport infrastructures, are fixed in the short run and are thus captured by the notion of LRMC discussed above. In the long run therefore, unit costs as a whole are brought down with greater economies of scale. Conceptually, investments along the entire chain, including the upstream, are taken into account while in the model's application the mid-stream is the focal point. As is mentioned in Section 8.2, significant economies of scale in the value chain can deter entry, because an investor forces entrants to invest heavily in capacity, while still risking an aggressive response from the incumbent [Smit and Trigeorgis 2004].

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  The transmission of gas can also have significant economies of scale, especially for long-distance gas pipelines [Correljé *et al.* 2009]. In the toolbox, the economies of scale are measured conceptually from total average transportation cost per unit, encompassing both capital and operating expenditures. In the application of the real-option game model only the operating expenditures (OPEX) are used to calculate the average cost per unit in transport, i.e., excluding upstream production costs, for a strategic investment. The capital expenditures (CAPEX) in excess of what is required for a commercial investment is seen as an initial expense to be made (see Section 8.4.5).[393] As for the difference between pipeline gas and LNG infrastructures, LNG trains and ships have lower economies of

[393] Greater economies of scale are not necessarily specific to strategic investments. Commercial investments can also benefit from high economies of scale, the difference being in the load factor or utilisation of the infrastructure (as described above).

scale in terms of unit costs, only becoming economic vis-à-vis pipeline gas over longer distances.[394]

- *Strategic versus commercial investments:* For the purpose of this research, commercial projects are those which have a short technical ramp-up phase (i.e., by making the greatest possible use of capacity of ever any length of time). These are generally lower capacity infrastructures with higher average transport costs per unit (i.e., a smaller pipeline diameter). By contrast, at the conceptual level, strategic investments pertain primarily (but not exclusively) to the mid-stream segment of any given value chain, i.e., pipelines and/or LNG trains and shipping with higher capacities and thus generally lower average transport cost per unit. They are strategic only when the economies of scale resulting from their construction are proprietary to the investor and in the sense that they are made early to capture market share. During times of falling demand these high-capacity midstream projects have a greater tendency towards lower utilisation levels while in cases of strongly rising demand they are more fully and thus more optimally utilised (see Section 8.4 for the model definitions). In that light, strategic investments in LNG value chain components are also imaginable, though the relative cost reductions are less advantageous.[395]

- *Proprietary versus shared investments:* There is a difference between proprietary investments and shared investments. Proprietary investments are wholly owned and exclusive, and as is mentioned above projects can only be strategic when their use is proprietary. This pertains to pipeline cases in which both the commodity and the capacity are exclusive to the owner of the project. This can also be the case for an LNG project, where upstream liquefaction assets are wholly owned by one single company (or brought together under a joint venture, selling it gas under one single holding). By contrast in theory, shared investments result from the investment on one supplier's part in greater economies of scale whereupon it

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[394] Significant economies of scale gains have been made in the LNG value chain throughout the 1990s and 2000s, with trains and ships gradually increasing in terms of transport capacity. LNG travels longer distances at greater economies of scale than does pipeline gas while it has a higher threshold cost than does pipeline gas in being economic. Conversely, with shorter distances pipelines possess much greater economies of scale. Jensen [2004] describes the relationship between pipeline gas transport and LNG as such: "The costs of pipelining natural gas benefit substantially from economies of scale, since large diameter pipelines are not that much more expensive to lay than smaller lines but carry much greater volumes. Pipeline costs rise linearly with distance, but LNG–requiring liquefaction and re-gasification regardless of the distance travelled–has a high threshold cost but a much lower increase in costs with distance. Thus shorter distances tend to favour pipelining, but longer distances favour LNG […]. For markets with an established pipeline grid [such as the US and much of Europe], LNG can easily alter the geographic pricing relationships or basis differentials among different points on the pipeline system" [Jensen 2004, p. 7].

[395] The increase in plant (i.e., liquefaction capacity) and tanker size during the 1990s and 2000s has significantly reduced average costs. As a rule of thumb, the a plant size increase by a factor of 2 has led to a reduction of unit costs by 25 percent (e.g., from 3 bcm to 6 bcm and from 6 bcm to 10.66 bcm more recently), while a 20 percent increase in shipping capacity has led to a 5 percent reduction in shipping costs [Jensen 2004]. By that yardstick, the new 250,000 cubic meter LNG tankers reduce unit costs by 10 percent relative to 145,000 cubic meter tankers.

can be jointly used by itself and its partners (i.e., investment free rider behaviour on the part of the competitor). A shared investment in the gas industry may also be thought of as, for example, a pipeline governed by TPA rules, effectively making it a *compulsory* shared investment, robbing it of its strategic nature.

There is always a trade-off between the incentives to invest early versus waiting for a more opportune time to invest strategically.[396] According to the model, it may be better to postpone strategic investments when the value of postponement, i.e., an option to 'wait and see', is greater than the value to commit early.[397] In this sense, a strategic investment may be seen as a competitive 'disadvantage'. In addition, suppliers may choose to make a commercial investment at different phases of the game's development or defer (after having made a strategic investment or not at the beginning of the game) within the model. This is an option to wait as well, but is known as 'managerial flexibility'.

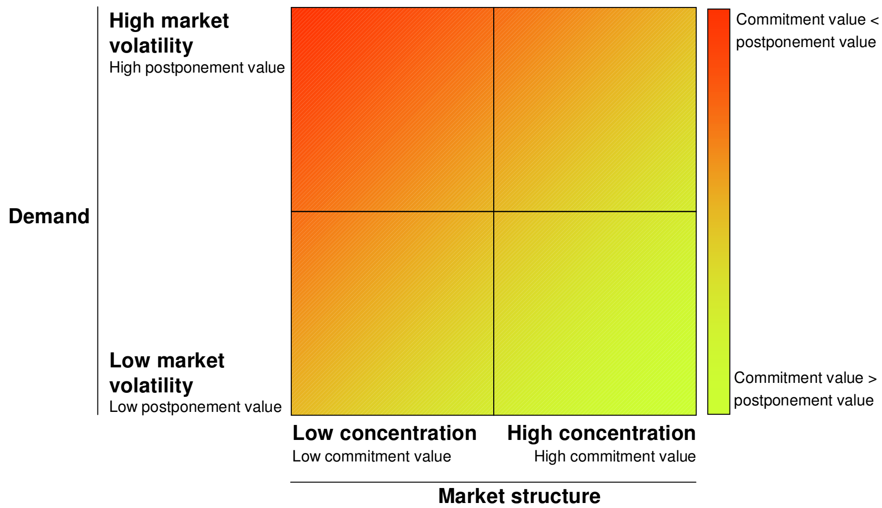
Thus, having provided some of the basic conceptual definitions above, a step-by-step sequence of conceptual factors is discussed in the following sections.

8.3.2 Market uncertainty: Volume and price risks versus likely competition

The first step in determining Gazprom's export strategy and whether or not to invest strategically is to identify possible off-take markets.[398] The matrix in Figure 8.2 illustrates the relationship between growth potential and uncertainty of demand on the one hand, and likely competition for a given market and/or shares in that market (and with that the level of concentration may vary as well) on the other. As shown in Figure 8.2, *high upside demand potential* may place emphasis on investing. Investing strategically in an early phase of market development is the case particularly in the presence of likely competition from existing players or entrants and/or when these include large potential players (see the next matrix below in Figure 8.3). Conversely, *low upside demand potential* or *downside demand risk* may do the opposite: place more emphasis on postponement value.[399]

[396] In the model, included in Section 8.3, this trade-off is captured by the commitment versus postponement values.
[397] Incomplete information can help explain why firms in practice may delay their entry beyond the breakeven trigger [Smit 2003].
[398] Given the research questions posed in this study (see Chapter 1), the focus in this study is on Gazprom's perspective.
[399] The postponement value may rise with increased upside and downside market volatility while the commitment value may also rise relative to the postponement value under increased market volatility. Ultimately, the size of the initial or strategic investment to be made ('K' in the model) may also make a large difference between killing a project or giving it a green light to proceed.

Figure 8.2 Exploring a pro-active strategy towards new off-take markets



Source: own analysis, based on: Smit [1996]; Smit and Trigeorgis [2004]

The relationship described above is then analysed on the basis of market uncertainty and the possible level and nature of competition in that market (at regional and/or sub-regional levels). The uncertainties in the off-take market are mainly related to the following:

a. *Oil and gas price risks:* Volatile oil prices have an impact, albeit with a time lag, on gas prices in long-term contracts. Gas hub prices may be volatile too, and these may feed into long-term oil-indexed contracts, which also include hub indexation.
b. *The availability of substitutes:* In the power generation sector especially, gas may have to compete with nuclear energy, coal and even renewable sources of energy. The demand for gas is thus affected by the availability of substitute powers sources.
c. *Government policies:* Government policies regarding the primary energy mix, regulatory issues as well as the general investment climate (e.g., property rights, rule of law) may all impact the demand for gas.
d. *Potential rival behaviour from other suppliers and/or entrants:* Other gas exporters, either through pipeline volumes or by means of LNG, may have an incentive to capture a share in that future growth. The higher the degree of possible competition and the higher the growth potential in volume terms, the greater the incentive is to make an early strategic commitment (in order to have a first mover's advantage). However, if the level of growth potential is uncertain, varying by large degrees, the level of competition is relatively low,

meaning that a wait-and-see strategy based on delaying the investment is likely to be a more prudent approach.

e. *The degree of concentration:* Competition may arise from a large amount of smaller players with small market shares or from few, comparatively large players with large market shares, i.e., depends on the structure of the market. Other players may also be prospecting market entry.

The figure above basically states that the more fragmented potential competition is, i.e., there are many other existing or potential entrants, the less strategic commitment value a project may have to deter such mostly smaller players. The game theoretical element thus becomes less pressing and postponement of the strategic investment is more likely. However, when competitors consist of few, very large players, or even only one player such that Gazprom would thus be part of a duopoly, then the greater the need to deter their entry. Hence the more oligopolistic the market structure, the greater the potential commitment value from Gazprom's perspective.

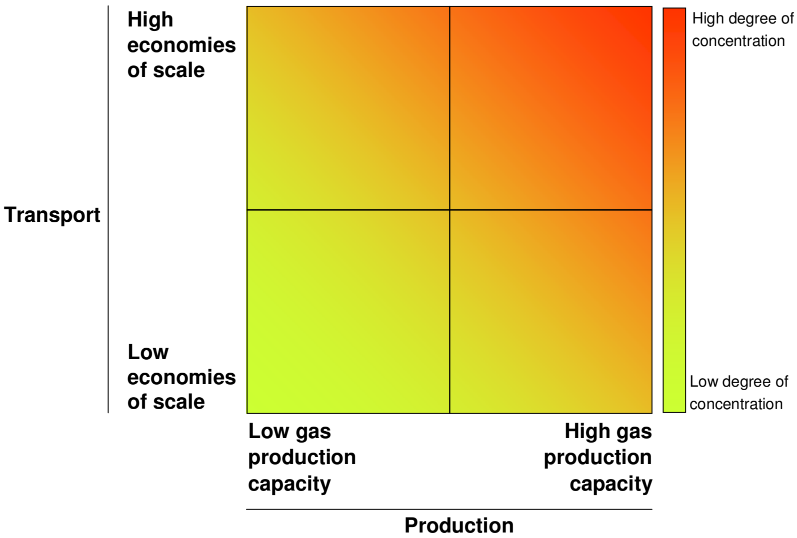
8.3.3 Gas suppliers: Weighing rival cost structure versus production capacity

The second consideration which needs to be taken into account when deciding whether or not to invest strategically and thus commit to a certain market, is weighing the economies of scale in gas transport versus potential upstream gas production capacity. Economies of scale offers the possibility to reduce unit costs, though the extent to which unit costs are achieved depends on a pipeline's utilisation rate (high utilisation rates lower unit costs):

a. *High gas production capacity, low average total transportation costs:* Suppliers can bring on-stream large amounts of gas at high economies of scale in transport;
b. *Low gas production capacity, high average total transportation costs:* Suppliers can bring on-stream smaller amounts of gas at low economies of scale in transport;
c. *Mismatch between gas production and transport capacity:* Suppliers may have much gas production capacity but a lack of infrastructure, or the availability of infrastructure but a lack of sufficient transport capacity at high economies of scale.

The level and intensity of competition is thus to a large extent determined by economies of scale in both up- and mid-stream production capacity. The matrix in Figure 8.3 captures this relationship; essentially it is an expression of economies of scale in transport versus upstream gas production capacity. The distance to market, especially for pipeline gas, is also an important factor: the shorter the distance, the greater the impact of pipeline gas in terms of lower unit costs, both in terms of SRMC and LRMC.

Figure 8.3 Exploring the degree of concentration in possible new off-take markets



Source: own analysis, based on: Smit [1996]; Smit and Trigeorgis [2004]

8.3.4 Other investment variables

In addition to (1) market uncertainty and (2) possible competing gas suppliers, there are other investment variables to take into account conceptually when deciding whether or not strategic investments are viable or desirable. In addition, when the decision is being made whether or not to enter a specific market, there are other considerations at play than only the construction of mid-stream level projects. Decisions about the mid-stream are, for Russia, equally significant and interlinked with decisions about the development of upstream sources, i.e., across its entire resource base. Indeed one can think of these as 'value chain' level decisions involving primarily a portfolio of various 'production' possibilities. These value chains begin upstream and proceed mid-stream and onwards towards the final customer(s). Ultimately, Russia's strategy hinges further on how far to integrate vertically, i.e. how close it sells its gas to the final customer. According to Barnes *et al.* [2006], the following factors have to be taken into account as well, in addition to market uncertainties, in order to explain investment decisions with regard to gas infrastructure:

1) *The general investment climate up- and downstream:* Investments in the gas industry, often involving large up-front investment costs, require a long period of predictable operation in order to recover the original investment and yield acceptable returns. Hence, investors have a large interest in the enforceability of contracts, a stable business environment (e.g., regulatory, fiscal stability and rule of law) as well as access to capital to finance investment

projects via commercial banks and multilateral financial institutions. The domestic security, political and macro-economic contexts in consumer and producer countries shape the general investment climate along the value chain.

2) *The involvement of transit countries:* The existence of transit countries may create significant obstacles (including permit risks) in constructing viable cross-border gas pipelines, but simultaneously create the incentive to invest in transit-avoidance pipelines. Essentially, transit countries have interests that may not necessarily coincide with those of exporting or importing countries. In addition, they may behave opportunistically, because they only have their transit fees (and royalties) to lose. Conversely, transit risks may encourage additional investments in transit avoidance gas infrastructure. Certain international institutions have been established after the collapse of the Soviet Union in an effort to mitigate these risks, an example being the Energy Charter.
3) *Geopolitical relationships:* According to Barnes *et al.* [2006], another point of concern is the geopolitical relationship between states and how this influences greenfield investments. The geopolitical and geo-economic relationship between endogenous and exogenous actors can affect the feasibility of investments and thus also the likely materialisation of gas flows. International financial institutions also play a pivotal role in the overall investment framework surrounding gas infrastructure projects (also refer to Section 8.3.5).

8.3.5 Organisational and financial institutionalisation

Ultimately, depending on Gazprom's position vis-à-vis its competitors (i.e., market outcomes, see Section 8.3.6), different types of organisational institutionalisation of investments can materialise amongst Gazprom and its would-be rivals, mid-streamers, etc. Also, as mentioned above, the financial institutionalisation of projects, as to how the project in question is likely to be financed and at what rate, also has bearing on project feasibility. Financial institutionalisation pertains to the type and source of financing whereas organisational institutionalisation relates to the shape, form and structure mainly of inter-firm and -government agreements.

Besides firm-level agreements (as illustrated in Chapter 2 and 3 of Smeenk [2010]), government-to-government agreements can help institutionalise firm-level trade and investments. In addition, such organisations can reduce risks along the value chain (e,g., transit risks or volume risks in the off-take markets).[400] Because of the structure of the gas market (e.g., a regionally traded commodity and high upfront costs, see Chapter 2 in Smeenk [2010]), a strong path-dependency in mutual gas relations is a reality with which both producing and consuming governments must deal, by working on a bi-lateral basis [Goldthau 2010]. This can be done

[400] Most of the government-to-government deals are cut on a bi-lateral basis, although some multilateral institutions try to help institutionalise firm-level trade and investments and reducing risks along the value chain, such as the WTO, the ECT and the EU, for example via the Trans-European Network (TEN) Programs and the agreements and dialogues with third-party countries and regions.

through energy diplomacy, where the government takes on an active role in supporting its (national) firms at home and abroad.[401] The role of energy diplomacy is especially important in an oligopolistic market environment. The aim of government support is not necessarily maximising business opportunities, but can also be national security goals. Therefore, diplomatic efforts to strengthen a firm's presence in domestic and export markets reflect not necessarily identical interests of the government and the firm; see also Chapter 3 in Smeenk [2010] [Goldthau 2010]. The success of its organisational and financial institutionalisation, both on government and firm level, has an impact on the ability to realise strategic investments.

1) *Organisational institutionalisation:* The forms of institutionalisation on firm level are determined to a large extent by the market's phase of evolution and structure–and as far as the model is concerned–by market outcomes (see Section 8.3.6 below). As already discussed in Chapter 4, De Jong [1989] distinguishes between three forms of institutionalisation on firm level: (1) Mergers and acquisitions (M&A), (2) joint ventures and/or collusion and (3) direct competition via greenfield investments.

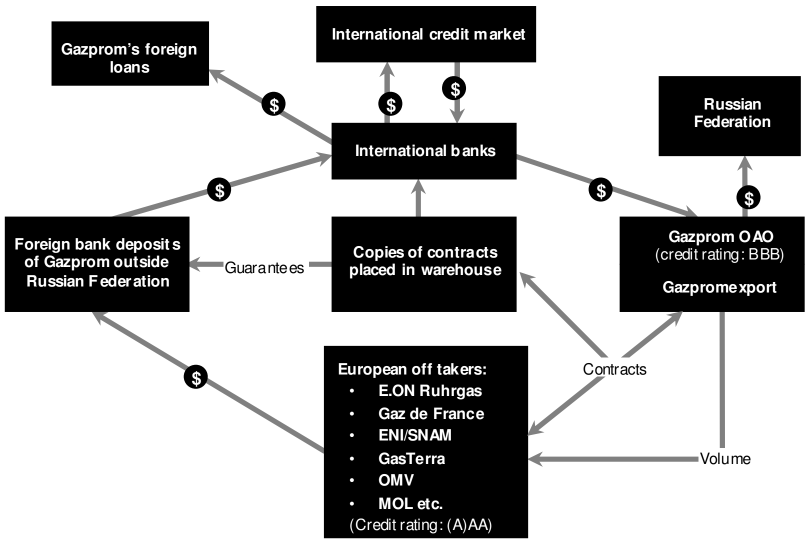
   To increase the success of organisational institutionalisation through energy – and more specifically in this context–gas diplomacy, we have made a distinction between 'vertical' and 'horizontal' gas diplomacy. Vertical gas diplomacy is related to pipeline diplomacy along the value chain, both in the mid- and downstream. In light of the model discussion in Section 8.4, pipeline diplomacy can help to facilitate a firm's first-mover advantage (i.e., its proprietary position) and to improve the change that a firm captures additional market share in a scenario of demand growth. In addition, gas diplomacy can help to reduce other risks, such as transit risk. Horizontal gas diplomacy is related to governmental efforts to support firm's (bilateral) deals with other gas-producing and exporting firms and/or governments. Horizontal energy diplomacy also pertains to multi-lateral producer organisations such as the GECF, OPEC and bilateral gas producer country relations. From the model's perspective, horizontal gas diplomacy can facilitate forms of supply coordination (i.e., cooperation and/or collusion) and shared investments; see also Chapter 10.

2) *Financial institutionalisation:* The next issue to be considered in the value chain is the financial institutionalisation of various investment programs geared towards establishing

[401] There is no consensus on the definition of 'energy diplomacy'. However, according to Goldthau [2010], "[t]he term commonly connotes the way countries give their energy companies a competitive edge in bidding for resources by using the state's power: consumer countries strengthen their supply situation by diplomatically flanking energy contracts, whereas producer countries use diplomacy to enhance access to markets or reserves". According to Okano-Heijmans [2010], economic (energy) diplomacy includes a 'commercial' dimension and a 'power play' dimension (these dimensions are not mutually exclusive *per se*). For an in-dept analysis on energy and pipeline diplomacy, see for example Zhiznin [2007], Goldthau [2010], and Bahgat [2003].

components of the value chain: how will these multi-billion dollar projects be financed and how will the corresponding risks be mitigated? There are differences in applying various business models in up-, mid-, and downstream activities. Large sums of required capital are involved for even just one such large-scale production and transportation project.

Figure 8.4 The general structure of financial flows for Russian gas exports



Source: Komduur [2007, not published], based on interviews.

A firm can finance its projects internal (tap into their own cash flow) and external (rely on external investors and lenders). In general, the government- or state-backed ultimately guarantees debt issued by national gas firms. In some cases, a government authority also guarantees the debt capital of privately owned energy firms [Jaffe and Soligo 2010].[402] The traditional means of risk mitigation and financing of large gas supply infrastructures is via long-term take-or-pay contracts.

In the specific case for Gazprom, in addition to these take-or-pay contracts, it is using higher credit ratings of Western companies in order to realise better borrowing rates for debt via the so-called 'warehouse' construction (see Figure 8.4 above). The contracts between Gazprom and European mid-streamers are incorporated into a 'warehouse', serving as collateral for the financing of the project as well as a source of cheaper credits.

[402] See Myers Jaffe and Soligo [2010] for an in-depth analysis on state-backed financing in oil and gas projects.

As discussed in Chapter 2 in Smeenk [2010], self-contracting as a form of new business models enables companies to integrate vertically, also resulting in higher financial exposure, because they must access capital markets on the basis of their own credit rating rather on the basis of the rating of their Western partners, i.e., mid-streamers [De Jong et al. 2010].

8.3.6 Possible market outcome scenarios

In accordance with steps 1 and 2 in Sections 8.3.2 and 8.3.3, the last step taken in the conceptual toolbox is making a rough assessment of which market outcomes may result from the situation Gazprom is confronted with in terms of possible entrants and their own characteristics in terms of market power. While the quantitative model leads, in its application, to its own various game theoretic equilibria, this component of the toolbox is designed to translate those equilibria into market outcomes. The application of the toolbox in each case will lead to separate market outcome scenarios *after* the application of the quantitative model, which itself is preceded by the application of the steps in the toolbox listed and explained above. So while the model uses a stylised approach to describe the various market outcomes in its own game theoretic fashion, the 'real world' requires a more loosely defined set of scenarios, which may for example explain situations involving oversupply despite oligopolistic market structures. For example, during the early 2000s the Turkish gas market was characterised by a gas oversupply despite a limited number of players in the market. Gazprom's decision in each case which may range from investing in commercial projects to investing strategically early on, the following corresponding range of scenarios can result: (1) a (quasi-)monopolist scenario in a given market; (2) a dominant firm scenario; and (3) non-dominant or fringe firm scenario. These market outcomes are translated into model outcomes in Section 8.4.4 below, and both the conceptual market and model outcomes are summarised in Figure 8.8.

In each of the three 'real-world' scenarios, Gazprom's various potential rivals in the European market are diverse, coming in the form of pipeline gas suppliers as well as LNG, varying largely in market power terms (also see Chapter 9). The competitors in this case may involve different groupings and behaviours: they may act as a 'competitive fringe', for example, sharing investments together in common infrastructures or projects (also see below). These competitors can be sub-divided roughly into two loose categories: (1) Fringe and non-dominant players, both pipeline gas and LNG suppliers, and (2) potentially dominant players (pipeline gas and LNG suppliers). In all three scenarios, oversupply is a real possibility. This is particularly plausible in the case of an economic crisis, which may precipitate a collapse in demand. The possible market outcomes are fed back into the beginning of the decision-making process, as is the case through backward induction in the model, discussed below.

In conceptual terms, and in taking the market outcome scenarios a step further, Gazprom can end up in a different position in a number of different scenarios. Gazprom may end up as a dominant firm, on the one hand, and as a non-dominant firm on the other, both at regional and sub-regional levels. Simultaneously, either the industry sees the rise of a buyer's or a seller's market for gas as a market condition. The different market outcomes and market conditions lead to different combinations, e.g., Gazprom may become a dominant or non-dominant firm in either a buyer's or a seller's market. Each such different combination has differing consequences for Gazprom's investment strategy and merit order and the form, shape and nature of its cooperation with other gas-exporting countries.

8.3.7 Interregional prices and shared investments

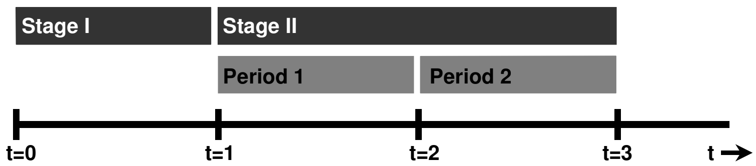
As was described in Chapter 5, the complexity of interregional gas trade and the nature of gas pricing (i.e., spot or 'flexible' volumes versus long-term oil-indexed volumes) preclude an independent pricing framework for gas. As was explained above, the framework used in this conceptual and quantitative model pertains to competition in quantities, not prices, because firms are assumed to compete in capacities before competing in prices in the longer run. In mature markets where excess or over-capacities are built up as firms compete for a stronger position in the market over time; firms ultimately are forced to compete through prices as demand growth slows down [Colell et al. 1995].

In order to avoid (interregional) price erosion, firms can engage in shared investments along the gas value chain, both at a regional level (e.g., pipelines) as well as at an interregional level (e.g., large-scale LNG projects). Indeed, according to Smit and Trigeorgis [2004] competitors may either act in a contrarian or reciprocating manner. If the competitor reciprocates and an investment is shared (such as both parties sharing the advantages of economies of scale of a shared value chain), it can lead to shared strategic benefits such as avoiding price rivalry by adopting a pricing standard, i.e., in the natural gas industry this could correspond to avoiding price competition in the long run.

8.4 Whether or not to invest strategically: A real-option game model

As an extension of the review of the standard DCF approach, the real-options approach and the game-theoretic, entry-deterrence component captured by the overall net project value (see also equation 8.1), the scene is set to introduce the real-option game model. This is the quantitative, stylised counterpart to the toolbox included in the previous section. The model consists of a two-stage game involving a duopoly, i.e., Gazprom (the incumbent, or "firm A") and an entrant or competitor ("firm B"). In stage I, firm A can decide whether or not to invest strategically before the game begins. In stage II, firm B is assumed to take part in the game, after which this entering firm may decide whether or not to invest. Stage II in turn consists of two periods, see Figure 8.5. The stylisation of the model implies that a wait-and-see strategy is a *definitive* deferral of the strategic investment, which means firm A postpones the option to compete for good.

Figure 8.5 Time line of the two-stage real-option game



Following these steps, four dates exist and stage II subsequently consists of two periods. Hence t_0 denotes the beginning of the game, stage I, which is when firm A makes a decision whether or not to invest strategically. Then, t_1 denotes the beginning of period 1 in stage II, which is when the market opens while t_2 denotes the beginning of period 2 in stage II. In this duopolistic framework, where binomial valuation is used, each player wants to have the greatest possible market share at the end of the "game" (t_3) in order to maximise so-called state-contingent project values, or 'payoffs' in game-theoretic terms (the term payoff is used in the model. These values basically represent the present values of profits derived from the different actions (i.e., of investing and not doing so, also refer to column 5 in Table 8.1 in the appendix of Section 8.6 for a mathematical explanation). For the incumbent, the decision whether or not to invest early leads to different market outcomes on the basis of actions by the potential entrant. Following Smit [2003], we estimate the value of a firm's growth opportunities as the sum of the outcomes of repeated expansion sub-games along an equilibrium path in the overall game. After t_3, the game is over and firm cash flows are assumed to continue in a 'steady state'.

In the remainder of this section, a description of the model is provided in 6 sections. Section 8.4.1 is a stylised review of the logic of early commitment and its strategic or net commitment value, which is broken down into separate components: the direct, the strategic reaction value and the strategic pre-emption value. Based on this logic, Section 8.4.2 argues that four competitive strategies or postures can be assumed by the incumbent (and its potential competitor). Section 8.4.3 is an overview of the mechanics of the decision tree that comprises the possible decision paths of both the incumbent and the potential competitor, as a function of market demand swings upward and downward. Section 8.4.4 is an overview of the two cases the model offers: one where the incumbent makes an early strategic investment, the so-called *proprietary case*, and the other where both players decide not to invest strategically early on but only make commercial investments, the so-called *base case*. Subsequently, Section 8.4.5 links pipeline economics to the real-option game model concerning its input variables. Section 8.4.5 presents a summary of the different equilibria, which can result from each of these two scenarios where competitive strategies determine these equilibria. Section 8.4.6 provides an explanation of how the different value components described in Section 8.4.1 are calculated.

8.4.1 The strategic value of early commitment

Assume firm A is an incumbent firm in the European gas market and supplies gas through already existing infrastructure. It can make a first stage strategic capital investment, K_A, for the construction of a new gas pipeline to the European market. The present value at t_1, (V_i) of second stage operating profits (π_i) for firm A or B in each state of nature depends on the strategic investment of the incumbent firm, K_A as well as on the firm's ability to appropriate the benefits when investing in subsequent opportunities (i.e., non-strategic investments, as discussed in Section 8.3), which is a function of competitive reaction from an entrant or rival.

Firm A: $V_A(K_A, \alpha^*_A(K_A), \alpha^*_B(K_B))$; Firm B: $V_B(K_A, \alpha^*_A(K_A), \alpha^*_B(K_A))$ (8.2)

where:

K_A = first-stage strategic capital investment of incumbent firm A (potentially influencing second-stage average costs, *AC*).

$\alpha^*_i(K_A)$ = optimal $(*)$ second-stage action of firm *i* (Q_i in quantity competition if investment is made in a proprietary investment by pipeline or P_i in price competition), in response to first-stage strategic investment K_A.

$V_i(\ )$ = the present value of operating profits (π_i) at t_1 for firm A in the second stage of the market, given K_A and the optimal actions of both firms.

Given market demand and taking the potential rival's decision into account, player A must decide whether or not to make an upfront strategic investment commitment, K_A while it must also, as in the case of its opponent, decide whether and when to invest in the second stage and select an optimal action (i.e., the quantity Q). In some cases, incumbent firm A may invest in a strategic pipeline capacity in order to deter entry by making firm B's entry, thereby able to earn monopoly profits in the later stage of the market. The incremental impact of firm A's strategic investment (dK_A) on firm B's second stage value (dV_B) is generally given by:

$$\frac{dV_B}{dK_A} = \frac{\delta V_B}{\delta K_A} + \frac{\delta V_B}{\delta \alpha_A} \frac{d\alpha_A^*}{dK_A} \tag{8.3}$$

In order to deter entry, firm A must take a 'tough' stance that would inflict damage to its competitor ($dV_B/dK_A < 0$). If entry deterrence is too costly (i.e., the postponement value being greater than the commitment value) firm A may find it preferable in some cases to follow an accommodating strategy, in which case it would *by definition* not be making a strategic investment. Firm A's incentive to make the strategic investment then depends on the impact of the incremental investment (dK_A) on its own value from second-stage operating profits, i.e.:

$$\frac{dV_A}{dK_A} = \frac{\delta V_A}{\delta K_A} + \frac{\delta V_B}{\delta \alpha_B} \frac{d\alpha_B^*}{dK_A} \tag{8.4}$$

The commitment value, which is explained in Section 8.2, can be broken up in the direct value, and the strategic reaction and pre-emption values (see the appendix in Section 8.6 for the mathematical explanation):

- the *direct value* pertains to the direct incremental future cash flows resulting from the strategic investment, due mainly to lower marginal cost of production/transportations (gains from economies of scale);
- the *strategic reaction value* is the strategic value component of the investment which influences a potential competitor's reaction. This enables the firm to conquer greater market share opportunities (due to a first-mover advantage);
- the *strategic pre-emption value* corresponds with a strategic investment which can influence the competitive equilibrium at the end of the game or, the game's final outcome. In some cases this may even involve changing the market structure altogether by deterring entry.

The net commitment value thus has a direct effect on the investment itself by increasing economies scale and a strategic effect expressed by the effect it has on a competitor's scale of entry, if at all. A net commitment value indicates whether a strategic investment is to be made at t_0 , which may be seen as pursuing a *strategic growth investment*. The postponement value indicates at t_0 whether a strategic investment should be postponed and that therefore only commercial investments should be pursued, which may be seen as excising the postponement option rather investing *strategically* (see above). If the difference between the net commitment value and postponement value is positive, then the incumbent invests; if the difference is negative, then the investment is postponed. The model is an extension of what was described in

Section 8.2, namely an approach where standard NPV calculations are enhanced with flexibility options value and the strategic option-game value. This overall value is recapitulated below:

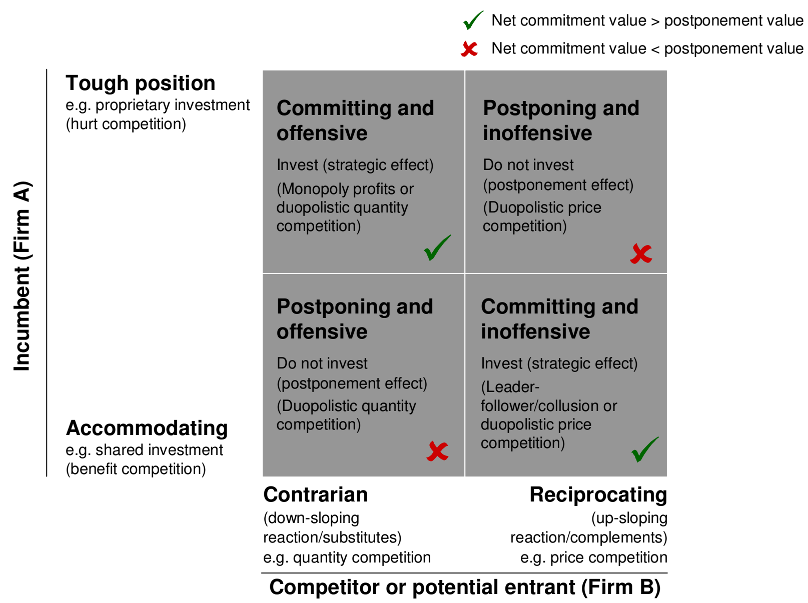
The overall net project value (NPV*) = 'direct' (static) NPV + flexibility options value
+ net strategic option-game value (8.5)

The competitive setting used in the conceptual toolbox and above pertains to quantity competition. However, the real-option game approach can also be applied in a duopoly situation of price competition (see Smit and Trigeorgis [2004]), which goes beyond the scope of this study.

8.4.2 Competitive strategies

This section conceptually links the various possible competitive strategies of each player to the market outcomes, which are described in the next Section. An offensive strategy is directed at undermining a competitors' payoff in a later stage of the market, seriously impacting its ability to enter the market. An accommodating strategy may involve a decision not to fully engage a potential entrant.

Figure 8.6 Sign of strategic effect and competitive strategies under different position and competition



Source: adapted from Smit [1996]; Smit & Trigeorgis [2001].

The incumbent firm accommodates entry in that it accepts the entering firm's entry as a *fait accompli* and merely tries to affect its subsequent behaviour. Conversely, as Colell *et al.* [1995] note, if deterrence is optimal, then even though entry does not occur, its threat nevertheless has an effect on the market outcome, raising the level of firm A's output relative to a situation in which no entry is possible. The effects of a decision to invest early or not are expressed mathematically in equations 8.2 and 8.3.

Based on these strategic effects, four competitive strategies or combinations of strategic actions can be imagined, involving competition and/or cooperation through proprietary and shared investments, respectively. The four different strategy combinations are summarised in Figure 8.6. In the left two cases, competition occurs in volume terms while in the second it occurs in price terms because the potential entrant can act in either a contrarian or reciprocating fashion, respectively. For the conceptual treatment of price games in this study, reciprocating competition is included as well, in addition to contrarian competition.

1) *Committing and offensive strategy* (tough position with contrarian competition): An offensive strategic investment, for example by building a large-diameter gas pipeline, can generate a proprietary an advantage, translating into a tough position, hurting the competitor's chances in the second stage of the game. Under contrarian or volume/quantity competition, competition will retreat and the incumbent firm can expand its share and gain leadership as the market grows. At lower relative demand the competitor's profit value is negative, and the incumbent firm may even enjoy monopoly rents.
2) *Flexible and offensive strategy* (accommodating with contrarian competition): Under contrarian competition, a new entrant may take advantage of the incumbent's accommodating position and capture most of the shared benefits of a strategic investment. According to the model, there is no strategic advantage to pre-commit investment since it would offer a rival firm with the opportunity to free ride on the incumbent's initial investment, if shared (see also Section 8.3.1). In order to prevent the creation of valuable shared opportunities for the competition, the incumbent should maintain an offensive posture by postponing its investment (postponement value), all the while maintaining its option to invest at a later stage (maintaining managerial flexibility value). In case future demand grows, two identical competitors would choose to invest simultaneously. If demand declines, both would abandon the market.
3) *Flexible and inoffensive strategy* (tough with reciprocating competition): A tough position through a strategic investment may hurt competition but can induce a tough reaction by a reciprocating competitor, which can result in intensified rivalry. Here competition would take place through prices. To avoid such intense second-stage competition, the firm will

not invest in an early strategic investment, remaining flexible and inoffensive. If demand develops later, both firms can invest, resulting in a duopolistic price equilibrium.

4) *Committing and inoffensive* (accommodating with reciprocating competition): Now suppose that early strategic investment will also benefit demand for the competitor, who is ready to reciprocate. The incumbent firm should invest in the strategic project and be accommodating in a later stage of the market development, avoiding price competition, reaping shared benefits in the process. Though maintaining high prices and higher profit margins, both firms can enjoy more profitable follow-up investments. The incumbent firm could act as a dominant player, with the competitor following suit. Compared to the base case (see Section 8.4.3), a strategic investment has positive strategic reaction and coordination effects but at the same time implies a flexibility loss (i.e., foregoing of postponement value).

8.4.3 The base case versus the proprietary case

Depending on which competitive strategy the incumbent and the entrant take in quantity terms, a base case and a proprietary case may result. In the base case, both the incumbent and the entrant do not invest strategically but rather invest only commercially against relative high operating transport costs per unit (see also Section 8.4.5).

By contrast, in the proprietary case the incumbent makes a strategic investment, for example by building a large-diameter pipeline. A large-diameter pipeline results in lower average operating transport costs per unit vis-à-vis the competition. In the case of shared investment (see Section 8.3.1), the incumbent makes an upfront investment which it then shares with the entrant. This implies a mutual decrease in the operating transport cost per unit. For this research, shared investments are not taken into account as a possibility in the real-option game model.

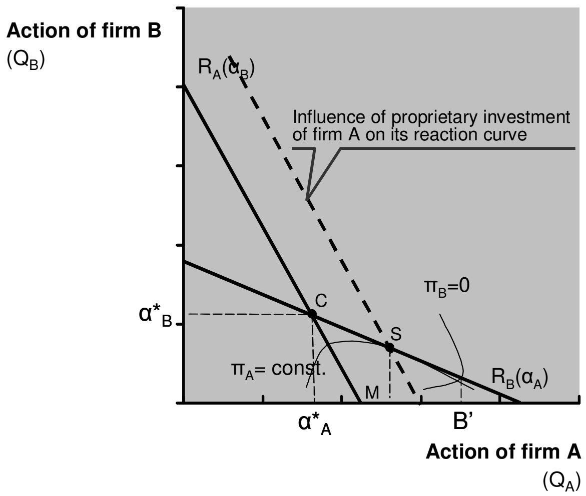
8.4.4 Model outcomes, demand moves and the decision tree

Each different combination of strategic choices made by firm A, the incumbent, and firm B, the competitor, leads to various combinations of quantities supplied, profits and state-contingent project values for both firms. Table 8.1 (see the appendix in Section 8.6) contains the formulae needed to compute equilibrium quantities, the final profits and corresponding state-contingent project values. Each such combination corresponds to a different model outcome within this duopolistic market setting. It is useful to describe the essentials of these model elements in a step-by-step fashion, starting with the various model outcomes and moving on to the workings of the model's so-called decision tree.

Model outcomes
Essentially, each market outcome (described conceptually in Section 8.4.6) corresponds with various game-theoretic equilibria resulting from the interaction between the two firms in the model. Each equilibrium in the game is essentially a Nash equilibrium, where each firm pursues its own dominant strategy given what the other firm does. Because the game is based on interaction between two players, the market structure of the game remains duopolistic, in principal. However, at the end of the game (i.e., model outcomes), firm A and/or B may not remain in the market, which changes the overall market structure at that stage. Changed market structures are implicitly valued for both firms in the state-contingent project values.

Game theory prescribes to such situations various equilibria or outcomes, in which one or the other firm 'ends' the game in a certain position vis-à-vis the other firm. These equilibria in the model can be described intuitively as various market structures in a two-firm world (see also Figure 8.7 below).

Figure 8.7 Graphical representation of quantity competition[403]



Source: Smit and Trigeorgis [2004].

In other words, in a duopoly, these outcomes explain the balance of power between only two firms. We refer to these market structures as outcomes rather than structures, in order to avoid

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403 In a situation of reciprocating (Bertrand) competition, the reaction curves would be upward-sloping (e.g., price competition), see also Smit and Trigeorgis [2004]. For a more complete explanation of the various model outcomes and a more detailed explanation of the graph produced in Figure 8.7, see Figure 4.6 in Smit and Trigeorgis [2004], p. 195.

confusion, given the duopolistic nature of the model. Since a discussion about game-theoretic equilibria is beyond the scope of the application of the real-option game model here, an intuitive description will suffice at this stage.[404]

Each type of market outcome hinges on the quantities supplied respectively by the two firms. These quantities vary according to the various combinations of actions taken by the two players (in terms of investing commercially or not in stage II, or also investing strategically or not in stage I, i.e., base versus proprietary case). Following mostly textbook industrial organisation economics and game theory, this can be represented graphically by means of a figure depicting the so-called reaction curves of both firms, see Figure 8.7.

The two firms react to each other's supply decisions, which are represented graphically by their reaction curves. Each firm's reaction curve (R_A for firm A and R_B for firm B) represents what it supplies given what its competitor produces, and is determined by solving the two firms' production functions. The reaction curves can also be derived by determining a firm's iso-profit curve, a curve that represents the combinations of output that will generate the same level of profit (iso-profit) for each firm.[405] The farther a firm's reaction curve is from the axes in the graph, the greater is its share of the market, and hence the greater its profits. The model outcomes should be interpreted at the end of stage II, where investment actions by firm A in stage I or by either of the two firms in stage II can lead to:

1) A duopoly outcome[406] with two firms that roughly supply a similar portion of the market (which is represented by point C in Figure 8.7) because they *both* end up investing accordingly in such an outcome. This is represented in the decision tree (see Figure 8.9) and elsewhere by the letter 'C' (i.e., C for Cournot duopolists).
2) A monopoly for firm A on the one hand, where firm B is deterred from the market entirely, or on the other hand, where the converse is the case (which is represented by point M in Figure 8.7). This is represented in the decision tree and elsewhere by the letter M. For firm A, a monopoly for B means firm A deferred investment in both stages of the game while firm B invested, a market outcome denoted by the letter 'D' for deferral (also see Table 8.1 in the appendix in Section 8.6).

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[404] This is the case since essentially the research objective calls "only" calls for applications of the model, in order to provide insights that serve the research questions as mentioned in Chapter 1. The game-theoretic concepts nevertheless remain fundamental to understanding the link between model outcomes and the state-contingent project values. For a theoretical background on these game theoretic concepts, see for example, Tirole [1998] and Dixit and Nalebuff [1991], Colell *et al.* [1995], Rasmussen [2001] and Jacquemain [1987].

[405] There is a different iso-profit curve for each level of profit. The parabolic iso-profit curves drawn above are combinations with a higher quantity for the competitor (firm B), and consequently a lower profit for firm A.

[406] This corresponds with a Nash-Cournot model outcome, see Figure 8.8.

3) A leader-follower outcome[407] for firm A where it ends as a dominant firm (i.e., the leader) and where firm B invests in such a way that it ends as a non-dominant firm (i.e., the follower). This model outcome is represented by 'S' for firm A in Figure 8.7 and in the decision tree in Figure 8.9. In Figure 8.7, an outward shift of firm A's reaction curve is a result of quantity competition in stage II, based on a strategic investment made in stage I by firm A. Elsewhere in the text and throughout text pertaining to applications of the model, this outcome is represented by S-L for the leading firm and S-F for the following firm (this is applicable to both firms).
4) An outcome in which *both* firms defer their investments in *both* stages of the game, denoted by the letter 'A' in Figure 8.9 (i.e., A for abandon).

Figure 8.8 provides an overview of the different possible scenario market outcomes as discussed in Section 8.3.6 and their translation into model outcomes, which was discussed above.

Figure 8.8 Gazprom's market outcomes in scenarios and model terms

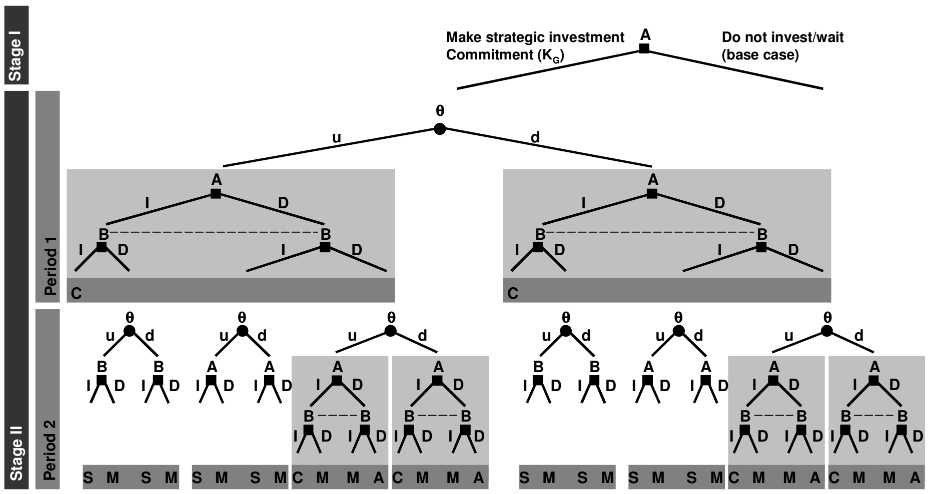
	Market outcomes – scenarios	Market outcomes – model	
(Quasi-) monopolist	• Market share of between 70-100 percent • Competitor(s) are either non-dominant or fringe players with a share of between 0 and 30 percent	• The incumbent builds capacity early such that it is unprofitable for the competitor to enter	**Monopolist**
Dominant position	• Market share of between 30-70 percent • Competitor(s) can be dominant, non-dominant or fringe players with a share of between 30 and 70 percent	• S-L: The incumbent invests first in a project and its competitor invests in a later period. • C: Both firm invest simultaneously	**Von Stackelberg leader (S-L) or Nash-Cournot (C)**
Fringe/non-dominant position	• Market share is less then 30 percent • Competitor(s) take a quasi-monopolist, dominant and/or non-dominant firm position	• S-F: The incumbent ends up investing later in a (commercial) project while the entrant itself invests commercially before the incumbent does so. • This outcome is the converse case of S-L (see above)	**Von Stackelberg follower (S-F)**

Note: the model-based market outcomes refer to equilibrium results from economic game theory. Section 4.3 provides an explanation of these results.
Source: own analysis, based on Smit and Trigeorgis [2004]; De Jong [1989].

[407] This corresponds with a von Stackelberg Leader-Follower model outcome, see Figure 8.8.

While Figure 8.8 includes the game-theoretic terms associated with these model outcomes, they are used here merely to illustrate the link between the toolbox and the model in terms of the outcomes.

Figure 8.9 The two-stage game in extensive form under different market structures



Notes: A or B (■) represents a decision to invest (I) or defer (D) by firm A or B. θ (●) represents the state of market demand or nature's up (u) and down (d) moves.
The combination of competitive decisions (from both A and B) and market demand (θ) may result in one of the following market structure
game outcomes:
C: Cournot Nash quantity competition equilibrium outcome (cf. Appendix 4.1)
S: Stackelberg leader (S-L)/follower (S-F) outcome (cf. Appendix 4.1)
M: Monopolist outcome
A: Abandon (0 value)
D: Defer/stay flexible (option value)
Source: Smit and Trigeorgis [2004].

The decision tree

Through the use of a decision tree (Figure 8.9), each of the strategy combinations mentioned above in Section 8.4.2 and the model outcomes can be visualised. Each of these outcomes is tied to the valuations of the relevant investments (valued through the state-contingent project values), both initial as well as follow-up ones. The tree uses binomial real option valuation to compute the state-contingent project values. Figure 8.9 contains the binomial valuation tree, the letters at the bottom of which (i.e., at the ends of the branches at t_3) correspond with the model outcomes.

Demand moves

The values or numbers lodged at the bottom of the decision tree are the state-contingent project values resulting from the competitive strategies each of the two firms can take (see Figure 8.7 for an overview of the various competitive strategies the two firms can take). The tree structure conveys the two-stage uncertainty and decision structure of the model, which has been described in Section 8.4.1. The nodes at the bottom end of the branches in the tree contain the values of the various actions as a function of resulting model outcomes at the end of each period in the second stage, which in turn result from the decisions of each player (as described above). These values ultimately determine whether or not firm A is to make a strategic investment decision or not.

The state-contingent project values are factored into risk-neutral backward valuation formulae used to calculate values of investing and/or deferring under binomial upward and downward movements of demand between periods 1 and 2 (these formulae are included in the bottom half of Table 8.1 in the appendix, Section 8.6), discounted using a risk-free interest rate, r. This is the relevant rate within the applied approach of risk-neutral valuation. The approach has been described in Chapter 3 of Smeenk [2010] and is visualised by means of the decision tree in Figure 8.9 above.[408] The state project values themselves are based on the equilibrium quantities derived from the relevant calculation framed in Table 8.1 (see Section 8.6) and are discounted back to t=0 as long-term expected cash flow annuities at end of period 2 (at a risk-adjusted discount rate k).

When both firms decide to invest simultaneously, (I,I), the game ends in a duopolistic competitive equilibrium (C). When both firms choose to defer, (D,D), under low realisations of demand, the nature of demand (θ) moves again and the game is repeated in a sub-game. The different outcomes of each game and sub-game imply different state-contingent project values (for the different sets of firm actions, investing or not) at the end of each branch (node) in the binomial valuation tree, representing equilibrium outcomes: duopolistic competitive equilibrium competition, a duopolistic leader/follower outcome, monopoly, a deferral in period 1 (which is 'not yet' a market outcome), and an abandon outcome; see also Section 8.4.6.

[408] According to Smit and Trigeorgis [2004], it is assumed that complete financial markets exist with portfolios of securities that replicate the dynamics of the present value of the project. In such markets, the risk-neutral or 'certainty-equivalent' probabilities can be obtained from:

$$p = \frac{(1 + r - \delta) - d}{u - d} \text{, and } (1 - p) \qquad (8.6)$$

where u and d represent the multiplicative up or down moves in price, r is the risk-free interest rate, and δ is the is the constant asset (dividend-like) payout yield (equal to $k/(1+k)$ for a perpetual project, where k is the risk-adjusted discount rate).

In the end, the model aims to answer the question as to whether the incumbent is to invest strategically or not at the outset of the first stage of the game. The final equilibrium outcomes resulting from strategic interaction at the end of each sub-game (i.e., each "path" through the tree) are used to reason backwards towards the first branches in order to provide outcomes for the net commitment and flexibility values of the strategic investment. The stage II sub-game equilibrium outcomes are dealt with first, used to calculate optimal actions along the different branches of the tree backwards towards the initial point of decision in stage I. The direct, strategic and postponement values of the strategic investment are then calculated on the basis of various quantity outputs and corresponding profit levels; see the appendix in Section 8.6. The stylised model formalises the relationship between the notions and attaches to the net commitment value its own components.

8.4.5 Input variables from the perspective of the gas industry

Pipeline economics are based on CAPEX, operating expenditures (OPEX) and are also subject to the pipeline's utilisation rate and ramp-up period, see also Chapter 2 in Smeenk [2010]. The CAPEX cover mainly the costs of building a pipeline (e.g., steel costs etc.), and the costs of building compressor facilities. The OPEX covers mainly the costs of maintaining the compressor and pipeline facilities for operational use. In addition fuel costs are taken into account. The economic lifetime of a pipeline investment is assumed to be 25 years. Below one can find an explanation and a calculation approach of a number of input variables from the perspective of the gas industry, in order to make gas infrastructure investments useable for a real-option game model.

- *Calculation of the average operating transport cost (c):* In order to calculate the average operating transport cost, the cash flows of operating costs (i.e., OPEX and fuel costs) are discounted over 25 years with the Weighted Average Cost of Capital (WACC). The present value of the operating costs is divided by the present value of the pipeline's volumes multiplied by the price index (i.e., in order to correct it for economies of scale). Both the price index and the cash flows of costs are corrected partially for inflation.[409] For simplicity, the calculations exclude any form of taxation. We assume the OPEX at 1.5 percent of the CAPEX of the pipeline and 3 percent of the CAPEX of the compression facilities on a yearly basis. The fuel costs per year are calculated through the fuel usage by full capacity, i.e., 1160 thousand cubic meters per year (1160 mcm/y[410]; corrected with the utilisation rate) to the power of the fuel versus flow ration (i.e., 1.5), multiplied by the gas price (corrected partially for inflation). In order to determine the gas volumes per year, we assume a

[409] According to expert interviews, inflation is partially passed on, defined as the indexation tariff (in this research assumed at 25 percent). This tariff increases marginally during time according to a specific formula.

[410] The fuel usage by full capacity is calculated as follows: (Megawatt (MW)power/efficiency of compression in percentage)*(number of hours generator is working yearly/caloric value of gas in megajoujle per centimeter (MJ/cm))*0.0036 = (564/0.35)*(8000/40)*0.0036= 1,160 mcm/y.

technical ramp-up phase with a utilisation rate of 20 percent in year 1; 40 percent in year 2; 60 percent in year 3; 80 percent in year 4; and 100 in year 5.

- *Calculation of the strategic investment (K) and commercial investment (I) from the theoretical and project CAPEX:* As mentioned above, a large part of the investment has to be realised upfront via the CAPEX of pipeline and compressor facilities. Generally speaking, it can be assumed that the CAPEX of a pipeline is 70 percent of the total CAPEX, while the CAPEX of compression 30 percent. In order to define the CAPEX, public data will be used when applicable. In other cases, a theoretical CAPEX will be calculated for the pipeline section, and added with a CAPEX component of compression. In general, the CAPEX of a pipeline scales with the diameter of the pipeline, while the capacity of a pipeline scales with more than the square of the diameter [Correljé *et al.* 2009]. The throughput of a natural gas pipeline is thus a function of a pipeline's diameter. An increase in the diameter of the pipeline generates an exponential rise in additional throughput capacity. This is an important determinant of economies of scale in pipeline economics; see above. According to expert interviews, a constant factor (i.e., an average theoretical derivation) is derived from the relation between the diameter and the capacity (i.e., 0.0013).[411] The average CAPEX of a pipeline is assumed to be 43 euro/inch/meter.[412]

  The next step is to define the variables K and I. In the model, the variable I corresponds with investments pertaining to small-diameter pipelines with a short, technical ramp-up phase, i.e., an 8 bcm/y pipeline (with the same distance in case of a proprietary investment). By contrast, in the proprietary case the incumbent makes a strategic investment by building a large-diameter pipeline in order to lower the average operating transport costs. The strategic investment, with a lower potential utilisation level under various market conditions, is denoted by K. As such, in modelling terms, a strategic investment K can be defined as the difference between the total CAPEX for the large-diameter pipeline investment (e.g., the Nord Stream) and the 'theoretical' CAPEX for the investment of a 8 bcm/y pipeline (I), i.e., K – I.[413]

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[411] The theoretical formula according to Davis [1984], $T(d) = d^{5/2} = d^{2.5}$, is adjusted by the constant factor, so that the diameter of a pipeline is: $d = \left[\frac{Cap}{0.0013}\right]^{\frac{1}{2.5}}$, where Cap = throughput capacity; and d = the diameter of the pipeline).

[412] For simplicity, offshore and onshore piplines are assumed to bear the same costs in terms of euro/inch/meter in this analysis.

[413] Other options for defining K in gas industry terms have also been considered. This includes the aggregated opportunity costs arising from lower infrastructure utilisation levels under lower market demand conditions within the model (as a result of upward and downward moves in market demand). These opportunity costs in all the various outcomes at the end of the first and second periods of the game would then be valued back up through the tree through binominal risk-neutral valuation. This results in an amount, which is equal to 'K'. For simplicity after consulting experts, the 'total CAPEX-I' approach was opted for.

In a specific case, when the incumbent does not invest commercially (I=0) in either periods 1 or 2, a deferral and/or abandon outcome results, respectively. However, the incumbent invests in K at the beginning of the game. If in the end, the incumbent has invested K but did not actually use this strategic investment, K may be seen for the future as a comparatively cheap option, which requires a correction in the model. For this reason the incumbent is 'punished' in the model's outcomes with the subtraction of a commercial investment amount (I) from the state-contingent project values at the end of period 2, at t_3. This subtraction is also made in order to come to a 'correct' total CAPEX for the gas pipeline project. This exception holds for situations in which firm A did not invest commercially in periods 1 and 2.[414]

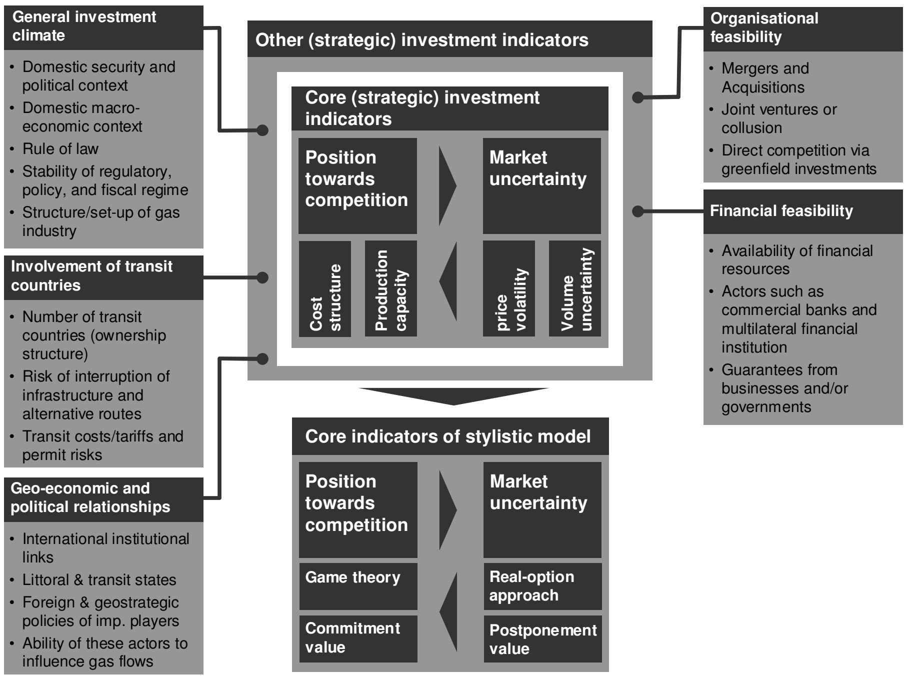
- *Calculation of the theta at t=0 (θ_0) and u and d:* For the purpose of this research, the initial market demand θ_0 is a function of the increasing gap between gas market demand and volumes supplied through long-term contracts and indigenous production. As long-term gas contracts expire and indigenous production declines, combined with possible increase demand, additional demand or market opportunities are manifested, thus increasing θ_0. New capacity (e.g., in the form of pipelines to be built by firm A and/or firm B) is built based on and designed to capture this 'widening gap in the market'. In the model's applications, θ_0 is computed by taking an average of the difference between the level of demand and contracted volumes added to indigenous production per year. This amount is then discounted at the risk free rate. This is done in order to account for time value differences in market demand since satisfying demand today is worth more than doing so tomorrow.

In the model, demand is assumed to be stochastic, moving up or down with binomial parameters u and d (where $d = 1/u$). In light of the conceptual discussion above, we assume the upward potential (which in the model as $2 \times u$) to coincide with an upward demand scenario after 25 years. For simplicity in the model, we define $2 \times u$ as the highest level of demand (θ_2) reached at t_3 (see Figure 8.5). Starting at t_3, there is a 'steady state' over 25 years, i.e., no more upward and downward moves. The data used as input in conceptual reasoning act as an annuity involving approximately linear growth. However, for simplicity given the purpose of the model, this is translated into the binomial evolution of demand periods 1 and 2 in stage II, with a steady state after t_3.

[414] In reality, when a firm did not actually use a strategic investment, it can possibly abandon investments in compression facilities.

- *Maximum capacity of new pipeline investments and Q_i:* In a number of market outcomes in period 1 and/or 2, quantities supplied by both the incumbent (for firm A's strategic investment in a proprietary case), and the competitor (for firm B's commercial investment) may exceed the pipeline capacity of their investment, i.e., $Q_{A,B} > Q_{MAX}$. For example, as a dominant firm or a monopolist in a market outcome, firm A may supply a quantity greater than the theoretical capacity of its strategic pipeline investment in order to achieve this market position. As is explained in the conceptual sections of the cases in Chapter 9, both the incumbent and its competitor are assumed to be supplying a given market through existing infrastructure. With the fall in flows provided through long-term contracts, existing pipeline infrastructure utilisation falls gradually. When additional infrastructure is built, and $Q_{A,B} > Q_{MAX}$ in various market outcomes, it is assumed that firm A and/or B can supply gas through already existing infrastructure (because of falling, already contracted supplies). When an action on the part of the incumbent squeezes the competitor out of the market, it is also assumed that the competitor's infrastructure hereby becomes redundant.

Figure 8.10 The conceptual toolbox and the stylised model



Source: own analysis, based on Smit and Trigeorgis [2004]; Victor et al. [2006]; De Jong [1989].

Ultimately this formalised combination is a quantitative assessment of strategic investments in the face of demand uncertainty and the impact of potential entry (and/or other actions) by a competitor. The stylised model fits into the toolbox where its quantitative essence is lodged inside a qualitative framework. A schematic overview of the conceptual toolbox and its relationship with the stylised model is provided in the Figure 8.10 above.

8.5 Conclusion

The DCF approach, real-option valuation (as a means of factoring demand uncertainty), and the game theoretic underpinnings of entry deterrence, act as a three-step build-up towards the conceptual toolbox and the stylistic model. The conceptual toolbox and the stylistic real option game model comprise a framework designed to analyse the issue of strategic investments. The real-option game model shows that pipelines with high economies of scale over longer distances can serve as tools to preserve or expand market share. Strategic investments are fundamentally different from commercial investments, the latter pertaining to pipelines with a more optimal utilisation profile. Investments may be proprietary or shared.

The conceptual toolbox is designed to take into account those factors which cannot be taken into account quantitatively when assessing whether or not to invest strategically. These include the general investment climate, geo-economic and geopolitical relationships, difficulties involved in transit countries as well as organisational and financial feasibility of investments. Market demand uncertainty in terms of volumes and prices, as well as the nature of competition is also taken into account conceptually in the toolbox. The stylised real-option game model acts as a supplement where demand uncertainty and rival moves are taken into account more formally by quantitative means. The model's added value lies in its mathematical underpinning for a more intuitive understanding of strategic investments. This value lies in its exact application, where the toolbox is more conceptual. The various outcomes yield preferences, expressed by large-scale investments from the perspective of this model, the ultimate aggregation of which helps determine the merit order. Ultimately, the model also helps explain how gas suppliers may lean towards a tendency to compete on the one hand and cooperate on the other.

8.6 Appendix to Section 8.4

In Table 8.1, the equilibrium quantities, profits and state project values are included for the various market structures under contrarian (Cournot) quantity competition, based on the equilibria outcomes mentioned in Section 8.3.6 and 8.4.5. The formulae are derived from Smit and Trigeorgis [2004].

Smit and Trigeorgis [2004] attain higher values for the state-contingent project values due to the fact that they discount profits (see column 4 in Table 8.1 below) simply by the variable k, which implies that profits are discounted as perpetuities. The state-contingent project values have thus been adjusted because infrastructural investments in the gas world typically have a lifetime of 25 years.[415] Therefore, rather than allowing the cash flows to take place in the form of a perpetuity, the state-contingent project values are discounted for that length of time by multiplying the contingent state project value by:

$\left(1-\left(\frac{1}{(1+k)^{25}}\right)\right)$, where k is the risk-adjusted discount rate.

The value components of the total net commitment value and the overall NPV

The total net commitment value of gas infrastructure investments is broken down into three parts and calculated as follows:[416]

1) a *direct value* resulting from direct reduction in future operating costs (i.e., economies of scale). The direct value is calculated from the reaction curves as explained in Section 8.4 (see Figure 8.7 of Section 8.4.4), reducing c_i (AC) to the cost level derived from the strategic investment (for the incumbent):

   Solve $R_A(Q_B)=\frac{1}{2}(\theta_t-c_A-Q_B)$ for Q_A (Q_B is known from the base case), then solve the Cournot proprietary profit function:

   $\pi_A=[(\theta_t-c_A-Q_B]Q_A-Q^2{}_A$ where $c_A < c_B$.

   Then $\frac{\pi}{k}=V_A$ determines the direct profit value while subtracting from this the base case profit value determines the direct value (because the base case reflects the situation in which both parties *do not* invest strategically).

2) a *strategic reaction value* reflecting the impact of the strategic investment made by the incumbent on the competitor's reaction curve and profit value for a given market structure. It is obtained by subtracting the direct profit value from the to-

[415] A constant perpetuity is an annuity that has no definite end, that is, a stream of expected cash flows that continues forever.

[416] For the exact mathematical application and break down of the commitment and postponement values, refer to the quantitative numerical application of the model in Case study 1 in Chapter 9.

tal profit value (the total profit value function used depends on the dominant equilibrium in question):

E.g., $\left(\dfrac{\theta_t - 2c_A + c_B}{9}\right) / k - \dfrac{\pi}{k}$.[417]

3) a *strategic pre-emption value* resulting from deterring competitive entry and causing a change in the market structure altogether (i.e., gaining a Stackelberg leader or monopoly position instead of a Nash-Cournot one). It is calculated simply by subtracting the resulting project value from the project value under a Nash-Cournot outcome. Ultimately, the overall net project value described conceptually in Section 8.2, in the value components of expression 8.1, translates in model terms to the overall NPV (NPV*):[418]

NPV* = base case NPV + [-K_A + (direct value + strategic reaction value + pre-emption value)] + postponement value (8.7)

[417] Remember that the model assumes a duopoly. This implies that the total value to be gained by players in the market is to be distributed exclusively among the two firms (firm A, the incumbent and firm B, the competitor).

[418] Also see Chapter 9 for an application of the formula described above.

Table 8.1 Equilibrium quantities, profits and state project values for various market structures under contrarian (Cournot) quantity competition in the second stage

Action[419]	**Model outcome**	**Equilibrium quantity**	**Equilibrium profit**[420]	**State-contingent project value**[421]	**Demand state**
(A, B)	C/M/S/A/D[422]	Q^*_i	π_i^*	NPV_i	θ_t
Second-stage game in period 2 *(continued on the next page)*					
(DI, DI); (II, II)	Nash Cournot (N)	$\frac{(\theta_t - c_i)(2+q_j)-(\theta_t - c_j)}{(2+q_i)(2+q_j)-1}$	$\frac{(\theta_t - 2c_i + c_j)^2}{9}$	$\frac{(\theta_t - 2c_i + c_j)^2}{9k} - I$	$\geq 3\sqrt{kI} + 2c_i - c_j$
(DI, DD); (II, DD)	Monopolist (M)	$\frac{\theta_t - c_i}{2+q_i}(Q_j = 0)$	$\frac{(\theta_t - c_i)^2}{4}(\pi_j \leq 0)$	$\frac{(\theta_t - c_i)^2}{4k} - I$	$< 3\sqrt{kI} + 2c_j - c_i$
(II, DI)	Stackelberg Leader (S-L)/ Monopolist (M)	$\frac{(\theta_t - c_i)(2+q_j)-(\theta_t - c_j)}{(2+q_i)(2+q_j)-2}$	$\frac{(\theta_t - 2c_i + c_j)^2}{8}$	$\frac{(\theta_t - 2c_i + c_j)^2}{8k} - I'$	$\geq 4\sqrt{kI} + 2c_j - c_i$ $(< 4\sqrt{kI} + 2c_j - c_i)$

[419] During period 1, the denotation (A, B) means that firm A took action A while competition firm B took action B. During the entire second stage the denotation (AA', BB') means that firm A took action A in period 1 and A' in period 2, while firm B took action B in period 1 and B' in period 2.

[420] Calculated from $\pi_i = PQ_i - C(Q_i)$, assuming for simplicity $q_i = q_j = q = 0$. In the application of the model, $q_A, q_B \geq 0$, that is: when model outcomes are negative, they are assumed to equal zero, because firms do not produce negative quantities.

[421] This state-contingent project value is determined in the last stage from $NPV_i = \max(\pi_i / k - I, 0)$, where π_i is a perpetuity cash flow stream, *I* is the required outlay and *k* the risk-adjusted discount rate. In the first period, the state-contingent project valuee may be determined from future expanded (strategic) net present value in the up and down states using backward binomial risk-neutral valuation. When A or B make an investment (I) in the second period I' must be subtracted in order to calculate the state-contingent project value otherwise this does not apply.

[422] Model outcome symbols: C: Cournot duopoly, M: Monopoly, S: Stackelberg Leader or Stackelberg Follower, A: Abandon, D: Defer.

Action	Model outcome	Equilibrium quantity	Equilibrium profit	State-contingent project value	Demand state
(A, B)	C/M/S/A/D	Q^*_i	π_i^*	NPV_i	θ_t
(DI, II)	Stackelberg Follower (S-F)	$\frac{\theta_t - 3c_j + 2c_i}{4}$	$\frac{\left(\theta_t - 3c_j + c_i\right)^2}{16}$	$\frac{\left(\theta_t - 3c_j + 2c_i\right)^2}{16k} - I$	$\geq 4\sqrt{k}I + 3c_j - 2c_i$
(DD, DD)	Abandon (A)	0	0	0	
Period 1					
(I, I)	Nash Cournot (N)	$\frac{(\theta_t - c_i)(2+q_j) - (\theta_t - c_j)}{(2+q_i)(2+q_j) - 1}$	$\frac{\left(\theta_t - 2c_i + c_j\right)^2}{9}$	$\frac{\left(\theta_t - 2c_i + c_j\right)^2}{9k} - I$	
(I, D)	Monopolist (M)/ Stackelberg Leader (S-L)	$\frac{\theta_t - c_i}{2+q_i}$	$\pi_m = \frac{(\theta_t - c_i)^2}{4}$	$\frac{pV_u^* + (1-p)V_d^*}{1+r} - I + \frac{\pi_m}{1+k}$	
(D, D); (D, I)	Defer (D)	0	0	$\frac{pNPV_u^* + (1-p)NPV_d^*}{1+r}$	

Chapter 9

Gazprom's investment strategy in an uncertain, competitive gas market*

9.1 Introduction

This chapter contains the application of the real-options game model discussed in Chapter 8. By means of exploratory research in the form of separate case studies, Gazprom's investment strategy will be ascertained in light of market outcomes on a sub-regional level by applying the Chapter 8 toolbox and the model. Written from Gazprom's perspective, the case studies pertain to the Turkish and various sub-regional European gas markets. This chapter opens with Case study 1, an assessment of Blue Stream, a historical or ex post case. Subsequently, Case study 2 deals with the South Stream pipeline and Case study 3 with the Nord Stream pipeline.

The case studies each have a similar structure: they begin with a brief background description of the market in question, followed by a conceptual discussion about market uncertainty. Market uncertainty involves demand-side factors such as potential market demand itself as well as pricing. Then, the various potential gas suppliers to the sub-regional market in question are reviewed and assessed. Other investment variables are then considered in accordance with the conceptual toolbox, such as geopolitical factors, regulatory barriers, etc. This is followed by an overview of the possible or planned institutionalisation of the project in question (and in the case of the Blue Stream its institutionalisation as it really occurred).

In all three case studies the real-options game model is then applied, which is a stylised approach to market demand uncertainty and potential gas supply competition in the form of a potential entrant. The model's outcome, namely the overall value of the various projects in question, is then provided. In Case study 1, where the Blue Stream is discussed, the application of the model is followed by a discussion of the gas market's structure as it has evolved since the start of operations of that pipeline in the Turkish gas market. As for the South and Nord Stream pipelines, which are yet to be constructed, potential scenarios (from Gazprom's perspective) concerning ex-post market structures in the respective sub-regional gas markets are then discussed. Each case study ends with a reflection on the use of the model, the respective outcomes, the model's assumptions and their limits.

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9.2 CASE STUDY 1: Gazprom versus competition in the Turkish gas market during the 1990s

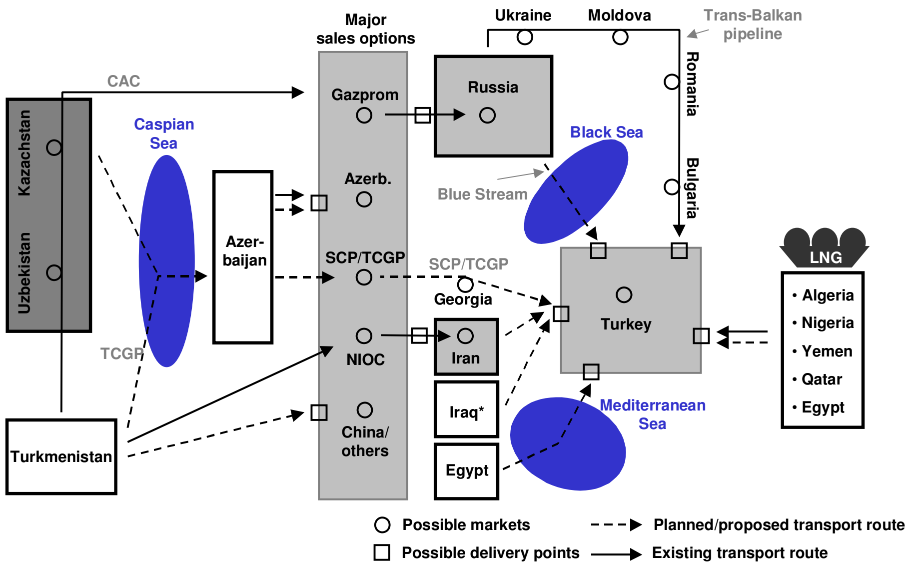
This case study pertains to the Turkish market as it was during the late 1990s. Booming gas demand in Turkey and the construction of the oil BTC pipeline through the Caucasus prompted Russia (Gazprom) to build the Blue Stream pipeline. The pipeline's construction had a major impact on Turkey's gas market structure while the pipeline's commercial value still hangs in the balance, years after its final investment was made (in 2008, approximately half of the total capacity was utilised). Set in the 1990s, this case study is a reconstructive investigation of the strategic value of Blue Stream in view of possible gas flows from newly sovereign Central Asian states and Iran to Turkey (and beyond, as will be shown in Case study 2).

9.2.1 Background

According to many projections made during the early 1990s, the Turkish gas market was to become a booming growth market. Russian gas already played a role early on during this period. The Soviet Union had become an important gas supplier to the Turkish market in 1987, after it started its gas exports to large numbers of European countries during the 1960s. In order to accommodate these Soviet supplies, a trunk line was constructed from the Bulgarian border to Ankara in 1986. In 1990, the Turkish government announced that they also desired to purchase LNG from Algeria (and from Nigeria later on), a move that would help to counterbalance Turkey's large purchases from the Soviet Union [Hacisalihoglu 2008]. After the break-up of the Soviet Union in 1991, the Central Asian states of Kazakhstan, Uzbekistan and Turkmenistan became independent and started acting as sovereign net gas-exporting countries with their own goals and strategies. In the early to mid-1990s, their general attitude reflected a desire to break away from Russia. Russia itself entered a brief period of politico-economic chaos. As a result, combined with higher domestic gas prices, gas for Russian demand decreased during the first part of the 1990s.

The key aspect to the behaviour of the Central Asian countries is that they correspondingly sought to export their resources, both oil and gas, through routes other than the ones that led to and through Russia, which dated from the old Soviet days. This was the heritage from the Soviet Union as described in Chapter 5 and 6 in Smeenk [2010]. A westward export strategy seemed a real possibility for the Caspian countries, particularly for Turkmenistan, because Turkey (and Europe) were recognised as the closest hard currency markets. These were expected to have a significant increase in demand for gas in the years following the collapse of the Soviet Union. In the same period, Iran was also expected to start its export to Turkey and Europe and to become a considerable supplier. The threat of these projects to Gazprom's revenues in Europe combined with increasing pressure on the Russia's gas balance, encouraged Gazprom to take pro-active action in developing its value chain. Simultaneously, Turkey was seeking to strengthen its relations with Iran and other Caspian countries [Akdeniz *et al.* 2002; Hacisalihoglu 2008]. Besides its increasing gas demand, Turkey could and can also be considered as a bridge for gas (and other energy flows) to connect European off-take markets with the Caspian region and the Middle East, see also Case study 2 [Kilic and Kaya 2007]. For a schematic overview of the various export routes from the Caspian Sea region to Turkey, see Figure 9.1.

Figure 9.1 Schematic overview of competing gas supply and transport routes to the Turkish gas market in 1999



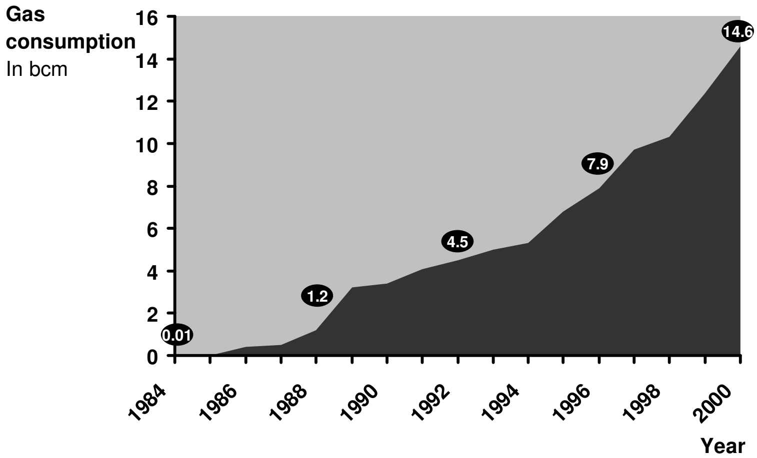
* Iraqi supplies were held up due to UN sanctions aimed at Saddam Hussein's regime.
Note: The overview is schematic (1999) and therefore not accurate.
Source: own analysis, company information; figure adapted from StatoilHydro information.

9.2.2 Market demand in Turkey: A booming gas market during the late 1990s

Natural gas became important for Turkey during the 1980s, as a new emerging economy, having been introduced in 1981 as a primary fuel. Turkey's economic activity has spurred on the need for primary energy, and gas had a substantial share in the primary energy mix in 1999: approximately 15 percent. Power generation played (and still plays) an important role in the demand for gas (in 2000, 60 percent of the total demand for gas, according to Botas). Much of this demand was and is concentrated in the Western (Marmara area) and Southern parts of

Turkey, specifically around Ankara, Izmir and Istanbul.[423] For a number of reasons, including environmental, geographic, energy security, economic and political ones, Turkey had chosen natural gas as the preferred fuel for power generation, of which new capacities were to be added [Hacisalihoglu 2008]. Turkey's gas demand was therefore expected to grow by 5 to 8 percent annually between 2000 and 2020, one of the highest growth rates in the world during that period [privately disclosed company data; Stern 2005]. Domestic gas production in Turkey is not significant: less than 3 percent was coming from domestic gas supply sources, increasing the pressure to import.

Figure 9.2 Turkey's natural gas consumption from 1984 to 2000



Source: own analysis, based on BP [2008]; MENR [2007].

Government-owned entities dominated the Turkish gas sector, so government policies had a large impact on fuel choices. The Turkish gas company Botas had a monopoly on gas imports. After Turkey's financial crisis in 1999, substantial reforms were pushed through by the IMF, which had resulted in liberalisation and a partial privatisation of the gas sector. A key element of the IMF reforms was a requirement for a phased divestment of import contracts by Botas, which will be discussed later on in this case study [Hacisalihoglu 2008; OECD 2002].

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[423] In 1988, gas began to be exploited for residential and commercial purposes in Ankara [Ozturk and Hepbasli 2003]. In the first part of the 1990s, it continued with Istanbul and Bursa, and then in the mid-1990s with Eskisehir and Izmir [Aras and Aras 2004].

In order to appreciate the possible strategic significance of the Blue Stream pipeline, one needs to look back at the period of time when the investment decision was made. In 1999, Turkey was consuming 12.4 bcm, up from only 8 mcm in 1983, consuming 9.7 bcm by 1997, see also Figure 9.2 [Ministry of Energy and Natural Resources 2007; BP 2008]. According to various projections, gas demand was projected to grow rapidly, from between 16.4 and 16.5 bcm in 2000 to between 57.2 and 65.7 bcm in 2020 (which corresponds with a 4.7 to 6.3 percent growth per annum from 2000-2020; see also Figure 9.6). It was by all accounts projected to be a booming gas market. Therefore, the prospects for various potential gas suppliers to the market appeared favourable. Supplying the Turkish market however was by no means a risk-free venture. The possibility always existed that demand in Turkey could remain sluggish or even fall, resulting in a potential oversupply of the Turkish gas market (see also Figure 9.6).

Price risks associated with additional supplies to the Turkish gas market also influence the level of market uncertainty, besides the aforementioned volume (or demand) risk. During the 1990s, (Brent) oil prices were quite volatile and low, which encouraged a deferral of investment and therefore the stimulation of a wait-and-see strategy. Some forecasts at the time (1999) estimated a constant Brent oil price (in real terms) of $17.00/bbl. This would imply a Turkish gas price around Ankara of approximately $55-60/mcm in 1999 dollars.[424] Because of the low and relatively volatile gas prices, investors may indeed be encouraged to defer their investments, i.e., a wait-and-see strategy, if their total cost for, e.g., supply and transport are below the actual gas price and/or relatively high when compared with the gas supply costs of potential competitors.

9.2.3 Various potential gas suppliers to the Turkish market (1991-1999)

Gas suppliers to Turkey were few in the immediate post-Cold War period from 1991 to 1999. Russia delivered a maximum of 16.2 bcm via two contracts with the Turkish gas company Botas. These volumes travelled through its Trans-Balkan pipeline, running via the Ukraine, Moldavia, Romania and Bulgaria. In 1987, the Soviet Union began supplying Turkey with 5.66 bcm, resulting in a 25-year contract for 6 bcm/y until 2011. In 1997, Gazprom and Botas agreed to increase gas supplies via a 50/50 joint venture, Turusgaz, with a maximum of 8 bcm/y, starting in 1998 and lasting until 2021 [Hacisalihoglu 2008]. Modest LNG imports began with Algerian and Nigerian LNG volumes (respectively, a maximum of 4 bcm/y, from 1994 to 2014, and 1.2 bcm from 1999 to 2021). As mentioned above, Turkish domestic gas production accounted for less than 3 percent (around 0.7-1 bcm/y), which was not expected

[424] Additional transportation costs should also be take into account for transport from the off-take centres to the borders of Turkey. In that time, Cedigaz suggests that for long-distance gas transportation $17.50/mcm would be a conservative approximation for each 1,000 km. For example, extra costs of circa $20/mcm from Ankara to the eastern border.

to increase in the coming decades, and thus gas imports had to increase in tandem with demand.[425]

During the late 1990s, some ten gas-exporting countries had announced pipeline and LNG projects in order to supply the growing Turkish gas market. The Turkish government was encouraging these plans in order to promote the diversification of its gas suppliers. Several infrastructure projects to bring pipeline gas from Iran, Iraq, Egypt and the Caspian area were announced. In addition, plans were drawn up to increase (pipeline) imports from Russia and LNG supplying countries, such as Egypt, Yemen and Qatar [Demirbas *et al.* 2004; Hacisalihoglu 2008]. All the gas import agreements were held by Botas, which had signed eight long-term sales and purchase contracts with six different supply sources (contracting a total of 67.8 bcm, which were higher than some demand forecasts) [Ozturk and Hepbasli 2003].

Iran became the first possible large supplier to the Turkish market and did indeed begin modest exports in 2001. During this period, Iran was seen as a large threat to Gazprom's market share in Turkey and Europe. In 1996, the construction of the Tabriz-Erzurum gas pipeline began, with a maximum capacity of 20 bcm/y, connecting Iran with Turkey. From 2001 onwards, Iran started to supply gas to the Turkish market, with a maximum of 10 bcm/y until 2025.[426] Combined with other possible suppliers looking to supply the Turkish market, the Turkish off-take from Iran was disappointing and therefore Iran did not manage to reach its full load factor [US Department of Energy 2009b; CIEP 2008].

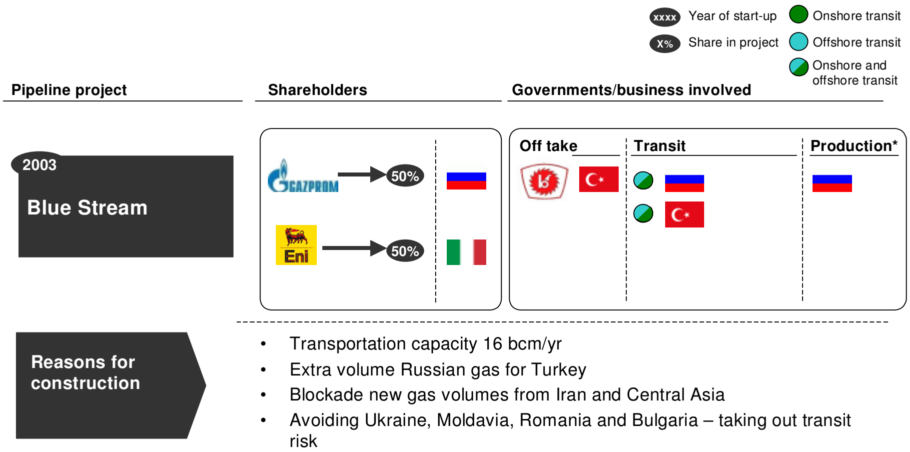
In December 1997, Russia and Turkey signed a 25-year deal under which Gazprom would construct a new gas export pipeline to Turkey for 14.15 bcm of gas annually by the early 2000s [Yazici and Demirbas 2001; Hacisalihoglu 2008]. The investment decision for the construction of the transportation capacity had to be made in 1998 or 1999. Gazprom had three options to increase its supply to the Turkish market. The first option was to increase the capacity of the existing Trans-Balkan pipeline and its existing capacity towards Turkey via brownfields. This was not the most advantageous option, because Gazprom had significant transit problems in Ukraine and Bulgaria (see also Part II). In the mid 1990s Turkey already suffered shortages of Russian gas (in early 1994, daily deliveries of Gazprom's gas were reduced by about 50 percent) due to Ukrainian diversion of transit volumes [Stern 2005]. The second option was a transport route via Georgia and Armenia to Erzurum in eastern Turkey. This

[425] Major gas producers in Turkey include Arco, the Turkish State Petroleum Company (TPAO) and Shell [Hacisalihoglu 2008].
[426] The underlying contract, which was not solid, was partly based on Turkmen gas deliveries to Iran, which started in 2002 with 4 bcm [US Department of Energy 2009b]. The Iranian gas had to come from the non-associated Kangan regional fields and also from associated sources around Ahwaz [Hacisalihoglu 2008].

option was also not favourable, because the main off-take markets were located around Ankara and in the Istanbul/Marmara region in the west and not in the eastern part of Turkey. Moreover, this greenfield investment involved potential political risks. Therefore a direct link under the Black Sea would be a better option [Stern 1999].

The proposed Blue Stream project included a pipeline of 1213 kilometres in length running from Izobilnoye, north of Stravropol in Russia's North Caucasus region, across the Black Sea via the Turkish port of Samsun to Ankara (see Figure 9.3).[427] The gas available from the Siberian gas basin could be used for filling the pipeline.[428] Gazprom's proposal to construct two 372 kilometres off-shore greenfield pipelines implied building the pipelines at record depth (up to 2150 metres) and in very difficult water conditions [Stern 2005]. The dual off-shore pipeline – twice 8 bcm/y – was expected to cost $3.2 billion (including the costs of some Russian onshore pipelines and compression facilities, accounting $1.7 billion), whereas the Turkey's onshore section of Blue Stream was expected to cost $339 million.

Figure 9.3 The Blue Stream project



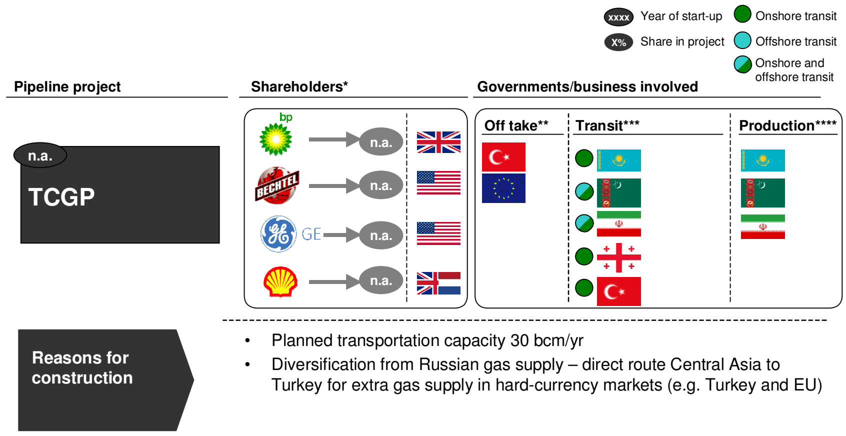
* Some 'Russian' gas exports through Blue Stream to Turkey may possibly be imported by Russia from Central Asian countries.
Source: own analysis, based on Gazprom; Eni; Stern 2005; Mabro and Wybrew-Bond 1999.

In mid-1998, Turkey and Egypt announced a plan to construct a gas pipeline from Egypt to Turkey under the Mediterranean. However, this was too ambitious an idea, and Egypt opted

[427] Eventually, the Blue Stream project could be extended to other Mediterranean countries, such as Lebanon, Syria and Israel.
[428] Gas storage facility at Stavropol could be used for back-up supplies [Stern 2005].

for supplying the Turkish market through LNG (4 bcm/y) [Hacisalihoglu 2008; OECD 2002]. Other LNG supplies from Yemen and Qatar were under consideration as well (4 bcm/y, respectively 3.1 bcm/y). According to expert interviews, gas supplies from Iraq (10 bcm/y) via a greenfield pipeline were also proposed, however, the Iraqi supplies were on hold during this time due to UN sanctions.

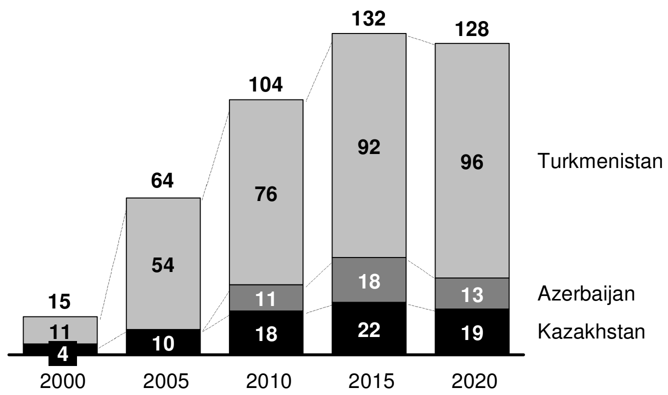
Figure 9.4 Trans-Caspian Gas Pipeline project



* First planned consortium. (Later, Chevron, Kazakhoil and Mobil were involved as well). Bechtel and Turkish Botaş did feasibility studies. Amoco – initially shareholder – is part of BP.
** Main off takers – other (transit) countries may take off gas as well.
*** For EU off taking countries, other transit countries are involved (see Nabucco)
**** Uncertainty about production capacity in Central Asia to fill TCGP
Source: own analysis, based on: expert interviews; EIA [2007].

As was noted, during the 1990s, plans were proposed for the diversification of gas export and transport routes from the Caspian Sea region to Western markets, with the aim specifically of circumventing Russia. One of these projects focused on the Turkish gas market. A possible pipeline to the West – the so-called Trans-Caspian Gas Pipeline (TCGP) – had been on the table for serious consideration by different investment consortia of national and international oil firms as far as implementation was concerned. The proponents of the TCGP were ready to push the project forward and feasibility studies on the possible pipeline route had been carried out, such as a joint venture including Bechtel, General Electric and Royal Dutch Shell and a joint venture including Royal Dutch Shell, ChevronTexaco, ExxonMobil and Kazakh the national oil company, Kazakhoil. The bottom-line of these studies were a gas pipeline from Turkmenistan (close to Turkmenbashy), underneath the Caspian Sea, across Azerbaijan and Georgia, and on to Turkey (see also Figure 9.4). Some studies also explored Kazakh and Azeri supplies alongside the Turkmen one.[429] The TCGP presented Turkmenistan with a valuable opportunity to export gas westwards, underneath the Caspian Sea and away from Russia, both increasing its bargaining power vis-à-vis Russia as well as offering the closest hard currency market to the Caspian countries that was expected to have a significant increase in demand for gas. Figure 9.5 provides an overview of the potential exports from the Caspian region in a base case scenario (e.g. Turkmenistan, Kazakhstan and Azerbaijan), taken into account domestic demand.

Figure 9.5 Potential exports from the Caspian region in 1999 – base case scenario



Note: Base case scenario. Totals may not add up due to rounding. In 2000 and 2005, Azerbaijan was still a net-importing country (2000: -3.3 bcm; 2005: 0.9 bcm).
Source: own analysis, based on privately disclosed company data.

From the mid-nineties four other 'calls' on Caspian gas were under consideration: to Iran, Pakistan (and Afghanistan), China and Russia.[430] It was debatable, however, whether Turkmenistan and other Caspian countries could fulfil all these projects, totalling some 160 bcm/y, which is significantly higher than the estimates made in Figure 9.5. Some groups within the Turkish government stated that a pipeline from Turkmenistan was a top priority, although the pipeline would compete against the proposed Blue Stream pipeline, as well as possibly against Iranian and LNG supplies [Demirbas *et al.* 2004; Hacisalihoglu 2008].

However, it was questionable whether Turkish demand would grow rapidly enough to absorb all proposed volumes of natural gas from Iran, Caspian region, Russia and LNG supplying countries, in addition to gas slated to be supplied by Russia, Algeria, and Nigeria

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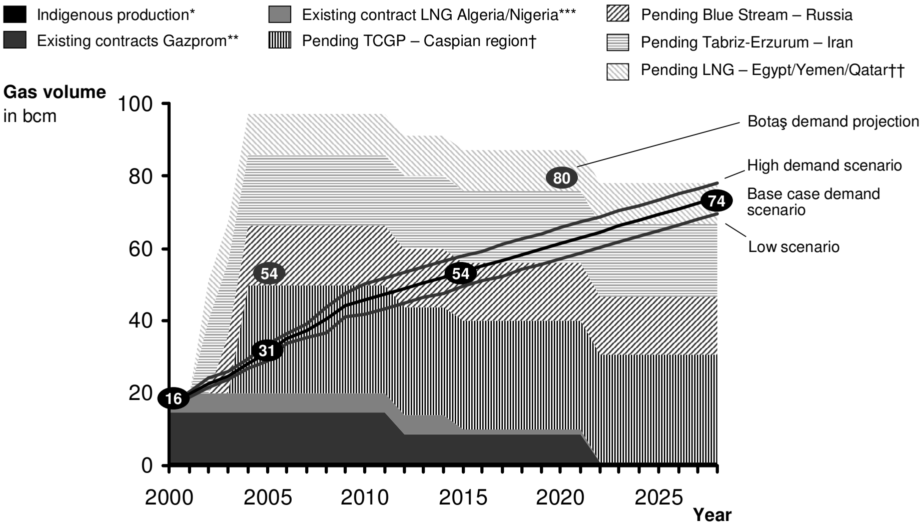
[429] The costs associated with the TCGP were estimated at $3.8 to 4.1 billion (including CAPEX compressor capacity and a Kazakh section along the Caspian Sea of $0.57 billion).
[430] In Case study 2 and Chapter 6, a more in-depth analysis of the Caspian region is presented.

[Hacisalihoglu 2008]. Figure 9.6 presents an overview of the existing and pending supply distribution over Turkey's demand projections in 1999. Indeed, if all projects would have been realised, the Turkish gas market would have been oversupplied, even in the mid-term scenario of Botas.[431]

Figure 9.6 Existing and pending supply distribution over Turkey's demand projections in from 1999 onwards



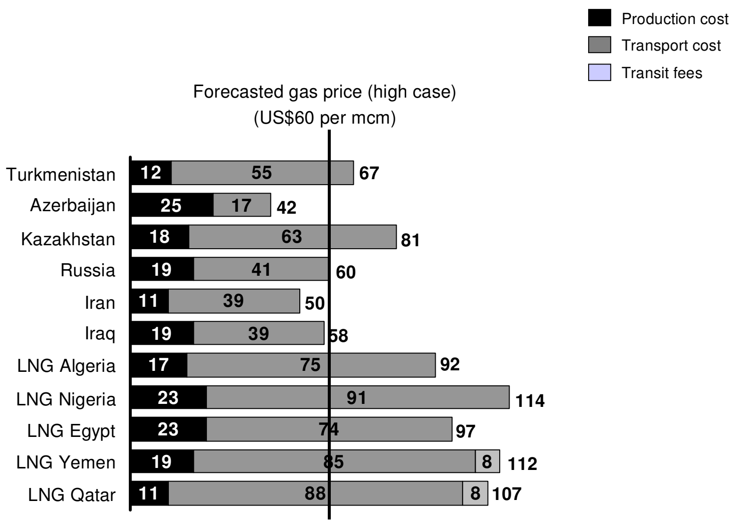
* Indigenous production level varies, in this figure assumed at 0.8 bcm/y.
** Turusgas contract (8 bcm/y) and Gazexport contract (6 bcm/y).
*** Algeria LNG contract (4 bcm/y) and Nigeria LNG contract (1.2 bcm/y).
† Base case scenario: Supply from Kazakhstan (7.5 bcm/y), Turkmenistan (15 bcm/y) and Azerbaijan (7.5 bcm/y).
†† Egypt LNG (4 bcm/y); Yemen (4 bcm/y); Qatar (3.1 bcm/y).
Note: Linear trend extrapolation (via the method of least squares) after 2020 for demand (based on 2015-2020). Other possible pending volumes: Egypt pipeline gas (very uncertain) and Iraq pipeline gas (10 bcm/y – supplies were on hold due to UN sanctions).
Source: own analysis, based on Gazprom information; Stern [2005]; Victor and Victor [2006]; privately disclosed company data.

Referring now to Figure 8.2 in Chapter 8, the growth potential of Turkish gas imports was high, while Turkey was in close proximity to two very large potential pipeline gas suppliers besides Russia: Iran and Turkmenistan (and possibly other Caspian countries), and some smaller potential LNG suppliers. This high degree of competition could induce Gazprom to maintain a pro-active investment strategy in order to preserve and increase its market share in the Turkish gas market. Yet, the low and relatively volatile gas/oil prices at that moment may also encourage a wait-and-see strategy. In order to better grasp the trade-off between the commitment and postponement values, regarding the uncertainty about price and volume,

[431] Turkey could become an important transit centre for gas exports to Greece and beyond in case of oversupply [Hacisalihoglu 2008].

one should focus more in detail on the cost structure of the different competitors towards the Turkish gas market.

Figure 9.7 Comparative unit costs to deliver gas to the Turkish gas market in Ankara – base case scenario in 1999 $/mcm



*A value of US$20 per mcm has been assumed as the cost to transport the gas from Erzerum (East Turkey) to Ankara.
Source: own analysis, based on OME [1999]; privately disclosed company data.

As described in Chapter 7, the LRMC of (new) supplies, influenced largely by economies of scale in transport and upstream production capacity, consists of production and transportation costs, transit fees and royalties, the latter two types of cost are included when applicable. Based on available data on gas supply costs involved in the Caspian Sea region, OME [1999] and privately disclosed company data, one can roughly conclude that four suppliers could deliver gas to the Turkish market on a profitable basis, taking into account the forecasted gas prices in Turkey in 1999 (around $60/mcm, see Figure 9.7).[432] Due to low transportation costs, Iran, Iraq, Russia and Azerbaijan could deliver gas at a cost of below or around $60/mcm. Other proposed pipeline suppliers, Turkmenistan and Kazakhstan, had a unit cost level above $60/mcm: $67/mcm, and $81/mcm respectively. In the case of higher gas prices and/or an optimistic scenario of (transport) costs, supplies from this region could therefore become profitable. The possible entry of LNG played a smaller, fringe role with smaller volumes and lower economies of scale: LNG from Algeria, for example, has a unit cost of roughly $92/mcm to

[432] A said before, the gas price at that moment was based on an oil price of $17 bbl in 1999$.

Turkey, whereas Egypt LNG costed $97/mcm and Nigerian over $110 per mcm. LNG supplies were not competitive under these price circumstances.

Iran and, to a (much) lesser extent Iraq, had considerable potential to become a large supplier to the Turkish market. However, Iranian supplies to the West were unlikely, given due the Iran-Libya Sanction Act (ILSA), while Iranian production capacity remained uncertain. Similarly, Iraqi supplies were 'on hold' as well during this period due to UN sanctions. As described in Figure 9.5, Turkmenistan (and Kazakhstan) also had a large export potential, but the TCGP had and has to compete with other pipeline projects (for example, from Iran in terms of source but also from Russia in terms of gas volume availability as a result of Russian initiatives to secure Turkmen gas volumes). At the time, Azerbaijan had a limited export potential (see also Figure 9.5). The TCGP and the possibility of seeing Turkmen (possibly to match up with Azeri and Kazakh gas) gas flows materialise to Turkey was significant for Gazprom from a strategic point of view, because it represented major new sources of gas from newly independent and sovereign states upon which Russia now depended for those same volumes. Simultaneously, the same gas would compete with Russian gas, potentially loosing market share beyond Turkey in the process.

Referring to Figure 8.3 in Chapter 8, the nature of competition potentially emanating from the Caspian region (including Iran) was therefore significant in terms of economies of scale in transport and production capacity as well as in terms of distance to market. Given the sensitive role of Central Asian gas volumes in Russia's own supply and export balance, the urgent need for a strategic investment ostensibly legitimised an aggressive strategy. Section 9.2.6 of this case study includes the application of the real-option game model in an effort to assess this urgency and measure the strategic impact of the decision regarding the Blue Stream pipeline Gazprom ultimately took.

9.2.4 Other investment variables relevant to the Caspian pipelines and Blue Stream

Other factors besides the geo-economic considerations played an important role in the Blue Stream case as far as new gas supplies are concerned. These should be considered in a conceptual matter in line with Barnes *et al.* [2006], which has been outlined in the conceptual toolbox in Chapter 8. It will focus mainly on supplies from the Caspian region and Russia. Some of these issues are already mentioned under Section 9.2.3. The investment climate for private investors in the Caspian region for instance, especially Turkmenistan and Iran with a great export potential, was not that favourable. The government of Turkmenistan under president Niyazov was perceived as an unreliable partner, offering little protection in guaranteeing the sanctity of contracts. The political future, the rule of law and legal regime of the country were not stable and unfavourable [Olcott 2006]. The Iranian gas sector was also severely underdeveloped and it suffered from a lack of investment capital due to the different sanctions in place, including the ILSA sanctions, severely undermining any export ambitions. The general investment climate in Russia was also unfavourable. Private (Western) investors had little means to secure investments in the Russian gas sector, in which Gazprom had a quasi-monopoly. As a result of Russia's financial crisis in 1998, modest capital was available for financing greenfield projects [Victor and Victor 2006].

Besides the generally flawed investment climate, the possible Turkmen, Kazakh and Azeri supplies were subject to possible transit risks in the south-Caucasus. After the break-up of the Soviet Union, the Caspian Sea was exposed to legal struggles of ownership, whereby Russia delayed the possible realisation of the TCGP underneath the Caspian Sea by insisting that the project did not satisfy environmental regulations [Amineh 2003]. Possible Central Asian transport routes to Turkey via Iran were blocked by the US and the sanctions in place. In the process of assessing the TCGP's feasibility, different external governmental actors were involved for geo-economic reasons. As was described in Chapter 3, the US sought to break-up Russia's transport (and production) monopoly over gas flows from the Caspian Sea region. This strategy was supported by political instruments and international organisations such as the World Bank (this will be discussed under Section 9.2.5 in this case study).

The Blue Stream was a direct offshore link between Russia and Turkey without any involvement of third parties, which resulted in a minimum level of transit risks and political interference. As described earlier, transit risks were growing in Ukraine and Bulgaria during the 1990s. According to expert interviews, various political factions in Turkey had diverging preferences when it came to the different potential suppliers for the Turkish gas market. In the meantime, according to some sources, unconventional measures were perhaps taken by Russia to influence Turkey's political dialogue in its favour. There is some speculation as to whether this included providing Bulgaria (as a trans-Balkan transit country) with some form of financial incentive in exchange for manipulating the physical flows to Turkey and thus encouraging policy-makers in Turkey to opt for the construction of the Blue Stream. Combined with a possible time delay in attaining transit permits, Gazprom (and Turkey) desired to have a direct route towards the Turkish market, instead of boosting the existing capacity to Turkey [Stern 2005]. Russia also had geo-strategic and -economic interests in the Caspian region, as described in Chapter 3. Combined with existing transit problems this provided a positive incentive for a pro-active investment policy with respect to the Turkish market.

9.2.5 Institutionalisation of the Blue Stream and Caspian pipeline projects

Before the model will be applied, it is necessary to assess the organisational and financial institutionalisation of (strategic) pipeline investment from a practical point of view. The strategy and instruments of the Blue Stream and Caspian projects, varied substantially, which could influence the capability to make a strategic investment. The Blue Stream project was part of a strategic alliance between the Italian gas and oil company ENI and Gazprom. The involvement of a Western partner, backed by both governments, was deemed necessary to make the project bankable, because of financial and technical reasons. The project was an exponent of ultra deep-water pipeline technology (up to 2150 metres) and therefore also a technically risky commercial project [Victor and Victor 2006]. ENI could mitigate these technical risks due to earlier experiences. Gazprom and ENI hold a 50 percent interest in the joint venture each and ENI also attained a 50 percent share in the pipeline's capacity, allowing ENI to sell gas from its Astrakhan gas field on the North West shore of the Caspian Sea [Stern 2005].[433]

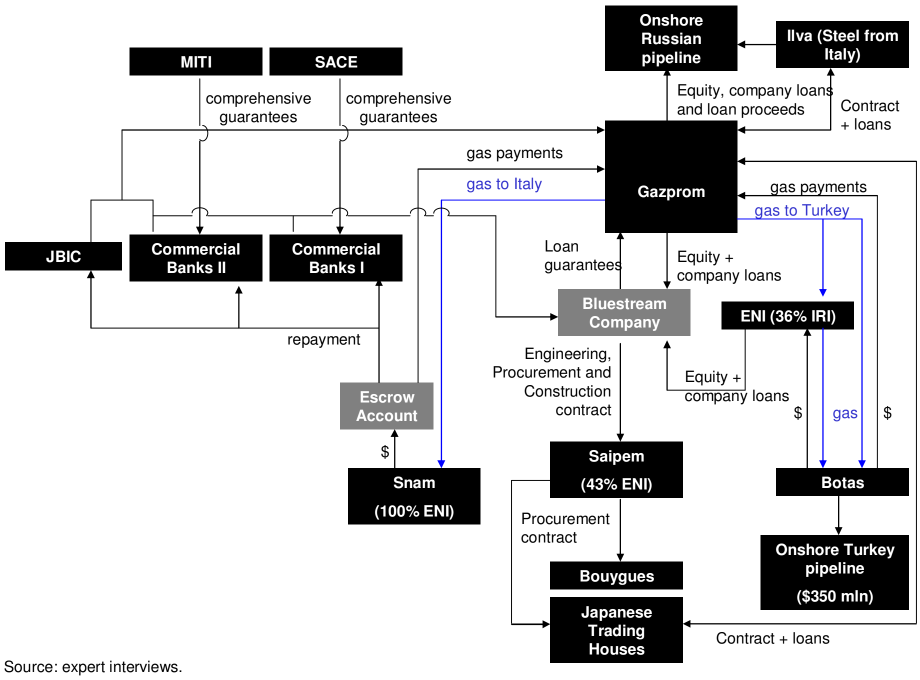
In the growing Turkish gas market, a direct sales strategy seemed the most advantageous option from Gazprom's perspective, which is in line with De Jong's [1989] competitive coordination mechanism. However, as a result of Gazprom's relatively weak organisational capabilities and Botas' monopoly in the Turkish market, a business model of long-term contracts seemed the most viable one in order to ensure Gazprom's position. As mentioned in section 9.2.4, some political factions in Turkey supported the construction of the Blue Stream pipeline and new flows from Russia at a political level.

ENI provided the majority of the $3.2 billion financing. Its return on equity has been realised from the margin between purchase and sales gas price. For strategic reasons, ENI accepted a lower return and took greater risks. Gazprom's return on equity and loss of income from repayment of both onshore and offshore loans could have been made from gas sales to Botas and ENI and the equity what was provided by ENI. The equity investment, the distribution of risks, and reward allocation between Gazprom, ENI and *Società Nazionale Metanodotti* (SNAM) were complex. The repayments of the loans were based on gas contracts between SNAM (a subsidiary company of ENI) and Gazprom, thus being completely de-coupled from the project itself. This resulted in less expensive loans via the so-called warehouse construction (see also Figure 8.4 in Chapter 8), provided by five commercial banks and in which Ministry of International Trade and Industry of Japan (MITI) and the Italian export credit agency Servizi Assicurativi del Commercio Estero (SACE) had given guarantees. Figure 9.8 is a detailed overview of the likely financial structure of the Blue Stream project. In late 2001, the laying of

[433] The joint development of the Astrakhan gas field was also part of the strategic alliance between Gazprom and ENI. So far, no ENI produced equity gas was going through the Blue Stream. In addition, no really significant new development of that gas field has since taken place [Stern 2005].

the offshore lines started and it was completed in October 2002, which was within acceptable limits for such a risky project [Stern 2005].

Figure 9.8 Likely reconstruction of financial structure of the Blue Stream project



Source: expert interviews.

In addition, according to expert interviews, in order to ensure its strategic success on the Turkish market and to moderate Iranian supplies, Gazprom had engaged in an aggressive negotiation strategy with regard to the price setting. The Iranian NIGEC/NIOC had offered Botas an import price of $65/mcm (with Ankara as the delivery point), whereas Gazprom had settled a gas import price of $75/mcm. After Iran's offer, Gazprom reduced its price substantially by treating the Blue Stream project as a sunk cost, therefore willing to bear the full gas transport cost. In other parts of the value chain, the Russian government and Gazprom had embarked on a pro-active policy as well, including the use of political instruments, including pipeline diplomacy. Russia has also been able, as mentioned, to delay the possible realisation of the TCGP across the Caspian Sea on environmental grounds. Meanwhile, according to expert interviews, Gazprom locked in new Turkmen supplies at more favourable rates than its TCGP competition, which reduced the availability of gas supplies to that project.

The institutionalisation of the pipeline of Gazprom's competition differs from the Blue Stream project. The TCGP project had to be financed on a purely commercial basis through project financing. As mentioned previously, joint ventures included the participation of both national and international oil firms. These entities had no strategic interest in a pipeline, except for shipping gas on a purely commercial basis. However, via political instruments and institutes, such as the Bretton Woods institutions, Western countries were able press forward with the realisation of a direct gas corridor from the Caspian region. Besides the attempt at breaking up the Caspian upstream sector for international energy firms, the US introduced some instruments for realising alternative transport routes from the region. New pipeline routes from the Caspian region directly to the West were stimulated via the 'East-West-corridor policy', which was backed up by a transit policy document of the former Clinton Administration (also see Chapter 11).[434] According to expert interviews, international financial institutions, such as the World Bank and the European Bank for Reconstruction and Development (EBRD), were also encouraged to help finance pipeline projects from the Caspian region directly to the West.[435] Also some political factions in Turkey favoured the Trans-Caspian pipeline as an alternative to the Russian proposal.

During the 1990s, Europe had a relatively passive policy towards the Caspian region and its gas reserves. The EU only signed an umbrella agreement in 1999 under its Interstate Oil and Gas Transport to Europe (INOGATE) programme, based on the European Energy Charter of 1991 in order to reduce European dependency on OPEC countries and to guarantee access to energy supplies (see chapters 6 and 7 in Smeenk [2010]).

9.2.6 Application of the real-option game model to the Blue Stream case

The essence of the application of the model is an analysis of Blue Stream as a potential strategic investment for Gazprom, by employing the embedded real-options game framework described in Section 8.4 of Chapter 8. The application of this model pertains to the Turkish gas market discussed descriptively in the previous sections, taking into account both opportunities and threats (i.e., vis-à-vis potential competitors). Given the presence of potential competitors on the one hand and demand uncertainty on the other, the goal is to ascertain the overall expanded value of the Blue Stream pipeline project using a simplified model, in other words, the descriptive analysis above must therefore be stylised. To the greatest degree possible, the as-

[434] This policy was supported at the time by a Richard Morningstar, Special Advisor to the President and Secretary of State on Assistance to the New Independent States of the former Ssoviet Union.

[435] An example of this financing concept was the Baku-Tbilisi-Ceyhan (BTC) oil pipeline, from Baku via Tbilisi in Georgia to Ceyhan in Turkey. The economic feasibility became under discussion by uncertainties in the upstream, as a result of questions about the availability of oil. Financing of the BTC pipeline were covered mostly by financing agencies and development banks. They offered favourable interest tariffs to make the pipeline economically profitable for its shareholders [Amineh 2003].

sumptions below are designed to approximate real world figures and numbers in the context of specific market circumstances and gas infrastructure investments.

9.2.6.1 Assumptions and parameter values

Operational assumptions:

a. We assume that the Turkish gas market consists of a duopoly, with Gazprom on the one hand and a potential competitor on the other, with the latter acting as a potential entrant for new market demand with an 8 bcm/y pipeline, both on a distance of 1,213 km to the off-take market (offshore section: 470 km; onshore section in total: 753 km). (No account is taken of potential LNG suppliers at this stage.)
b. Gazprom faces the choice in 1999 (i.e., stage I) of building or deferring the construction of the Blue Stream pipeline across the Black Sea to Turkey in the face of potential entry by a competitor (see Figure 8.9 in Chapter 8).

Parameter value assumptions:[436]

a. **Average operating gas transport costs in the base case:** In the base case, both players are assumed to make commercial investments only, i.e., constructing small-diameter pipelines with a capacity of 8 bcm/y, which only have a technical ramp-up phase. In this case it means both players do not undertake early strategic commitment (in the market), meaning the operational unit costs remain at: $c_G = c_E = \$9.93\,/\,\text{mcm}$. At this point, neither player yet benefits from economies of scale.
b. **Average operating gas transport costs in the proprietary case:** The construction of the Blue Stream is a proprietary investment. Gazprom decreases its average operational unit costs from $9.93/mcm to $8.54/mcm as the pipeline has greater economies of scale (from 8 bcm/y in the base case to 16 bcm/y in the proprietary case). This represents the move away from the base case and towards the proprietary case. The competitor is assumed to use an 8 bcm/y commercial pipeline capacity at the same distance (i.e., the base case situation with an average operational unit costs of $9.93/mcm).
c. **First-stage strategic pipeline investment (K):** The initial cost of building the Blue Stream, K (totalling $2.245 billion), is defined as the difference between the CAPEX for Blue Stream minus the 'theoretical' CAPEX for a normal 8 bcm/y commercial investment, I (totalling $0.955 billion).[437]

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[436] See the conceptual discussion on definitions held in the toolbox in Chapter 8.

[437] In order to calculate the 'theoretical' CAPEX as well as the average breakeven operating costs per unit, account is taken of steel price indices, inflation, the WACC (k), the risk-free rate (r), fuel and compression costs, etc. (see Chapter 8). The real, historical figures are used for the proprietary case here. The base case 'theoretical' pipeline CAPEX calculation is based on 2009 input data; including a steel price index correction (primarily for inflation) obtained from privately disclosed company sources. The inflation is assumed at 1.1 percent, according to Eurostat data for the Euro area.

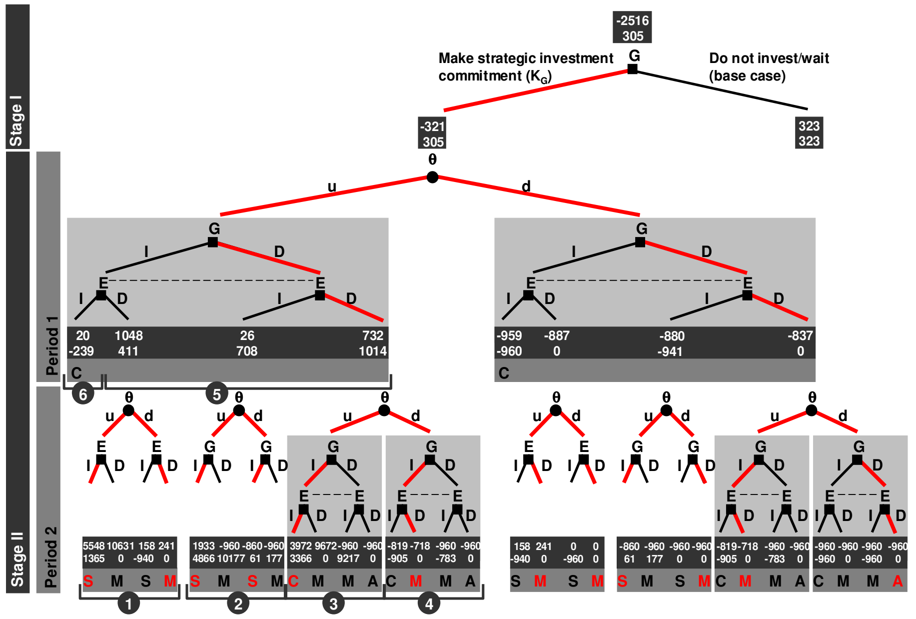
d. **Follow-up investment outlay by either Gazprom or the competitor (I):** Follow-up investment outlay, made after stage I and thus after the incumbent's strategic investment, corresponds with a base case commercial 8 bcm/y pipeline investment ($0.955 billion).
e. **Initial demand parameter (θ_0):** For simplicity, initial gas market demand in the Turkish gas market is assumed to be 18.25 bcm ($\theta_0 = 18.25$) at t_0 as detailed in Section 8.4.5.
f. **Binomial up or down demand parameters (u and d):** In the model, demand is assumed to be stochastic, moving up or down with binomial parameters u = 2 and u = 0.5, both at the beginning of periods 1 and 2 in stage II. Starting at t_3 there is a 'steady state' of 25 years, i.e., no more upward and downward moves, as detailed in Section 8.4.5.
g. **The risk-free interest rate:** The risk-free discount rate is assumed to be 5.5 percent ($r = 0.055$).[438]
h. **The risk-adjusted discount rate:** The rate at which profits in the last stage are to be discounted by is set at 8.5 percent ($k = 0.085$).[439] The project's expected annual cash flows extend over a period of 25 years, acting as an annuity.
i. **Risk-neutral probabilities:** Given u, d, k and r, it can be determined that p = 0.32 and 1-p = 0.68.

Figure 9.9 is an overview of the various payoffs to Gazprom and the competitor in a decision tree, which is a direct application of Figure 8.9 in Chapter 8. Each node corresponds an up- or downward move in demand and the resulting decisions of Gazprom (denoted in Figure 9.9 and elsewhere by the letter G) and the competitor (or potential entrant, denoted in Figure 9.9 and elsewhere by the letter E), respectively, to invest or defer (further) commercial investments ($G\{I, D\}$ and $E\{I, D\}$) in stage II while in stage I only Gazprom is assumed to invest as an incumbent. The highlighted (red) branches along the tree indicate the optimal actions along the equilibrium path.

The model is now explained in 6 distinct steps (steps **a.** through **f.**). For period 2 in stage II, we take the case in which demand has moved upward in period 1 (i.e., branch u), and do not elaborate here on either the case in which demand falls or the base case. Notice that Figure 9.9 will be approached through backward induction, i.e., bottom-up.

[438] The risk free rate is based on the yield-to-maturity in October 1999 of a 10-year Euro-denominated (or the equivalent thereof) German government bond [Tradingeconomics.com 2009].
[439] For lack of historical data, we have used the actual risk-adjusted discount rate (the WACC). We therefore do not make a distinction here between the rate prevailing in 1999 and 2009 (see case studies 2 and 3). Given the availability of the sensitivity analyses (see Figure 9.11), such changes in the WACC do not have a crucial impact, though it remains an important element in determining the overall net project value. The WACC is based on information provided in expert interviews, where a WACC of between 8 and 9 percent was proposed as being appropriate, which is in line with the regulated pipeline business.

Figure 9.9 The proprietary case for Blue Stream vis-à-vis the competitor



Assumptions:
First-stage strategic pipeline investment by Gazprom: K_G = 2,240 mln$
Follow-up (second-stage) investment outlay by either Gazprom or its competition: $I_G = I_E = I$ = 960 mln$
Initial demand parameters: θ_0 = 18.25 bcm (with $\theta_1 = u\theta_0$ or $d\theta_0$)
Binomial up or down demand parameters: u = 2.00; d = 1/u = 0.50
Risk-free interest rate: r = 0.055
Risk-adjusted discount rate: k = 0.085

Operating costs:	c_G	c_E
No investment (base case)	9.93	9.93 $/mcm
Proprietary investment	8.54	8.54 $/mcm

Note: monetary amounts are in million$.
Source: own analysis.

9.2.6.2 Model application and backward induction[440]

a. **Stage II, Period 2, Sub-game 1** (in Figure 9.9; frame 1)

State of demand in the Turkish market: At the beginning of period 2 in stage II, demand has already shifted upwards once in period 1, from 18.25 bcm to 36.5 bcm. In period 2 in stage II demand either shifts upwards again, to 73 bcm, i.e., θ_2 (i.e., $\theta_0 x\ u\ x\ u$), or falls back to 18.25 bcm, θ_2 (i.e., $\theta_0 x\ u\ x$ d).

[440] All state project values are noted in $ millions.

• State of demand in period 2 in stage II: θ_2 (i.e., $\theta_0 x\ u\ x\ u$) = 73 bcm

If demand rises to 73 bcm in period 2 in stage II, the two model outcomes with the optimal payoffs for Gazprom are the ones where it ends, respectively, as a dominant firm or leader (S-L) and as monopolist (M), respectively. From the competitor's perspective it is compelled in this sub-period either to invest in the case when demand rises in period 2, becoming a follower (S-F) in the process and obtaining a payoff of 1,365, which is greater than deferring and obtaining 0. So the competitor ends this particular sub-game with its own decision to invest even though Gazprom may prefer to obtain 10,631.[441]

• State of demand in period 2 in stage II: θ_2 (i.e., $\theta_0 x\ u\ x$ d) = 18.25 bcm

If demand shifts to 18.25 bcm in period 2 in stage II, the competitor will lose on its investment, obtaining -940 as a follower. Therefore, the competitor subsequently opts for deferral, obtaining 0 rather than -940, which implies that Gazprom is able to become a monopolist (M) in this particular sub-game *if* demand falls, deterring entry altogether in the Turkish gas market. In this situation, Gazprom is able to severely limit the competitor's profitability (thanks to its strategic investment), compelling it to choose between 1) not entering the market or 2) being compelled to accept substantially lower profits as a follower (S-F), while Gazprom obtains a payoff of 241.

b. Stage II, period 2, sub-game 2 (in Figure 9.9, frame ❷)

• State of demand in period 2 in stage II: θ_2 (i.e., $\theta_0 x\ u\ x\ u$) = 73 bcm

Referring to Figure 9.9, sub-game 2 yields dominant payoff values of 1,933 and 4,866 for Gazprom and the competitor, respectively. In this particular sub-game, Gazprom makes the last move of the game, as it deferred investment in the first period and demand has yet to shift, its actions themselves acting as a constraint on what the competitor can choose for. Thus the competitor may have preferred obtaining 10,177 rather than 4,866, however Gazprom is able to invest commercially, adding commercial pipeline capacity, ending as a leader (S-L) with a payoff of 1,933.

[441] Gazprom would thus become a monopolist in outcome (M) in the event that the competitor defers in the case of a rise in demand in period 2, obtaining 0 instead of 1,365. So the competitor, having the last word in this sub-game (for it still has a chance to invest with a rise and/or fall in demand), will obviously choose 1,365 rather than 0, in which case it invests ($E\{D, I\}$) in follow-up capacity, i.e., in a pipeline with only a technical ramp-up phase, making gas available to the market quickly in order to earn a commercial return on investment.

• State of demand in period 2 in stage II: θ_2 (i.e., $\theta_0 x\ u\ x\ d$) = 18.25 bcm

Sub-game 3 yields payoffs of -860 and 61 for Gazprom and the competitor, respectively. Here it is Gazprom which ends the game as a follower (S-F) while conversely the competitor ends as a leader (S-L).

c. Stage II, Period 2, sub-games 3 and 4 (in Figure 9.9, frames ❸and❹)

In the same manner as has been done in the first two sub-games discussed above, the optimal strategies are derived for sub-games 3 and 4.

• Sub-game 3: State of demand in period 2 in stage II: θ_2 (i.e., $\theta_0 x\ u\ x\ u$) = 73 bcm

The competitor is now again in a position to make the last move in the sub-game, which acts as a constraint on Gazprom's choices. However, in this panel of the sub-game (frame 3), Gazprom did not invest commercially in period 1 and neither did the competitor (see below). Both Gazprom and the competitor have the incentive to invest, ending in a duopoly model outcome (C), with payoff values 3,972 for Gazprom and 3,366 for the competitor, respectively.

• Sub-game 4: State of demand in period 2 in stage II: θ_2 (i.e., $\theta_0 x\ u\ x\ d$) = 18.25 bcm

Given the additional penalty that arises in the case of a deferral twice in periods 1 and 2, Gazprom has the dominant strategy to supply a quantity at a negative state project value. Conversely, the competitor has a dominant strategy to defer, which leads to a monopoly outcome for Gazprom. Gazprom ends with a payoff of –718 and the competitor with 0.

d. Stage II, Period 1, games 1 and 2 (in Figure 9.9, frames ❺and❻):

• Game 1: State of demand in period 1 in stage II: $\{\theta_1 = \theta_0 \text{ x } u\}$ = 36.5 bcm

The results listed above for the various sub-games are fed back into the first period of the second stage by backward induction. Here Gazprom has built a strong position by investing strategically in stage I. In this first period of stage II, the payoffs include values 20, 1,048, 26 and 732 for Gazprom and -239, 411, 708 and 1014 for the competitor, resulting from the state-contingent project values above (i.e., from the various sub-games). A duopoly model outcome results in period 1, when Gazprom and the competitor both decide to invest already in the first period (in period 1, stage II) yielding payoffs 20 for Gazprom and -239 for the competitor. Both parties opt for deferral at this stage, obtaining values 732 and 1014, respectively, despite and initial rise in demand.

e. Backward induction of period 1 (stage II), to stage I:
Finally, the period 1 payoffs for Gazprom help determine, again via a next step of backward induction, whether the strategic investment is worth making net of its initial capital investment cost, K_G, the amount invested in excess of a base case pipeline of 8 bcm/y. The stage I payoff for Gazprom is -321 while for the competitor it is 305. When the strategic investment is subtracted as well, i.e., the amount obtained from K – I, the overall NPV for Gazprom of building Blue Stream is –2,516. Thus, according to the real-option game model, the Blue Stream case demonstrates that the pipeline has an overall *negative* net project value of $2,516 million, which is far below the overall NPV (i.e., including the option value) under the base case of $305 million (refer to the top right two numbers in Figure 9.9).

f. The various value sub-components
As noted in the model, the total value of the early strategic investment can be measured by using formula 8.5. The composition of a total value into the different strategic value components is discussed below.

The game is initiated at an initial demand level of 18.25, and the binomial parameters u = 2 and d = 0.5 determine a number of different demand levels. Table 9.1 below shows how the equilibrium actions (Q^*_G), profits (π^*_G), the state-contingent project values (NPV^*_G), and the various value components (the direct, reaction, pre-emption and postponement values) vary with different levels of demand. As has been shown in the games and sub-games above, every demand level leads to dominant strategies on the part of both players. For simplicity, the following numerical explanation is based exclusively on the model's results in the last row in panel B, Table 9.1, specifically the case in which demand has risen twice to 73. Here, Gazprom ends up as a leader firm (S-L), where it supplies 33 bcm/y with a profit of 542. In this specific case, Gazprom uses its existing infrastructure adjacent to the capacity of the Blue Stream pipeline. At this level of demand, and given the cost functions as a result of the proprietary investment, Gazprom has effectively been able to ensure a large share of the market as a dominant or leading firm. The competitor ends as a follower producing 15 bcm/y, merely half of what Gazprom supplies.

Table 9.1 Second-stage equilibrium state project values and strategic effects for different market structures and states of demand for the base and proprietary pipeline investment case

Panel A – Base Case							
Demand θ	Market Structure (Static)	Quantity Q^*_G	Profit π^*_G	NPV_G	Market Structure (Dynamic)	Postponement value	Base Case NPV^*_G
5	Cournot Nash	0	0	(960)	Abandon	960	0
9	Cournot Nash	0	0	(960)	Defer	960	0
18	Cournot Nash	3	8	(881)	Defer	881	0
37	Cournot Nash	9	78	(157)	Defer	1230	1073
73	Cournot Nash	21	442	3563	Cournot Nash	0	3563

Panel B – Proprietary Pipeline Strategic Investment									
					Strategic				
Demand θ	Market Structure (Dynamic)	Quantity Q^*_G	Profit π^*_G	Direct value	Reaction value	Pre-emption value	Commitment value	Postponement value	NPV^*_G
5	Abandon	0	0	4	(40)	960	960	(960)	0
9	Defer	0	0	1	0	122	123	(960)	(837)
18	Monopoly	5	24	12	17	1078	112	(881)	241
37	Defer	0	0	131	46	758	889	(1230)	732
73	Stackelberg	33	542	305	104	1576	1984	0	5548

Note: Totals may not add up due to rounding. Monetary amounts are in million$.
Source: own analysis.

The proprietary case must be compared with the base case (panel A of Table 9.1) in order to determine the difference between making the strategic investment commitment and remaining at the original level of economies of scale, i.e., not building Blue Stream and sticking to an 8 bcm/y pipeline. In the base case, at the same level of demand, the NPV is 3,563 and both firms produce 21 bcm/y via existing and new infrastructure. Since the overall NPV is positive in the base case, the postponement value of investing strategically is zero.

The direct and strategic value

As was explained in the Section 8.4.1 of Chapter 8, the net commitment value consists of various components: the direct, reaction and pre-emption values (refer to the appendix in Chapter 8 for a detailed explanation of how these values are calculated). These values are shown in panel B of Table 9.1: The direct value of Blue Stream for Gazprom, attained due to the benefits of economies of scale alone is 305. The additional value of undermining the profitability of the potential entrant's investments is 104, i.e., the strategic reaction value, while the value of altering the structure of the market altogether, the pre-emption value of Blue Stream, is 1,576. This last value is the value attained by shifting from a model outcome involving duopoly (C) to one where Gazprom ends as the leading firm (S-L).

The postponement and net commitment values
The strategic reaction value and the pre-emption values together determine the strategic value. The net commitment value, which is computed by adding the direct to the strategic value, is therefore 1,984 (= 305+104+1,576). In this case the postponement value is zero, because in the base case scenario the NPV is also positive as a result of strong upward demand potential.

The overall net project value
Finally NPV^{*}_{G} of Blue Stream for Gazprom is the NPV in the base case (3,563), added to the net commitment value (1,984) and the postponement value (0), which is 5,548 in total, i.e., \$5,548 million.[442] Note that this is not the overall net project value of the Blue Stream pipeline to Gazprom (which has been determined as –\$2,516 million; see the end of the previous step **e**). The value of \$5,548 million, which has been reconstructed here as illustration of the sub-component analysis, is to be found as one of the end-of-period-2 values in Figure 9.9 (see in bottom-left box, indicated as frame 1).

9.2.6.3 Sensitivity analysis

Sensitivity analyses are designed in this context to measure the effect of changes in input variables, such as the binomial upward-move parameter (u), the risk-adjusted discount rate (k), commercial investment (I) and strategic investment cost (K) on NPV^{*}_{G}. Sensitivity analyses are made on all four input variables of the model. The most significant and remarkable results are mentioned below for the Blue Stream pipeline.

1) Overall net project value versus sensitivity to changes in upside market demand potential

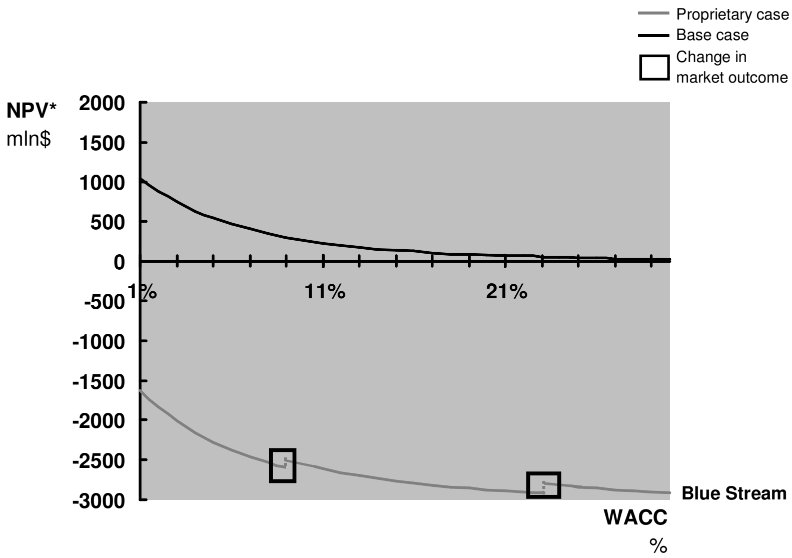
Refer to Figure 9.10 below, which shows the sensitivity of NPV^{*}_{G} to changes in upward market demand potential, u. The change in value of the upward demand potential parameter u, varying in the sensitivity analysis between values of 1.01 and 2, is positively related to NPV^{*}_{G}. In the base case of no pipeline with larger capacity (i.e., lower economies of scale), the project value increases monotonically (see top part of Figure 9.10) with upward market demand potential, as expected from option theory. Considering the positive relationship between overall NPV and upward demand potential, the graph (lower part of Figure 9.10) exhibits two remarkable discontinuities. These 'negative jumps' can be explained from the strategic competitive interaction in Gazprom's market.

In Figure 9.10, starting from u = 1.01, Gazprom is a monopolist (M) due to its proprietary investment. When upward market demand potential reaches a level of 1.65, demand increases sufficiently for an entrant to enter the market, which is when the model outcome shifts from

[442] The postponement value is a negative number in case the static NPV is below zero for the base case, added, when applicable, by the option value when deferring a commercial investment (I) in period 1 in stage II.

monopolist (M) to leadership (S-L). The second jump in Figure 9.10 reflects another shift in the model outcome from leadership (S-L) to duopoly (C). However, for all parameters of u, NPV^*_G remains negative for Blue Stream given the model's application.

Figure 9.10 Overall net project value as function of upward market demand potential, u (with d fixed at 0.50)

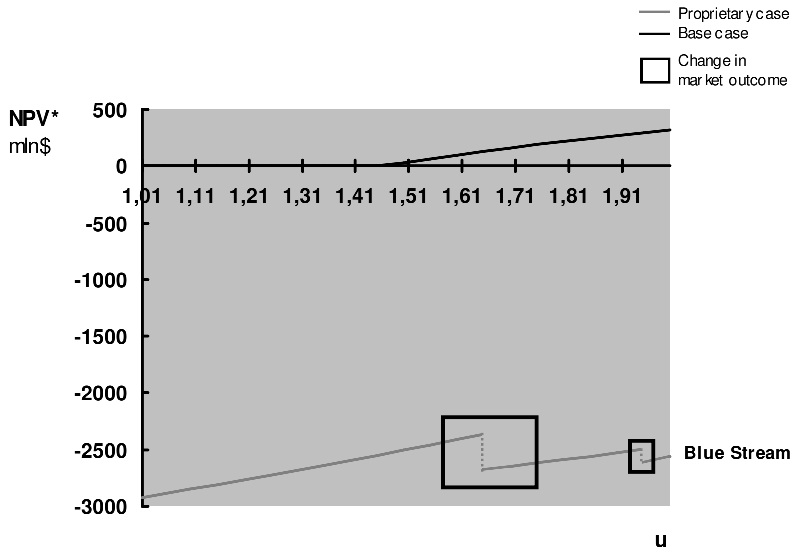


Source: own analysis.

2) Overall net project value versus sensitivity to changes in the WACC

Refer to Figure 9.11 below, which shows the sensitivity of NPV^*_G to changes in the risk-adjusted discount rate k (i.e., the WACC). From the rise in the slope of the curve, it can be derived that the NPV^*_G rises substantially with a small decrease in k, both in the base and proprietary cases. This result is logical, because future cash flows are discounted at a lower rate (i.e., a higher present value), with the NPV^*_G rising most rapidly in the interval ($0 < k < 11$), in both the proprietary and base cases. This sensitivity analysis shows that when Gazprom accepts a lower risk-adjusted rate of return, the strategic value components rise in the overall net project value. In the proprietary case, NPV^*_G experiences two jolts at separate values for k of 10 and 23 percent. These small jumps in the curve are related to the change in market outcome as result of the competitor's entry.

Figure 9.11 Overall net project value as function of the WACC

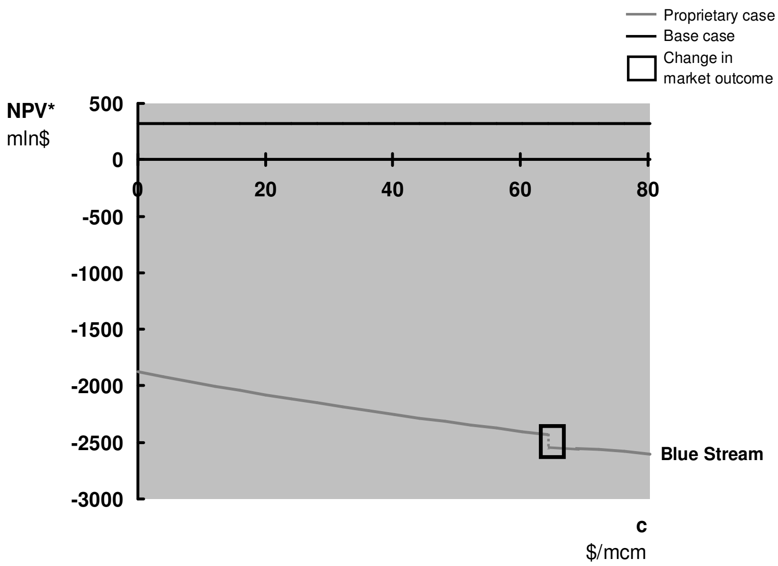


Source: own analysis.

3) Overall net project value versus sensitivity to changes in average operating costs per unit

Refer to Figure 9.12, which shows the sensitivity of NPV^*_G to changes in OPEX (c). With an increase in c, the NPV^*_G of the project decreases in the various value components of the pipeline: both in the direct value of attaining greater economies of scale, as well as in the deterrence effect. The small jumps in the curve are related to the change in market outcome from monopolist (M) to leadership (S-L) after $60-65/mcm for Gazprom.

Figure 9.12 Overall net project value as function of unit operating costs, c



Source: own analysis.

9.2.7 A reflection on Blue Stream and competitors' projects outcomes: ex-post Turkish gas market structure

The model: Limitations

The model is able to provide a quantitative assessment of the Blue Stream project regarding market demand uncertainty and potential entry. The model helps explain the strategic value, which transcends the commercial value as far as deterring entry is concerned. The overall value that the model has determined for the Blue Stream project is highly negative at approximately –$2.5 billion. Apart from the precise value, this implies a clearly negative verdict on the project. In support of this model verdict, we have learnt from various expert interviews that Blue Stream is generally felt to be a commercial disaster, though it did lock out other potential gas suppliers from the Turkish gas market in the process.

Of course the application of the model has its shortcomings. The most important ones are listed below:

1) The model only accounts for two players; it cannot simulate or account for a greater number of gas suppliers, while in the real world obviously there are many more existing and/or potential gas suppliers.

2) The model, composed of a two-stage game, only lasts for a limited number of periods. After the game has taken place, the situation is assumed to remain in a steady state, where developments remain frozen. Of course, real world developments are highly dynamic, not static as the model suggests, and continue long after the 'game' is finished.

Model results: Discussion

The application of the real-option game model in the Blue Stream case demonstrates that the pipeline is has a negative overall NPV of $2.5 billion, given of course the various assumptions and simplifications that have been made when introducing the model. This means the project was a financial fiasco both commercially, as well as strategically. Nevertheless, the pipeline did have some deterrence effect in the real world, since it locked other important suppliers in the region, such as Turkmenistan and Iran, out of the Turkish market. On the basis of the sensitivity analysis above, the pipeline may well have had a greater direct value if its economies of scale had been higher (i.e., a pipeline capacity greater than 16 bcm/y), combined with higher initial market demand.

According to expert interviews, the 16 bcm/y capacity was the highest possible technically achievable limit of offshore capacity in the late 1990s, exacerbated by the complex nature of the Black Sea's sea floor. Furthermore, expert interviews reveal that the pipeline's low utilisation rate after its completion (as it occurred historically in the real world) added to the pipeline's loss in commercial value. According to these interviews, Gazprom treated Blue Stream as a sunk cost (i.e., by not charging its customers part of the total transport costs of the pipeline), which artificially enhanced the economies of scale. In this way it (still) serves as a deterrent. This underlines the importance Gazprom may perhaps attribute to deterring entry in the Turkish market. The Blue Stream project in real world thus was successful with respect to potential long-run competition. However in hindsight, the anticipated growth in gas market demand was too optimistic and other (legal) aspects came into play, which may have rendered Gazprom's investment in the Blue Stream premature. With regard to the real world, the model naturally has its limitations (see the end of this chapter).

Ex post analysis: was Blue Stream a premature investment?

By 2004, Turkey was consuming 22.4 bcm of gas, importing 13.1 bcm worth of those volumes from Russia through the Blue Stream and via the 'longer' route through the Trans-Balkan pipeline. In 2008, Turkey consumed 37.2 bcm, 21.4 bcm of which came from Russia (through the two aforementioned pipelines).[443] This afforded Gazprom a stable 58 percent share of the emerging Turkish gas market in 2004 and 2008 market. Other pipeline gas con-

[443] Russia's deliveries are measured in European bcm's from Gazprom [2009]. IEA [2009b] estimates Russia's exports to Turkey at 22.5 bcm in 2008.

tenders in Turkey in 2008 included Azerbaijan (through the South Caucasus Pipeline – SCP, see also below) at 4.6 bcm (12 percent), Iran at 4.1 bcm (11 percent). Turkey's LNG imports included 4.1 bcm from Algeria (11 percent) and 1.0 bcm from Nigeria (3 percent). Other supplies were produced domestically (1 bcm) [IEA 2009a; Gazprom 2009]. After the US invasion of Iraq in 2003, Iraq also became a potential source, but by no means a secure gas exporter to Turkey and beyond.

Had Gazprom ignored the potential of Turkey's dynamic demand growth and given up on the risky Blue Stream project, Turkey's demand may well have been satisfied by a greater share of gas from the other suppliers mentioned, by means of both pipeline and LNG flows as well as possible Trans-Caspian gas flows from Turkmenistan. Gazprom's move thus resulted not only in a large market share; it limited other suppliers' penetration in the Turkish market. Essentially, combined with Gazprom's price setting policy and Russia's pro-active policy in the Caspian upstream sector, Gazprom pre-empted flows originating from Turkmenistan through the TCGP. Additionally, Turkmen gas flows to Russia were contracted. To a more limited extent, Iran's possible exports were also pre-empted. However, according to the results of the model application, the Blue Stream project was a very expensive strategy in order to preserve its position in the Turkish (and European) market.

Blue Stream did not discourage market entry of small Iranian(/Turkmen's) supplies, entered via the construction of pipeline from Iran to Turkey in 2001, respectively LNG re-gasification terminals. However, these volumes are not substantial (by case, circa 1-7 bcm/y in 2007). The pipeline also has not discouraged market entry of Azeri gas. Namely, after the (unexpected) discovery of the Shah Deniz field in 1999 in Azerbaijan, another pipeline project became subject of discussion, the so-called South Caucasus pipeline (SCP). The SCP runs parallel to the BTC pipeline from Baku via Georgia and connects with the Turkish gas network, close to Erzurum. However, the volumes were not substantial and therefore not a significant threat to Gazprom (a maximum of 6.6 bcm/y from 2006 to 2020).[444]

Given the negative value of the overall NPV, we could be compelled to conclude that Gazprom's investment in the Blue Stream pipeline has just as well been premature, given Turkey's market uncertainty and relative small absolute market volume. Among other factors, as a result of the political crisis and the economic recession in Turkey during the beginning of the 2000s, the previously expected growth of the Turkish gas market proved to be too optimistic. Combined with all new signed import contracts, this resulted in a period of contractual oversupply

[444] The current capacity is 8.8 bcm/y. After 2012 the capacity could still be raised to 16-20 bcm/y (see also Case study 2). The pipeline has approximately cost $1 billion. At a later stage Georgia wanted to off-take Azeri gas as well, partly as a compensation of the right to transit through the country. Moreover, Georgia wanted to diversify away from Russia's gas [US Department of Energy 2009b; Stern 2005].

of the Turkish gas market. Moreover, in 2001, Turkey passed a Natural Gas Market Law, with the intent of ending government control of the natural gas sector; in order to eliminate inefficiencies and harmonize its energy policy with that of the EU. The IMF also pushed for the liberalisation of the Turkish gas sector. This included the break up of Botas into separate units for natural gas import, export, storage and distribution by 2009. Pressing Botas' break-up might also be seen as a countervailing move on the part of the IMF to reduce Gazprom's strategic advantage. Botas was not allowed to sign new import contracts until its share in imports fell below 20 percent of the national consumption [State Planning Organisation 2005; Hacisalihoglu 2008].

Consequently, both the management of Botas and the Turkish Ministry in charge wanted to renegotiate their contract with Gazprom and halted Turkish off-take. At the end of 2003, a new contractual agreement had been signed for 8 bcm/y in which the corresponding price was reduced and the tax regime amended. Due to these problems, the relationship between Botas and Gazprom was undermined. Hence, Gazprom examined possible exports via the Blue Stream pipeline to Syria and Israel, in which case Turkey would become a transit country. From a theoretical point of view, Gazprom expanded its strategic growth option geographically. The same can be said for the European market: securing the Turkish market may be seen as an important stepping stone in capturing future European demand. Moreover, Gazprom bought an interest of 40 percent in the distribution company Bosphorus gas, in order to sell its gas directly on the Turkish gas market [Victor and Victor 2006; Stern 2005].

The Blue Stream pipeline was subject to financing and organisational feasibility issues too. Notably, it was built in the immediate aftermath of Russia's 1998 financial crisis. In order to mitigate off-take risks, Gazprom signed long-term contracts with Botas. By using Eni, these and other country risks were partially mitigated. Moreover, the Blue Stream pipeline also reduced the transit risks for Russia's gas supplies to Turkey, particularly with regard to the longer Balkan route. The Blue Stream case offers the benefit of hindsight, being a historical example that can be used to better understand examples of future potential strategic moves, such as those described in case study 2 and 3. In Case study 2, the Blue Stream pipeline is also dealt with on a sub-regional rather than at a regional, country level.

9.3 CASE STUDY 2: Gazprom versus competition in the SSEE gas markets

Case study 2 is an investigation of how Gazprom's Blue Stream strategy in Turkey can be repeated, this time on a larger scale. The market under consideration is South Southeastern Europe (SSEE),[445] a region where consumption is expected to rise and where import-dependency already stands at 80 percent. In addition, this region is the potential gateway for pipeline gas flows from the Caspian Sea region to other parts of Europe through Turkey (c.f., Case study 1). For Gazprom, the stakes are thus high.New Russian gas flows could materialise via slated Gazprom's midstream projects such as South Stream and maybe via current overcapacity in the Blue Stream (and/or a new extension). Given the historical case of Blue Stream and other existing infrastructure and flows within the SSEE gas market, the period of analysis is set in the future. Gazprom faces a newer, yet similar, threat to the one presented in Case study 1 through a possible aggregation of Caspian (and Iranian, Middle East) supplies via the so-called 'southern corridor'.[446] In addition, Gazprom faces possible competition from LNG suppliers and North African pipeline gas suppliers in SSEE markets.

9.3.1 Background

Composed of a diverse set of gas markets, the SSEE gas market is a relatively immature market, compared to the NWE market. There are two sides to this gas market in terms of maturity. On the one hand there are the Italian, Austrian and Hungarian gas markets, which are quite mature in terms of infrastructure as well as the connection between these two markets and the remainder of the European gas market as a whole. The Italian market itself accounts for the bulk of gas consumption in this sub-region, equalling more than all the remaining gas markets in it combined. On the other hand, there are much smaller, comparatively less well-developed gas markets in infrastructural terms, such as Greece and gas markets of the former Yugoslavian countries (Slovenia, Croatia, Serbia, Bosnia-Herzegovina, and Macedonia), Bulgaria and Albania. Romania is a mature gas market, but not well interconnected with the remainder of the European gas market. In addition, some countries such as Greece and the Balkan countries, still have embryonic gas markets, combined with relatively low absolute demand. All these countries, except Greece, were once part of the CMEA system of gas distribution. In a category of its own is the Turkish gas market, which was discussed at length in the previous case study. The Turkish gas market is geographically farther removed from the remainder of the European gas market.

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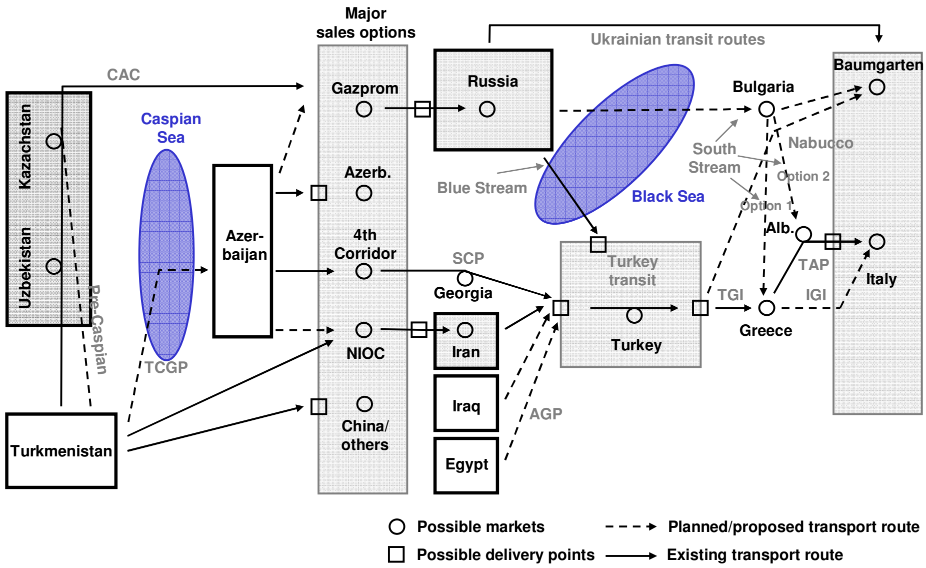
[445] In this study, SSEE is defined by Austria, Hungary, Former Yugoslavian countries (Slovenia, Croatia, Serbia, Bosnia-Herzegovina, and Macedonia), Rumania, Bulgaria, Albania, Greece, Italy and Turkey.

[446] The most quoted proposal is the Nabucco project, planned to start from the Turkish border. Other midstream projects are also under consideration (or are already under construction) to connect pipeline capacity from the Eastern border of Turkey with the off-take markets in Europe, such as White Stream, IGI and TAP.

With the likely increasing import-dependence of the SSEE gas market on sources of pipeline gas and LNG outside Europe, due to possibly rising demand and lower indigenous supplies, room is made for other existing and/or potential suppliers. As was briefly mentioned in Chapter 5, this sub-region of the European gas market is primarily dependent on pipeline supplies from Russia and Algeria, and, to a more limited extent, from Norway, Iran, the Netherlands, Libya and Azerbaijan. LNG producers, such as Qatar and Nigeria, are also shipping modest gas volumes to the some of the SSEE markets. It is mainly these pipeline and LNG suppliers, which could more deeply penetrate this section of the European gas market, as can other gas suppliers farther away. Figure 9.13 provides a schematic overview of gas transport and supply to SSEE (see also Map 5.1 in Chapter 5).

Figure 9.13 Schematic overview of competing gas supply, transport routes and delivery points, from the Caspian region and Russia to the SSEE market



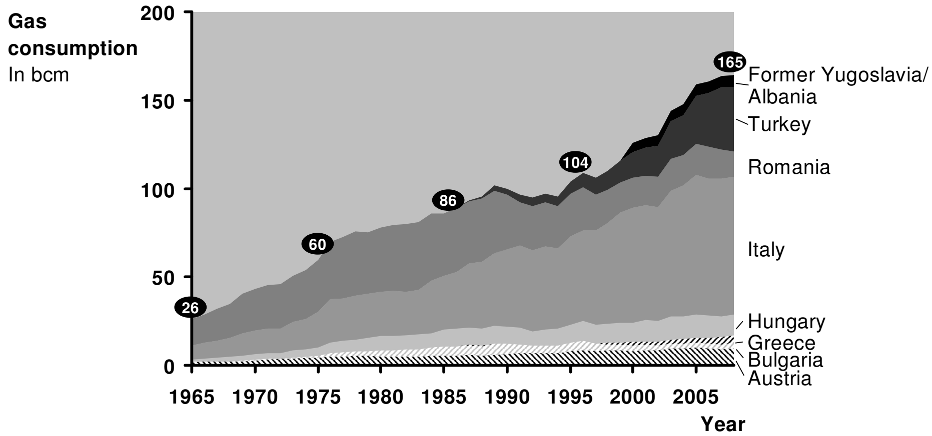
Note: excluding existing and planned/proposed supplies and transport routes from Europe, Algeria, Libya, and LNG suppliers; not all transit countries are included; The overview is schematic and therefore not accurate.
Source: own analysis, company information; figure adapted from StatoilHydro information.

9.3.2 Demand-side factors in the South Southeast European gas market

From Gazprom's perspective, the first step in assessing whether or not to invest strategically in the South Stream project is ascertaining market uncertainty on the demand side. This first step is prescribed in the conceptual toolbox in Chapter 8. In this particular case, the demand of all the various countries in the SSEE region is aggregated into one single whole for analytical simplicity. Volume (and price) risks play an important role in the SSEE market. It holds much potential in the way of additional import requirements, a fact which fits into the overall pattern of declining pan-European gas production and rising import-dependency. Capitalising on rising SSEE import-dependency by capturing the increased market potential in this market may provide an incentive for suppliers to competitively establish a position in there.

Though at an aggregate level oil is the dominant fuel in the primary energy mix in the SSEE markets, the potential for gas is rising, in both the power generation and industrial sectors. Indeed, currently, most of SSEE's natural gas is used for power generation and industry. Turkey has large growth opportunities, both in absolute and relative terms and relies currently almost equally on oil, gas and coal for its energy consumption [BP 2009].[447] The gas markets in Hungary, Austria, Bulgaria and Italy are mature, whereas Italy is by far the largest gas market (around 80 bcm in 2008) in SSEE [BP 2009].

Figure 9.14 Natural gas consumption in SSEE markets until 2008 per country



Note: Excluding former Yugoslavian countries and Albania until 2000.
Source: own analysis, based on BP [2008; 2009]; privately disclosed company data.

Romania's gas market is highly mature, natural gas being the most prominent energy source in this country; its domestic production is expected to decline from around 10 bcm/y to almost nil over next two decades. For Hungary too, gas has an important share in the primary energy mix, followed by oil and coal. In Italy and Austria, gas also has a significant share, although oil is the most dominant primary energy source, whereas coal is the traditional energy source in Bulgaria. Figure 9.14 shows that Italy, Turkey and Romania developed as the largest consum-

[447] Only Serbia relies on coal instead of oil [IEA 2009].

ers of gas in SSEE in terms volume. Combined with the other relatively small gas markets, gas consumption in the SSEE markets has increased from 26 bcm in 1965 to 165 bcm in 2008 [BP 2008; 2009].

Government-owned monopolies dominated the gas sector in SSEE for decades and still do so in most SSEE markets. As a result of EU-level liberalisation and privatisation processes, combined with the adjoined goal of creating a single internal gas market within the EU, the different markets were forced to open their markets to competition. In Italy, SNAM (part of the ENI group), Enel and Edison dominate the Italian gas sector. In Austria and Greece, OMV and Depa, respectively, still have a monopoly over import contracts. In some former CMEA-countries, which became EU-members in the period 2004-2007, Gazprom and West-European gas companies have entered the markets through greenfields, M&As, and joint ventures with existing government-owned gas companies.[448] Most of the Balkan countries and Turkey are not subject to EU legislation, and therefore are still dominated by government-owned monopolies. In 2008, Gazprom acquired a controlling stake in Serbia's government-owned oil and gas monopoly National Energy Services (NES) [Financial Times 2008b]. Turkey, however, as described in Case study 1, was forced to liberalise and partially privatise its gas sector by the IMF [OECD 2002; Hacisalihoglu 2008]. Nevertheless, Botas is still the dominant player in Turkey.

According to industry estimates, gas will remain important in the region and it will increase in importance in the energy mix of the different SSEE gas markets. In absolute terms, Italy and Turkey are identified as the most attractive markets by volume. Relatively, other markets are expected to grow faster, but in absolute terms they are less significant (some only reaching a consumption level of 6 bcm between 2008 and 2030). Due to declining domestic production in Romania, the growth of imports in this market is substantial.

Nevertheless, there still are volume risks in these SSEE markets (for some suppliers, relatively even more risks). At first, the fundamental volume risk is related to uncertainty about GDP development and the corresponding gas demand growth. The economic crisis of 2008/09 had resulted in a demand reduction and may have an impact on gas demand in the mid-term, depending on the length and depth of the crisis (see also Figure 9.15). Secondly, the Balkan countries still have embryonic gas markets and there are limited interconnections and distribution networks to connect new trunk lines with the main off-take centres. Although the EU and the US financed feasibility studies during the 1990s to stimulate cross-border initiatives, the

[448] For example, Hungary's gas company MOL has accomplished a joint venture (Panrusgaz) with Gazprom. Government-owned gas companies still play an important role in these markets (MOL in Hungary, Bulgargaz in Bulgaria, and Romgaz and Conef in Romania).

Balkan region is not yet well-developed in terms of cross-border pipeline networks [SECI 1998]. These littoral states and the related risks may lead to a passive attitude on the part of gas exporters when considering whether to invest in greenfield projects. Thirdly, in some former CMEA-countries there is discussion about the (supplementary) role of Russian (Gazprom's) gas in the primary energy mix for security of supply reasons. This is largely a result of the Russia-Ukraine gas disputes of 2005/06 and 2008/09 and the absence of interconnections (and other crisis management mechanisms) to manage possible supply cuts.[449] Finally, some contracts are still based on subsidised prices in several countries (e.g. Romania and Bulgaria) as a barter deal for Gazprom's transits via these countries [Stern 2005]. Introducing market prices that conform to these contracts may lead to lower gas demand since they may be driven up as a result.

On the price side as a whole, market uncertainty is relatively high. Gas prices are largely tied to oil and oil product prices in the SSEE markets. Oil prices are volatile and have fallen from $147/bbl to $40/bbl in late 2008, and back to $70-80/bbl in the winter of 2010. These oil prices have their impact on long-term contracts in Europe, albeit with a six-month lag. However, the long-run marginal and unit costs of the different supply and transport options of most of the various suppliers are still lower than the current gas prices. Gas trading on a short-term basis via gas-to-gas competition is less prevalent than is the case in the NWE market. The Central European Gas Hub (CEGH) at Baumgarten (in Austria) and *Punto di Scambio Virtuale* (PSV) in Italy are European gas trading hubs, which are less liquid than the UK's NBP.

9.3.3 Various potential gas suppliers to the SSEE markets

The SSEE market is supplied by a number of different suppliers in the form of both pipeline gas and LNG. Traditionally, the SSEE gas market as a whole is not an LNG importing region, though some countries, such as Italy and Turkey, have begun to import modest amounts of LNG (see below). Existing pipeline gas supply flows come from indigenous production and mainly from two major pipeline gas suppliers outside this sub-region: Algeria and Russia (see Figure 9.15).

1) *Volumes which are produced and consumed domestically:*
   From 2008 to 2040, the level of indigenous production has decreased from 23 bcm in 2008 to 20 bcm in 2020, and is projected to decrease further to 4 bcm and 0 bcm by the years 2030 and 2040, respectively. Nearly all produced gas is consumed domestically.[450]

[449] See chapters 6 and 12 in Smeenk [2010] for a deeper analysis on the Russia-Ukraine transit relationship and the impact on Russian supplies and transport to Europe as well as the relevant historical context.

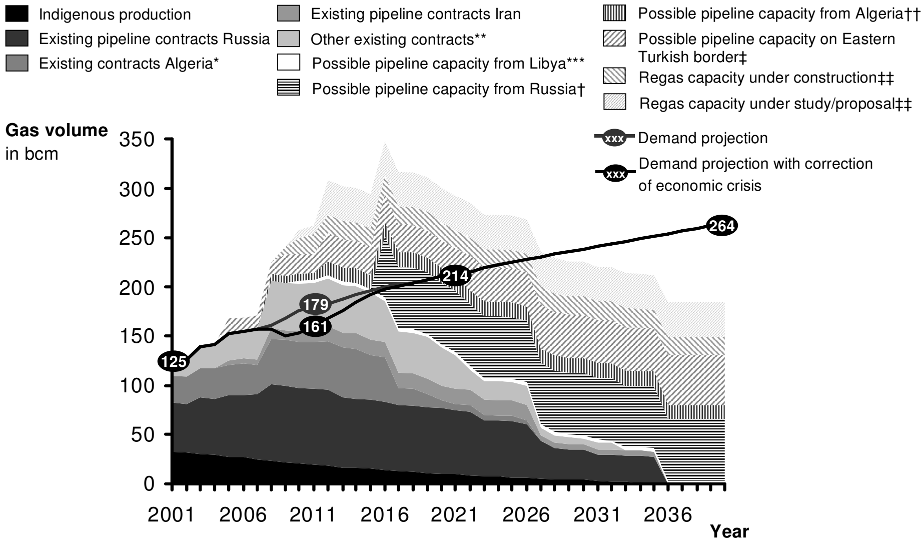
[450] The domestic production is largely concentrated in Romania (11.4 bcm in 2008), Italy (9.3 bcm in 2008), and to a lesser extent Croatia (2.9 bcm in 2008), Hungary (2.6 bcm in 2008), and Austria (1.5 bcm in 2008). Other SSEE countries produced less than 1 bcm in 2008 [BP 2009].

2) *Volumes which are supplied through existing LNG and pipeline contracts from outside the SSEE market and outside the EU:*
   Algeria supplies Italy and Slovenia by pipeline and it exports small LNG volumes to Turkey (in total 31 bcm in 2008). Russia supplied a total of 68 bcm to the region in 2008. Despite the ability of Turkey and Italy to afford a greater diversity of supplies, the countries in SSEE rely mostly on Russian gas. Norway (8 bcm in 2008) and the Netherlands (9 bcm in 2008) have some long-term contracts with companies in the northern periphery of SSEE (mainly in Italy). Libya supplied 10 bcm in 2008 to Italy via the Greenstream pipeline. Azerbaijan and Iran are carrying some gas to the Turkish market (both around 4-5 bcm in 2008), although these contracts are not solid. Finally, Nigeria supplied 1 bcm worth of LNG in 2008 to the Turkish market. According to privately disclosed company data, other supplies not included above which may have changed hands were part of contractual swaps (mainly between German and French gas companies and Gazprom).

3) *Volumes which could arrive in the SSEE gas market through new capacity in the form of LNG and/or pipeline gas:*
   Most of the existing contracts will expire in the second decade of this century. Only Gazprom is likely to maintain substantial contractual obligations (and thus also the volumes) in the SSEE market as a whole. Based on the available information about contracts, a certain amount will doubtlessly be renewed, holding mostly for pipeline gas from existing producers, such as Algeria. However, assuming that the contracted volumes will expire in the coming years, there is space for new supplies, due to possible increasing demand and decreasing domestic production (circa 75 bcm in 2020 and 200 bcm in 2030). As a result, a large number of pipeline and LNG projects are planned and proposed for the coming decades.

Referring to Figure 9.15, a high degree of oversupply can be discerned when adding all the various potential projects up to volumes provided through existing supply contracts, as well as the volumes arising from the possible extension of these contracts. The flows materialising on the basis of existing contracts from suppliers outside Europe alone account for some 138 bcm in 2020 (including indigenous production of 10 bcm), that is to say with the exclusion of possible volumes rolled-over from existing supply contracts. In addition, aggregating all re-gas and pipeline capacity under construction, study or proposal, exporting countries can supply the SSEE market with an additional potential of 205 bcm in 2020. The market structure of competition from a Russian perspective (by using the first matrix in Chapter 8, Figure 8.2) in SSEE appears fairly oligopolistic. Below is a more detailed analysis of the various gas infrastructure and suppliers likely to play key roles in the SSEE market vis-à-vis Russian gas.

Figure 9.15 Existing and pending supply distribution over SSEE demand projection (2001-2040)



* Both pipeline (up to 42.8 bcm/y) and LNG (7.9 bcm/y) volume contracts.
** Among others, the Netherlands (up to 10 bcm/y); Libya LNG (8 bcm/y); Norway (7.5 bcm/y); Azerbaijan (6.6 bcm/y); Qatar LNG (6.3 bcm/y); Egypt LNG (4.8 bcm/y); Nigeria LNG (4.6 bcm/y); Germany (2.6 bcm/y).
*** Extension of the Greenstream (3 bcm/yr).
† South Stream (63 bcm/yr).
†† Extension of Transmed (6.5 bcm/yr) and Galsi (8 bcm/yr).
‡ Iran-Turkey pipeline (up to 20 bcm/yr); SCP (up to 20 bcm/yr); Trans-Arabic (up to 10 bcm/yr), some of the capacity has already been used. To be extended by midstream project, such as Nabucco (31 bcm/yr).
‡‡ In Italy, but also one in Croatia.
Note: Existing contracts are based on ACQ bcm/y. Linear trend extrapolation (via the method of least squares) after 2030 for indigenous production (based on 2020-2030) and demand (based on 2025-2030).
Source:own analysis, based on IEA [2009]; Cedigaz [2009]; CIEP [2008]; MEES [2008]; privately disclosed company data.

Possible new pipeline supplies from Russia

As described in Case study 1, the Trans-Balkan pipeline was one the first pipelines which catered first Soviet, and now Russian gas to SSEE markets, followed by the Blue Stream pipeline to Turkey at turn of the century. Before the construction of the Trans-Balkan pipeline, other Soviet pipelines (e.g., the Transgas pipeline) were connected to Italy, Austria and Hungary through the Ukrainian pipeline system. The latest of Gazprom's proposals for a new gas pipeline to Europe is South Stream; this initiative was announced in June 2007. This proposed gas pipeline would become the second offshore pipeline to cross the Black Sea (and of course Blue Stream is the first one to do so).[451]

[451] The pipeline runs from Beregovaya on the Russian Black Sea coast to Varna in Bulgaria and from there onwards, splitting up between two proposed branches: southwards via Greece (or Macedonia and Albania) to Italy; and northwards via Serbia to Hungary and (via Slovenia) to Austria in Baumgarten. Discussions are also underway that may see the pipeline land in Romania rather than in Bulgaria. Gazprom had also purchased 50 percent of Austria's Central Europe Gas Hub (CEGH) in Baumgarten, also see Chapter 6.

The South Stream pipeline increases the Europe's gas import capacity, particularly for Italy, and to a lesser extent Austria, Bulgaria, Hungary and the Balkans (and probably Romania). South Stream's initially projected offshore capacity was 31 bcm/y, gradually scaled up to 47 bcm/y in March 2009 and then even to 63 bcm/y in May 2009 [WGI 2009a], respectively, in an apparent bid to improve its economies of scale. The South Stream is scheduled to be finalised before the end of 2015, subject to a degree of uncertainty.[452] South Stream is slated to transport gas from Russia, Turkmenistan and Kazakhstan. However, it is unclear whether sufficient gas volume will be available for South Stream (see also Chapter 6). Figure 9.16 below provides an overview of the various stakeholders of the project and other details pertaining to the South Stream pipeline.[453]

From the point at which the pipeline lands ashore in Bulgaria onwards, South Stream would in principal be subject to EU legislation (except for some Balkan countries). This implies TPA for the pipeline's capacity, which eliminates the exclusive right of using the capacity by the pipeline's owners (Gazprom and ENI). Possibly, the project may be exempted from TPA.

Possible new pipeline supplies from Turkey's eastern border

In the public debate about European gas imports much discussion has arisen concerning the export potential of the Caspian Sea region for European gas markets.[454] In the Caspian Sea region, Turkmenistan and Azerbaijan could potentially supply Europe with additional gas. However, Europe must compete with Iran, Russia and China for volumes from the region (also see Chapter 6). Gazprom also committed itself to purchasing new gas supplies from Turkmenistan, and possibly other Caspian suppliers against market-based prices, which will reduce the availability of gas supplies to Europe.

Iran may one day become a major potential gas exporter to Europe, though this currently is theoretical and a long-term prospect. According to IEA [2008d], there is unlikely to be enough production capacity to supply additional volumes to Europe in the mid-term, as a result of a lack of investment capital due to the Iran Sanction Act (ISA) sanctions, and other political risks.[455]

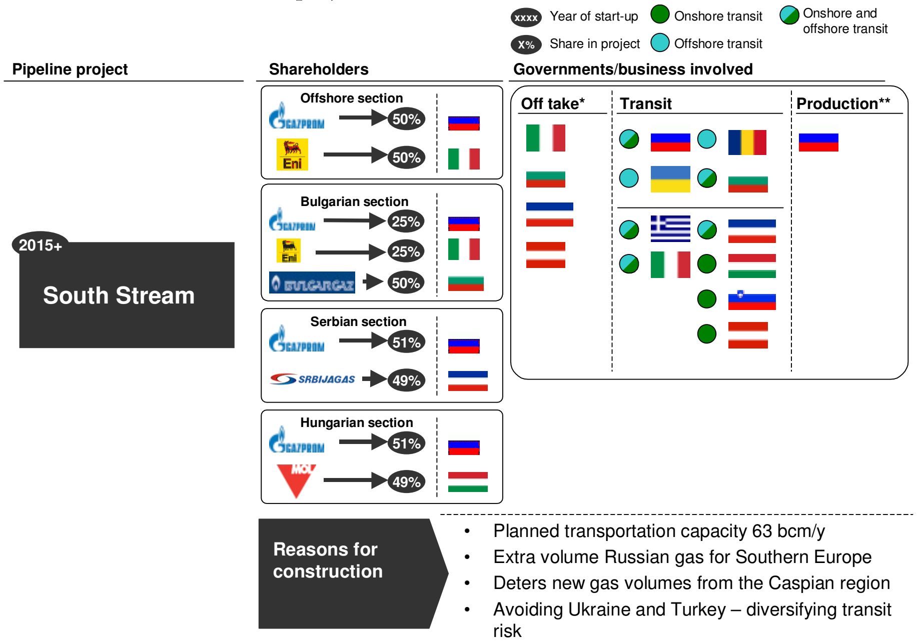
[452] The offshore section is expected to cost EUR2.3 billion, while the total cost of the entire route would be EUR8.6-20 billion, according to the latest estimations of Gazprom and ENI [WGI 2009a].

[453] ENI and Gazprom hold a 50 percent interest each in the offshore section. It is expected that EDF will attain a 20 percent stake in the offshore section by reducing ENI's and Gazprom stake by 10 percent, although negotiations are still underway [WGI 2009a].

[454] Chapter 6 provides an overview of the export potential in the Caspian region.

[455] Iran is currently only exporting a small amount of gas to Turkey via the Tabriz-Erzurum gas pipeline (a maximum of 9 bcm/y, and there were significant difficulties in fulfilling this gas contract) [IEA 2008d]. The only pipeline commitment to a European supplier was made in March 2008 with the Swiss energy company Elektrizitäts-Gesellschaft Laufenburg AG (EGL) for gas deliveries (5.5 bcm/y) via the existing Iran-Turkey pipeline and the aforementioned Trans-Adriatic pipeline to EGL's power plants in Italy [IEA 2008d].

Figure 9.16 The South Stream project

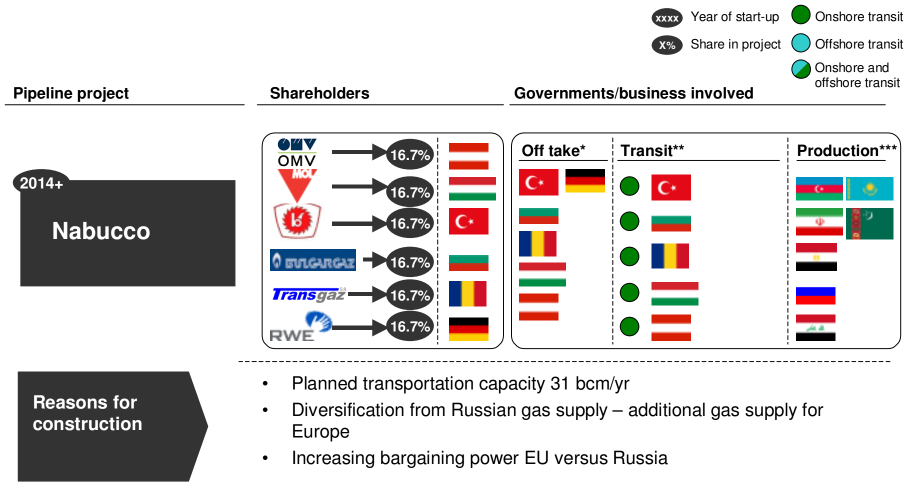


* Contracts n.a. Main off takers – other (transit) countries may take off gas as well.
** Some 'Russian' gas exports through South Stream to Europe could possibly be imported by Gazprom from Central Asian countries.
Source: own analysis, based on Gazprom and ENI information.

In the mid-term, other feasible trans-Turkey gas supplies could materialise from Egypt and Iraq, and possibly other Middle Eastern gas exporting countries in the longer-term. Egypt may become a pipeline supplier to Europe, with a volume of around 2 bcm/y through the Arab Gas Pipeline (AGP).[456] Although Iraq has relatively low-cost (associated) gas reserves, and some (unofficial) agreements are signed, Iraqi gas available for exports is still subject to a great deal of uncertainty due to country and legal risks and increasing domestic demand [CIEP 2008].

[456] The AGP pipeline has a maximum capacity of 10 bcm/y and links Syria via Jordan to Egypt, and then extended to Turkey and Iraq by 2009. Egypt supplies are very uncertain given the increasing domestic demand and planned LNG liquefaction capacity [CIEP 2008].

Figure 9.17 The Nabucco project



* Main off takers – other (transit) countries may take off gas as well.
** Depending on gas source for Nabucco, also other transit countries involved (see for example TCGP).
*** The gas sources for Nabucco are highly uncertain, either for political reasons (e.g. Iran) or available production capacity (e.g., Central Asia).
Source: own analysis, based on Nabucco information.

From the area of Georgia, Iran, Iraq, Syria and Turkey, there is also competition in terms of gas flows (i.e., gas shipping) destined further downstream into the European (and SSEE) markets, i.e., the southern corridor, also see Figure 9.13 above.

1. The possible Caspian and Middle Eastern supplies on the Eastern border of Turkey could feed the domestic system of Turkey for its rising demand. According to Botas, demand could reach 56 bcm/y by 2015 and 76 bcm/y by 2030. Turkey's current contractual surplus is set to become a deficit from 2012 onwards, although the current economic crisis could change this outlook [IEA 2008c].
2. Turkey could re-export Caspian and Middle Eastern gas to other European markets via two proposed pipelines using Turkey's domestic gas pipeline network (foreign shippers may perhaps ship these volumes as well). Once having arrived at this point, these flows could tap into the Turkey-Greece-Italy Interconnector (TGII) and/or the Trans-Adriatic Pipeline (TAP) [IEA 2008c].[457]

[457] The TGII pipeline aims to link Turkey, Greece and in a second stage, Italy, the first leg between Turkey and Greece already being in operation, with an initial capacity of 3.5 bcm/y (to be extended to 11 bcm/y). The TAP pipeline would connect Greece to Italy via Albania, estimated to be operational in 2012 with an initial capacity of 10 bcm/y (up to 20 bcm/y) [IEA 2008c]. StatoilHydro's participation in Azeri Shah Deniz field, combined with a 50 percent share in the TAP pipeline may improve project's bargaining power in acquiring Azeri supplies [IEA 2008c].

3. The Nabucco pipeline does not connect new gas fields with the European market. It should be seen starting from the Baumgarten hub in Austria in the EU en route to Turkey via Bulgaria, Romania, and Hungary, 'in search' of new supplies from both the Caspian region. These could include Iran and potentially other Middle Eastern gas sources. It is a joint venture of gas companies of the mentioned five countries, together with German *Rheinisch-Westfälisches Elektrizitätswerk* (RWE) [CIEP 2008].[458] It is designed to construct a gas corridor that realises transmission and supply diversification, primarily independent of Russian influence and therefore heavily backed diplomatically by the US and the EU [De Jong 2008].[459] Figure 9.17 above provides an overview of the Nabucco project and its shareholders.
4. The White Stream[460] pipeline aims to bring Caspian gas across the Black Sea from Georgia either to directly to Romania, or via the Crimea in the Ukraine (Ukraine actively promotes the project), independent from transit (and supplies) through Russia and Turkey. The initial capacity is slated at 8 bcm/y, which could rise to 32 bcm/y. The commercial and supply feasibility of White Stream is still subject to much uncertainty [IEA 2008d].

Possible new pipeline supplies from North and West Africa (excluding Egypt)
During the 1980s, Algeria, Tunisia and Italy constructed the TransMed pipeline from Algeria to Sicily in Italy (and Slovenia) via Tunisia. In 2008 the TransMed gas pipeline was extended from 27 bcm/y to 33.5 bcm/y [CIEP 2008]. Another planned gas pipeline, the Gasdotto Algeria Sardegna Italia (GALSI) pipeline, will connect the Algerian supply sources with Sardinia and further to Livorno in Toscana (Italy). Its design capacity is 8 bcm/y and is expected to be operational in 2012 [CIEP 2008].[461] The availability of gas in the Algerian gas system might increase if the Trans-Saharan Gas Pipeline (TSGP) from Brass in Nigeria via Niger to Algeria were to be built.[462] Libya has built only one gas pipeline (the Greenstream) directly to Sicily in Italy, which has a transportation capacity of 8 bcm/y (the pipeline could be extended to 11 bcm/y by mid-2010s) [CIEP 2008].

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[458] The initial stage of 8-10 bcm/y is expected to come on stream by 2014, whereas full planned capacity (at 31 bcm/y) is expected to be reached by 2019 [IEA 2009b].
[459] The total expected cost are EUR7.9 billion. The six shareholders have granted a third-party access exemption for 50 percent of the total capacity, whereas the other 50 percent are open for third-parties [De Jong 2008].
[460] The White Stream is formerly known as the Georgia-Ukraine-European Union (GUEU) pipeline.
[461] Sonatrach works in partnership with four Italian companies in constructing the pipeline (Sonatrach's share in the consortium is 41.6 percent). According to the agreement between Sonatrach and Gazprom, it is possible that Gazprom will have a stake in the GALSI pipeline.
[462] The TSGP has a maximum volume of 20-30 bcm/y and is planned to operate in 2015 onwards. Gazprom, Total and Sonatrach have expressed an interest to participate in a planned Trans-Saharan gas pipeline (in order to gain access to Nigeria's vast gas reserves) [Financial Times 2009h].

New re-gasification capacity in the SSEE market

During the late 1970s, the first SSEE's LNG re-gasification terminal was built in Panigaglia in Italy (capacity of 3.5 bcm/y). This project was followed by two re-gas terminals in Turkey (in the Marmara region and Izmir, respectively 6.5 bcm/y and 6.0 bcm/y) and one in Greece (Revithoussa, 1.4 bcm/y, with an expansion of 3.8 bcm in 2007). The LNG market in SSEE is still embryonic, but is likely to expand in the coming decades (mainly in Italy). Two re-gas terminals are already under construction in Italy (with a combined capacity of 11.8 bcm). On Krk Island in Croatia, one re-gas terminal is planned with a capacity of 8 bcm/y, while other planned and proposed re-gas terminals are located in Italy (i.e., in Sicily, Brindisi, an extension of Panigaglia, Le March, and Rosignano).[463] This capacity is no guarantee for actual LNG supplies, so it still uncertain as of yet whether LNG is available in order to fill the re-gas terminals.

Following the conceptual procedure designed to assess whether or not to invest strategically, developed in Chapter 8, demand is assessed given the information above along with the slated supplies (which includes potential LNG flows). Given the base case scenario of demand growth, one can discern a high degree of oversupply in SSEE markets by 2010. This can be deduced by adding existing supply contracts. Added to this are newly forthcoming volumes arising from the *new* possible supply contracts, volumes pertaining to which could be provided via midstream greenfields to Europe. The market structure of competition from a Russian perspective (by using the first matrix of the conceptual toolbox in Chapter 8, Figure 8.2) in SSEE appears fairly oligopolistic.

An examination of the different levels of economies of scale attainable for gas volumes channelled to the SSEE markets helps assess to what extent certain sources can compete with Russian gas, depending on the netback prices involved. In terms of gas supply costs, Azerbaijan, Iran, Iraq, Algeria and Egypt by pipeline are all competitive sources of gas for Russia in the SSEE market. Other Caspian countries (e.g. Turkmenistan) and Libya are also competitive for Russia, with their unit costs undercutting those of Russia. These potential suppliers therefore impose a threat in market power terms (price-cost margin) vis-à-vis Russia. Moreover, the next generation of gas production in Russia (but also, for instance, in Turkmenistan) will have to come at higher unit costs, which may reduce Russia's relative market power in price-cost terms. In terms of unit costs, the possible entry of LNG played a smaller role, largely due to lower economies of scale (although this tends to differ by source).

Iranian, Turkmen, Algerian and, to a lesser extent, other Caspian and North African suppliers have the potential to become important suppliers to the SSEE markets. However, Iranian sup-

[463] Outside Italy some LNG regas terminals are also under consideration, such as in Albania, which is part of the Trans-adriatic pipeline project [Cédigaz 2008]. However, these are still too speculative to taken into account.

plies to Europe are highly uncertain due to ISA sanctions. In addition, Iran and other Caspian countries already have other export commitments. Referring to the second matrix in Chapter 8, Figure 8.3, the competition level of Algerian and aggregated Caspian and LNG supplies is significant. Therefore, combined with the strategic importance of the Caspian production capacity in Gazprom's gas balance, and the relatively low market uncertainty, Gazprom may again consider a strategic investment. This will be examined on the basis of the application the quantitative model in the next section of this case study.

Gas supply costs to the SSEE market

In terms of total or long-run marginal gas supply costs, of which the economies of scale in transport and upstream production are key determinants (see Figure 8.3 in Chapter 8), Libya and Algeria are the most competitive sources of gas in the SSEE market (respectively $109/mcm and $95/mcm), due mainly to the proximity of these countries to the SSEE market by pipeline, especially in the case of the Italian market. Sources such as Iran and Iraq clock in at $85/mcm and $97/mcm for new gas for SSEE. The LRMC of supply costs for LNG from Qatar and Nigeria are slightly higher (also see Section 7.7 on market power). Indicative LRMC in 2020 for gas from Turkmenistan through South Stream costs $215/mcm compared with $152/mcm for gas from Turkmenistan to Greece and $185/mcm to Italy. In terms of LNG, Nigerian LNG costs $172/mcm and from Qatar $154/mcm. Algerian LNG for the SSEE market costs $161/mcm [IEA 2009c].

9.3.4 Other investment variables in relation to new investment projects

Before applying the model, other factors with regard to new gas supplies should be considered in a qualitative matter, in line with Barnes *et al.* [2006].

1) Foreign investment climate in gas supplier countries

As an extension of Case study 1, the focus here is primarily on supplies from the Caspian region and Russia.[464] The most important gas-rich regions that could potentially supply the SSEE gas market(s), where the investment climate could have a considerable impact on available supplies (and most relevant for South Stream) are the Caspian Sea region, Iran and Iraq, the southern corridor countries. As has been highlighted in Chapter 6, the investment climate for private investors in the Caspian Sea region is not favourable; few companies have established a firm presence in the region. As covered in Chapter 6, due to international sanctions, political risks and an unattractive buy-back scheme in place for foreign investors in the oil and gas sector, Iran's investment climate also leaves much to be desired.[465]

[464] Most of these issues are already covered in Chapter 6, and in particular in Case study 1.
[465] For instance, in 2008 a number of foreign investors (e.g., Total, StatoilHydro, Shell and Repsol) backed out of Iran, also refer to Chapter 6.

In Russia, private (Western) investors perceive relatively limited access to secure investment terms and ownership rights. In addition, Gazprom has a monopoly over Russia's gas exports. Inasmuch as this perception has an impact on Gazprom's access to Western know-how and technological expertise in dealing with difficult projects, it can affect the potential for the development of a number of upstream resources. In order to mutually share benefits and risks, foreign investments in Russia are in general based on asset-swap constructions and joint ventures [Victor and Victor 2006]. Conversely, Gazprom is often impaired in its access to downstream assets by EU-level initiatives, such as those included in the Third Energy Package, which specify a limit on foreign holdings within the European gas markets; consider for that matter the 'Gazprom clause' [De Jong 2008].

2) Transit, permit and regulatory risks
Both Russian and Caspian gas flows are exposed to transit risks. Central Asian supplies are subject to uncertainty over permits concerning offshore transport via the Caspian Sea, because the Caspian Sea does not suit simply into any existing categories offered by international law. The uncertainty surrounding the definition of the Caspian basin either as a sea or a lake, combined with environmental concerns (which Russia has sounded, see below), may result in delaying the construction of any offshore pipeline [IEA 2009c]. Iranian transit offers no alternative, because of US-driven political sanctions. The political instability in the South Caucasus, meanwhile, was exacerbated by the Georgia-Russia conflict in August 2008. This brief clash increased perceived transit risks and made it more difficult to finance new pipeline projects in this region.

The role of Turkey cannot be understated; it is the lynch-pin for gas volumes from the Caspian Sea region to European markets, playing an important strategic role as a key potential transit state for a number of sources. A possible new gas corridor via Turkey is exposed to direct security risks when it comes to impact of separatist Kurdish activities in South-eastern Turkey. More importantly, however, Botas is not satisfied with the transit role it is has been relegated to (on a cost plus basis). Turkey wants to create a gas hub, where it can act as a middleman, buying and selling gas and capturing the resulting economic rents [De Jong 2008].[466]

South Stream would bypass Ukraine and Turkey–in which the strategy underlying South Stream differs from the Blue Stream strategy–and insulates Gazprom's gas supplies to SSEE

[466] Turkey, well aware of its vital geographic position between the Caspian Sea region and South Eastern Europe, has sought to capitalise on it by acting as a reseller of gas transiting or due to transit through its territory. It refuses merely to act as a transit country, but sees itself as a resell hub akin to Russia for the Central Asian countries (also see Chapter 6). Turkey's relationship with Russia has long dogged by commercial disagreements since the economic problems arising after the Blue Stream's construction (also see Case 1). Ironically, this also acts as a barrier for Russia to export its gas via the Blue Stream pipeline to Europe. After a recent visit to Ankara by Putin, an improvement of relations appears to be materialising between Turkey and Russia [MEES 2009b].

from any political risk in transit countries (e.g. Ukraine, Moldova, and Turkey) between Russia and the EU [CIEP 2008].[467] Possibly transit in Balkan countries outside the EU may also result in some problems, because these countries are not subject to all EU and/or international legislations. Within the EU, pipeline investments are subject to regulation and other EU legislation, which expose a pipeline investor to policy and regulatory risks. For instance, TPA may undermine strategic investments, because a pipeline investor is forced to 'share' its capacity with potential competitors unless an exemption is awarded.

3) Geopolitical factors

Geopolitical factors most certainly play a central role in the South Stream case. Two important geo-economic forces compete with one another in terms of gas flows: on the one hand, the US and some factions within Europe want to break-up Russia's transport (and production) control over the Caspian gas, thus weaning European gas markets off their dependence on Russian gas (for an extensive discussion on the geo-strategic roles of the Euro-Atlantic community, see Chapter 8 and chapters 3 and 11. On the other hand, Russia aims to maintain its control over volumes from the Caspian Sea region and their flow to European gas markets.[468] These opposing forces are the result of broader geo-strategic agendas. As far as the potential institutionalisation of pipeline initiatives backed by the US are concerned, the various actors have some political instruments to stimulate (non-commercial) investments in the Caspian region, which were already mentioned in earlier chapters and will be further discussed below.

9.3.5 Organisational and financial institutionalisation of the South Stream and Caspian pipeline projects

The strategy and instruments designed to realise possible pipeline investments varies both for the South Stream and the southern corridor, In the case of South Stream, Russia uses vertical energy diplomacy to ensure the project's success. Russia employs foreign policy tools such as government-backing of Gazprom's investment initiatives. In South Stream's case, Russia has nurtured close bilateral ties with Italy and Bulgaria, for example, and has important traditional

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[467] Instead, the South Stream pipeline must transit the territorial waters of Ukraine and Romania, which could result in construction delays (owing to necessarily permit rights). As a result of commercial problems between Gazprom and Turkish Botas, of which Botas is not satisfied with its 'only'-transit role, Gazprom currently abandoned to build additional capacity via the Blue Stream for European destiny [De Jong 2008]. Nevertheless, Gazprom is studying on building extra capacity via the Blue Stream to boost its supplies to Turkey and probable Middle Eastern countries and Israel. Thus in addition, Russian gas strategy appears to take into account the need to prolong the deadlock between Turkey, Azerbaijan and the Nabucco consortium and the need to avoid a confrontation with Ukraine over the routing of the pipeline through the Black Sea [MEES 2009b].

[468] As former deputy CEO Komarov of Gazprom stated: "I would also highlight the developing process of the return of Gazprom to the gas markets of the countries of the CIS both from the point of view of inclusion in our portfolio of Central Asian gas (Kazakhstan, Turkmenistan and Uzbekistan), as well as from the point of view of broadening co-operation with importing countries (Ukraine, Moldova, and Trans-Caucasia). I believe this to be very important both from the perspective of guaranteeing the geopolitical interests of Russia as well as to assist in the integration process of the post-Soviet area" [IEA 2008d, pp. 16 - 17].

ties with Serbia, to which the South Stream is to branch off.[469] Agreements between government officials in various transit countries and Russia has subsequently facilitated business-to-business progress. In a way similar to Nord Stream (see Case study 3) political commitment could act in support of long-term take-or-pay contracts between Gazprom and mid-streamers in the SSEE market (e.g., ENI, OMV, MOL), where government support in the off-take countries can alleviate demand uncertainty. In model terms, Gazprom as a firm employed Russia's vertical energy diplomacy to secure upward demand potential.

At the firm level, Gazprom's potential vertical agreements with mid-streamers in the SSEE market(s) are in line with De Jong's [1989] joint venture coordination mechanism. Mature markets often feature greater tendencies towards cooperation between firms (also refer to Chapter 4), where the most important off-take countries in the SSEE market are still experiencing development toward a more mature market. Different from the Nord Stream strategy, no gas contracts have been concluded as of yet [De Jong 2008]. The South Stream project, in line with the Blue Stream, is part of a strategic alliance between the ENI and Gazprom, possibly added by *Electricité de France* (EDF). Gazprom and ENI hold a 50 percent interest in the joint venture of the offshore section each. The mid-streamers, such as ENI and EDF, play a critical role for Gazprom in the Italian and other markets through their position as incumbents in that market, and their political backing from their respective governments.

The involvement of a Western company is necessary in the project, for financing and technical reasons. In line with the Blue Stream project, the repayments of the loans could be based on gas contracts between SNAM (a subsidiary company of ENI) and Gazprom, thus completely de-coupled from the project itself. This may result in less expensive loans via the so-called 'warehouse' construction (see Figure 8.4 in Chapter 8). However, it is uncertain whether these largely strategic commitments can be reasonably financed, especially in light of the economic crisis in 2008/09. Linking Western 'cash-rich' mid-streamers to these projects in exchange for upstream interests appears to be a workable solution.

As for horizontal energy diplomacy, Gazprom is actively involved in up- and midstream projects in other gas supplying surrounding Europe's southern flank, such as Libya and Algeria, which were mentioned in Section 9.3.3. Russia has important traditional political ties with these two countries dating from the days of the Soviet Union. Russian government officials join Gazprom delegations in facilitating business arrangements. In the cases of both Libya and Algeria, Gazprom has expressed extensive interest in further involvement along the gas value

[469] In the onshore transit countries, Gazprom cooperates with the national gas companies and in Bulgaria it also cooperates with ENI. Intergovernmental agreements have been signed between Russia and Bulgaria, Serbia, Hungary and Greece. Negotiations are underway to sign the relevant agreements with Austria and Slovenia.

chain, For example. Gazprom has announced an interest in taking a stake in the Greenstream pipeline consortium (also see above) and buying Libya's total gas export portfolio [Argus Gas Connections 2007]. As explained extensively in Chapter 7, Russia is also involved in Algeria and appears to perceive North African gas suppliers as strategically important partners. By means of horizontal energy diplomacy, government-level relations help spearhead shared investments between Russia and Algeria as well as Libya. Egypt is another potential partner in this regard. Moreover, the Russian government is actively involved in acquiring Caspian production of Gazprom's supply portfolio [Goldthau 2010].[470]

As for the institutionalisation of the southern corridor pipeline(s), different mechanisms come into play. Project supported by the US and the EU (i.e., Euro-Atlantic) are based on a different, more market-orientated agenda. Therefore, these projects preclude vertically integrated, government-backed solutions as portrayed by the Russian approach described above. In general, the Transmission System Operators (TSOs) have no economic-strategic interests in a pipeline (i.e., they have no stake in the actual commodity), the only interest they have is shipping gas on a commercial basis. For instance, the Nabucco pipeline is intended to be owned by mid-streamers, which do not have any significant upstream interests (yet). Such a business model limits Nabucco's bargaining position and its overall feasibility, particularly with regard to attaining supplies and reducing the strategic viability of these projects. Some pipeline projects, as mentioned above, are (partly) owned by up-streamers, which could stimulate their feasibility.

In recent years, through both political instruments and financial institutions, such as the IMF, the World Bank and the EBRD, the Euro-Atlantic community attempts to stimulate gas flows from the Caspian Sea region. The US mainly has a geo-strategic and economic interest to moderate Russia's influence in the West, as mentioned in Chapter 3 and chapters 3 and 11. The World Bank and the EBRD could facilitate pipeline investments by means of favourable loans for projects that aim to secure a European stake in the Caspian Sea region. Whereas the EU and its institutions maintained a relatively passive stance towards the Caspian Sea region and its gas reserves, since 2006 the EU has a more proactive policy towards the region. For instance, the planned Caspian Development Corporation (CDC) aims to create an entity to aggregate and catalyse gas production and infrastructure development by constructing a mechanism for co-ordinated gas purchasing.[471] In this manner, a cluster of Western organisa-

[470] For Russia, this has come as an expedient in delaying the possible realisation of the Trans-Caspian route underneath the Caspian Sea (also discussed in Case study 1). Russia concluded a deal with Kazakhstan on the countries' division of the Caspian Sea). Additionally, although it was likely not the reason, the Russo-Georgian conflict in August 2008 has resulted in additional perceived investment risks with regard to Georgian transit.

[471] Endorsed by the European Council, the Energy Council and the European Parliament, the CDC is a mechanism designed to act as a purchasing consortium for Europe gas buyers, though the concept is still rather ambivalent. The terms of reference of a feasibility study which is being promoted by the European Commission, the World Bank and the EIB are

tions, companies and institutions aim to replicate the 'warehouse' model, mainly by using Western loans from international financial institutions for financing such projects instead of long-term gas contracts. Although this is a significant change from Europe's earlier classical approach, producers in Caspian region may not accept the creation of 'middlemen', because such entities may capture large resource rents.[472]

9.3.6 Application of the model to the South Stream case

As a next step, we apply the real-option game model to the South Stream case. From a country-level application, we move to a sub-regional one. The goal is the same as in the Blue Stream: to assess the overall value of the South Stream pipeline in the face of market uncertainty and potential rival moves. An important aspect to take into consideration is that South Stream is a project, which is yet to be built and the effects of which, at the time of this writing, still lie far into the future (i.e., it is an ex ante analysis). To the greatest degree possible, the assumptions below are designed to approximate real world figures and numbers in the context of the relevant market circumstances and gas infrastructure investments.

9.3.6.1 Assumptions and parameter values

Operational assumptions:

a. We assume the SSEE gas markets collectively consist of a duopoly, with Gazprom on the one hand and a potential competitor on the other, with the latter acting as a potential entrant for new market demand with an 8 bcm/y pipeline, both on a distance of 3,212 km to the off-take market (offshore section: 908 km; onshore section in total: 2,304 km). (No account is taken of potential LNG suppliers at this stage.)
b. Gazprom faces the choice in 2009 (i.e., stage I) of starting to build or deferring the construction of the South Stream pipeline across the Black Sea to Bulgaria onwards in the face of potential entry by a competitor.

Parameter value assumptions:[473]

a. **Average operating gas transport costs in the base case:** In the base case, both players are assumed to make commercial investments only, i.e., constructing small-diameter pipelines with a capacity of 8 bcm/y, which only have a technical ramp-up phase. In this case it means both players do not undertake early strategic commitment to the market, meaning

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outline the goal of providing gas producers in the Caspian Sea region with the "visibility on prospective aggregated gas demand from the EU, in order to trigger a firm commitment on their side to supply natural gas to the EU in sufficient quantities and for the long-term [Eurogas 2009].

[472] Another proposal to encourage the Nabucco project was launched by the EU as well, in which it decided to allocate EUR200 million from the European Economic Recovery Plan [Euractiv.com 2010]. A pro-active policy of (continental) Europe towards the Caspian region or cooperation with Russia's infrastructure proposals may undermine US predominance in the region [Euractiv 2010].

[473] See the conceptual discussion held in the toolbox in Chapter 8.

the operational unit costs remain at $c_G = c_E = \$80.4\ \text{mln/bcm}$. At this point, neither player yet benefits from economies of scale.

b. **Average operating gas transport costs in the proprietary case:** The construction of the South Stream is a proprietary investment. Gazprom decreases its average operational unit costs from \$80.4/mcm to \$15.4/mcm as the pipeline has greater economies of scale (from 8 bcm/y in the base case to 63 bcm/y in the proprietary case). This represents the move away from the base case and towards the proprietary case. The competitor is assumed to use an 8 bcm/y commercial pipeline capacity at the same distance (i.e., the base case situation with an average operational unit costs of \$80.4/mcm).

c. **First-stage strategic pipeline investment (K):** The initial cost of building the Blue Stream, K (totalling \$11.275 billion), is defined as the difference between the CAPEX for South Stream minus the 'theoretical' CAPEX for a 8 bcm/y commercial investment covering the same distance, I (totalling \$8.788 billion).[474]

d. **Follow-up investment outlay by either Gazprom or the competitor (I):** Follow-up investment outlay, made after stage I and thus after the incumbent's strategic investment, corresponds with a base case commercial 8 bcm/y pipeline investment covering the same distance (\$8.788 billion).

e. **Initial demand parameter (θ_0):** For simplicity, initial gas market demand in the SSEE gas market is assumed to be 120.6 bcm ($\theta_0 = 120.6$) at t_0 as detailed in the conceptual description in Chapter 8.

j. **Binomial up or down demand parameters (u and d):** In the model, demand is assumed to be stochastic, moving up or down with binomial parameters u = 1.48 and d = 0.68, both at the beginning of periods 1 and 2 in stage II. Starting at t_3 there is a 'steady state' of 25 years, i.e., no more upward and downward moves, as detailed in Section 8.4.5.

f. **The risk-free interest rate:** The risk-free discount rate is assumed to be 3.4 percent ($r = 0.034$).[475]

g. **The risk-adjusted discount rate:** The rate at which profits in the last stage are to be discounted by is set at 8.5 percent ($k = 0.085$).[476] The project's expected annual cash flows extend over a period of 25 years, acting as an annuity.

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[474] In order to calculate the 'theoretical' CAPEX as well as the average breakeven operating costs per unit, account is taken of inflation, the WACC (k), the risk-free rate (r), fuel and compression costs, etc. (see Chapter 8). In this case, the 'theoretical' value of the CAPEX for South Stream is used (see Chapter 8 for a definition of 'theoretical' values), which approximates the average of publically listed figures for the pipeline. The base case 'theoretical' pipeline CAPEX calculation is also based on 2009 input data, obtained from privately disclosed company sources. The inflation is assumed at 2.8 percent (based on the first half year of 2009), according to Eurostat data for the Euro area.

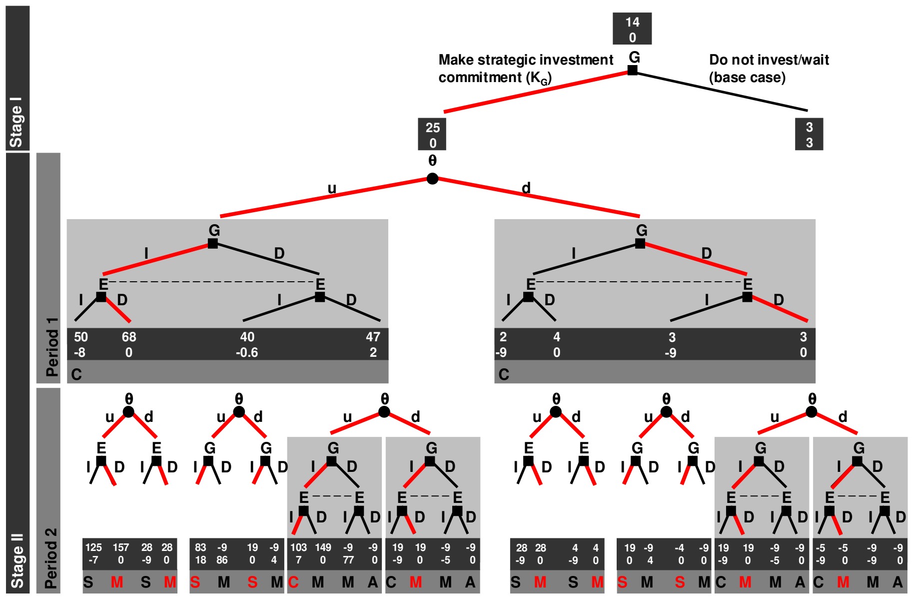
[475] The risk free rate is based on the yield-to-maturity in October 2009 of a 10-year Euro-denominated (or the equivalent thereof) German government bond [Tradingeconomics.com 2009].

[476] The WACC is based on information provided in expert interviews, where a WACC of between 8 and 9 percent was proposed as being appropriate, which is in line with the regulated pipeline business.

h. Risk-neutral probabilities: Given u, d, k and r, etc., it can be determined that p = 0.35 and 1-p = 0.65.

Figure 9.18 is an overview of the various payoffs to Gazprom and the competitor in a decision tree, which is a direct application of Figure 8.9 in Chapter 8. Each node corresponds with an up- or downward move in demand and the resulting decisions of Gazprom (denoted in Figure 9.18 and elsewhere by the letter G) and the competitor (or potential entrant, denoted in Figure 9.18 and elsewhere by the letter E), respectively, to invest or defer (further) commercial investments ($G\{I, D\}$ and $E\{I, D\}$) in stage II while in stage I only Gazprom is assumed to invest as an incumbent. The highlighted (red) branches along the tree indicate the optimal actions along the equilibrium path.

Figure 9.18 Gazprom's proprietary case for South Stream vis-à-vis the competitor



Assumptions:
First-stage strategic pipeline investment by Gazprom: K_G = 11.2 mln$
Follow-up (second-stage) investment outlay by either Gazprom or its competition: $I_G = I_E = I$ = 8.8 bln$
Initial demand parameters: θ_0 = 120.26 bcm (with $\theta_1 = u\theta_0$ or $d\theta_0$)
Binomial up or down demand parameters: u = 1.48; d = 1/u = 0.68
Risk-free interest rate: r = 0.034
Risk-adjusted discount rate: k = 0.085

Operating costs:	c_G	c_E
No investment (base case)	80.35	80.35 \$/mcm
Proprietary investment	15.42	15.42 \$/mcm

Note: monetary amounts are in billion\$.
Source: own analysis.

Just as in Case study 1, for period 2 in stage II, we take the case in which demand has moved upward in period 1 (i.e., branch u), and do not elaborate here on either the case in which demand falls or the base case. Notice that Figure 9.18 will be approached through backward induction, i.e., bottom-up.

9.3.6.2 Model application and backward induction[477]

a. Stage II, Period 2

The upward and downward movements in demand in the leftmost branch of the tree (see Figure 9.18 above) and corresponding decisions to invest in follow-up capacity by Gazprom and the competitor (after a strategic investment has been made by Gazprom) yield the following dominant routes based on the state-contingent project values:

- Sub-game 1: For Gazprom: 157 and 28 and 0 on both accounts for the competitor.
- Sub-game 2: For Gazprom: 83 and 18; for the competitor: 19 and 0.
- Sub-game 3: For Gazprom: 103; for the competitor: 7.
- Sub-game 4: For Gazprom: 19; for the competitor: 0.

b. Stage II, Period 1

The values listed above are fed back into period 1, on the basis of which Gazprom invests commercially, while the competitor defers. The competitor is unable to obtain its highest possible payoff in period 1 of stage II, i.e., 2, given Gazprom investment in this period for a payoff of 68. In Game 2, rather than investing, both players opt for a deferral in order to avoid a duopoly outcome in period 1 in which both would be worse off than under a deferral. Gazprom obtains 3 rather than 4 and the competitor obtains 0. As Smit and Trigeorgis [2004] argue, Gazprom may also prefer to remain unpredictable.

c. Backward induction of period 1 (stage II), to stage I

Finally, the period 1 payoffs for Gazprom help determine, again via a next step of backward induction, whether the strategic investment is worth making net of its initial capital investment, K_G, the amount invested in excess of a base case pipeline of 8 bcm/y. The stage I payoff for Gazprom is 25 while for the competitor it is 3. When the strategic investment is subtracted as well, i.e., the amount obtained from total CAPEX – I, the overall NPV (NPV^*_G) for Gazprom of building South Stream is \$14 billion into which has been factored all the upward and downward movements in demand, rival moves and resulting the NPVs resulting from each market outcome. The NPV^*_G under the proprietary case is greater than under the base case

[477] All monetary amounts are noted in \$billions rather than \$millions as in Case study 1.

(i.e., $14 billion for the proprietary case is higher than $3 billion for the base case). According to the result from the model, Gazprom should thus invest in the South Stream.

d. The various value sub-components

The model's application to South Stream yields value components in the same manner as in the Blue Stream case, using formula 8.5.

The game is initiated at an initial demand level of 120.6 bcm, and the binomial parameters u = 1.48 and d = 0.68 determine a number of different demand levels over the model periods. Table 9.2 shows how the equilibrium actions (Q^*_G), profits (π^*_G), the state-contingent project values (NPV^*_G), and the various value components (the direct, reaction, pre-emption and postponement values) vary with different levels of demand. Hence, as has been shown in the games and sub-games above; every demand level leads to dominant strategies on the part of both players. The example is taken of θ_2 (i.e., $\theta_0 x\ u\ x\ u$), where demand is 263 bcm/y.

Table 9.2 Second-stage equilibrium state project values and strategic effects for different market structures and states of demand for the base and proprietary pipeline investment case

Panel A – Base Case

Demand θ	Market Structure (Static)	Quantity Q^*_G	Profit π^*_G	NPV_G	Market Structure (Dynamic)	Postponement value	Base Case NPV^*_G
55	Cournot Nash	0	0	(9)	Abandon	18*	9
81	Cournot Nash	0	0	(9)	Defer	9	0
120	Cournot Nash	13	0.2	(7)	Abandon	7	0
178	Cournot Nash	33	1	2	Defer	8	10
263	Cournot Nash	61	4	29	Cournot Nash	0	29

Panel B – Proprietary Pipeline Strategic Investment

Demand θ	Market Structure (Dynamic)	Quantity Q^*_G	Profit π^*_G	Direct value	Strategic		Commitment value	Postponement value	NPV^*_G
					Reaction value	Pre-emption value			
55	Monopoly	20	0.4	4	0	9	13	(18)*	(5)
81	Defer	0	0	11	0.1	1	12	(9)	3
120	Stackelberg	52	3	20	7	9	35	(7)	28
178	Monopoly/Stackelberg	81	7	32	16	18	66	(8)	68
263	Monopoly	124	12	51	22	55	128	0	157

* Additional 6 bln$ to postponement value because of additional investment (I) in order to realise total project's CAPEX.
Note: Totals may not add up due to rounding. Monetary amounts are in billion$.
Source: own analysis.

For simplicity, the following numerical explanation is based exclusively on the model's results in the last row in panel B, Table 9.2, specifically the case in which demand has risen twice to 283 bcm. Here, Gazprom ends up in a monopolist market outcome (M), supplying 124 bcm/y via its existing infrastructure and the South Stream pipeline with a profit of 12. At this level of demand, and given the cost functions as a result of the proprietary investment, Gazprom has effectively been able to ensure its position as a monopolist, the competitor locked out of the market altogether. The proprietary case must be compared with the base case (panel A of Table 9.2 above) in order to determine the difference between making the strategic investment commitment and remaining at the original operating unit costs, i.e., not building South Stream and sticking to an 8 bcm/y pipeline. In the base case, at the same level of demand, the NPV is 29 for Gazprom, supplying 61 bcm/y via its existing and new infrastructure, while the competitor supplies 61 bcm/y as well (also at an NPV of 29).

The direct and strategic value

The net commitment values are shown in panel B of Table 9.2: The direct value of South Stream for Gazprom, attained due to the benefits of economies of scale alone is 51. The additional value of undermining the profitability of the potential entrant's investments is 22, i.e., the strategic reaction value, while the value of then altering the structure of the market altogether, the pre-emption value of South Stream, is 55. This last value is the value attained by shifting from a model outcome involving duopoly (C) to one where Gazprom ends as a monopolist (M).

The postponement and net commitment values

The strategic reaction value and the pre-emption values together determine the strategic value. The net commitment value, which is computed by adding the direct to the strategic value, is therefore 128 (= 51+22+55). In this case the postponement value is zero, because in the base case scenario the NPV is also positive as a result of strong upward demand potential.

The overall net project value

Finally NPV^*_G of South Stream for Gazprom is the NPV in the base case (29), added to the net commitment value (128) and the postponement value (0), which is 157 in total.[478] Note that this is not the overall net project value of South Stream to Gazprom.

9.3.6.3 Sensitivity analysis

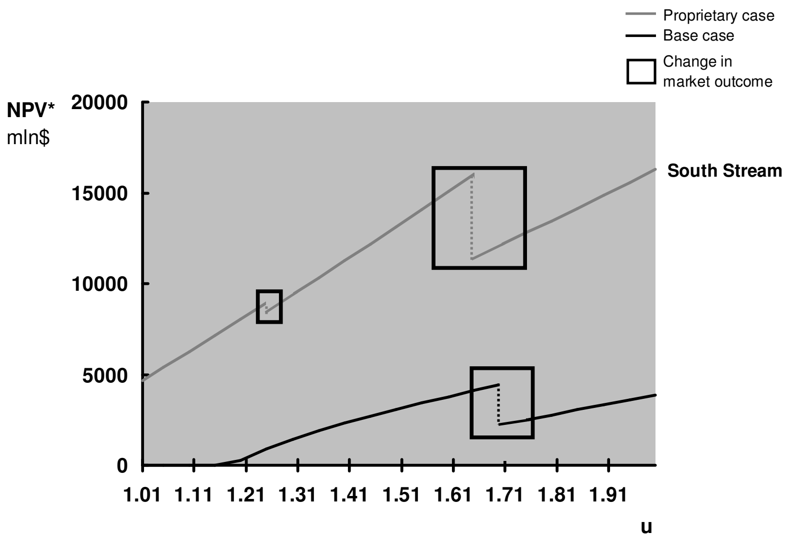
Pursuant to the approach used in Case study 1, the most significant and remarkable results are mentioned below for South Stream:

[478] The postponement value is a negative number in case the static NPV is below zero for the base case, added, when applicable, by the option value when deferring a commercial investment (I) in period 1 in stage II.

1) Overall net project value versus sensitivity to changes in upside market demand potential

As in the Blue Stream case, the change in value of the upward demand potential parameter u, varying in the sensitivity analysis between values of 1.01 and 2, is positively related to NPV^*_G. Considering the positive relationship between overall net project value and upward demand potential, the graph (higher part of Figure 9.19) exhibits two remarkable discontinuities. These 'negative jumps' can be explained from the strategic competitive interaction in Gazprom's market (notably a shift in the model outcome from monopolist (M) to leadership (S-L), and from S-L to duopoly (C)).

Figure 9.19 Overall net project value as function of upward market demand potential, u (with d fixed at 0.65)

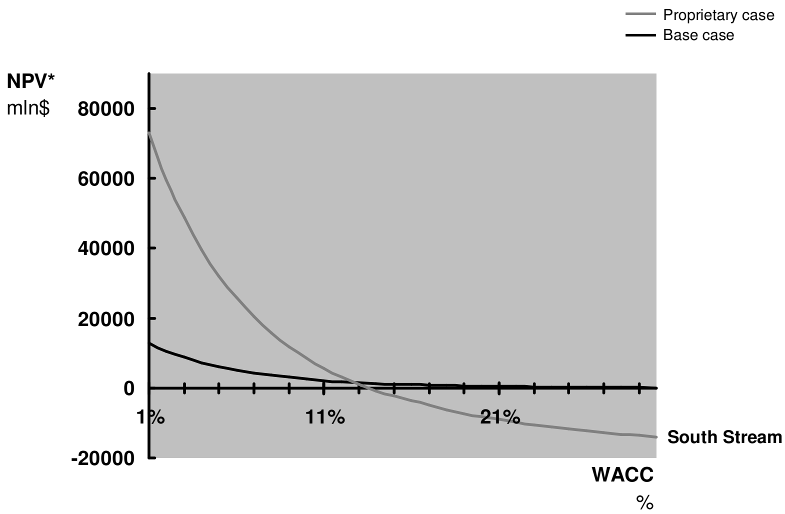


Source: own analysis.

2) Overall net project value versus sensitivity to changes in the WACC

Refer to Figure 9.20 below, which shows the sensitivity of NPV^*_G to changes in the risk-adjusted discount rate k (i.e., the WACC). From the rise in the slope of the curve, it can be derived that the NPV^*_G rises substantially with a small decrease in k, both in the base and proprietary cases. This result is logical, because future cash flows are discounted at a lower rate (i.e., a higher present value), with the NPV^*_G rising most rapidly in the interval ($0 < k < 13$), in the proprietary case, while the base cases NPV^*_G rises only slowly. This difference is very pronounced here, much more than in the Blue Stream case. This sensitivity analysis shows that when Gazprom accepts a lower risk-adjusted rate of return, the strategic value components rise in the overall net project value. The critical value of k (the internal rate of return) is around 13 percent.

Figure 9.20 Overall net project value as function of the WACC

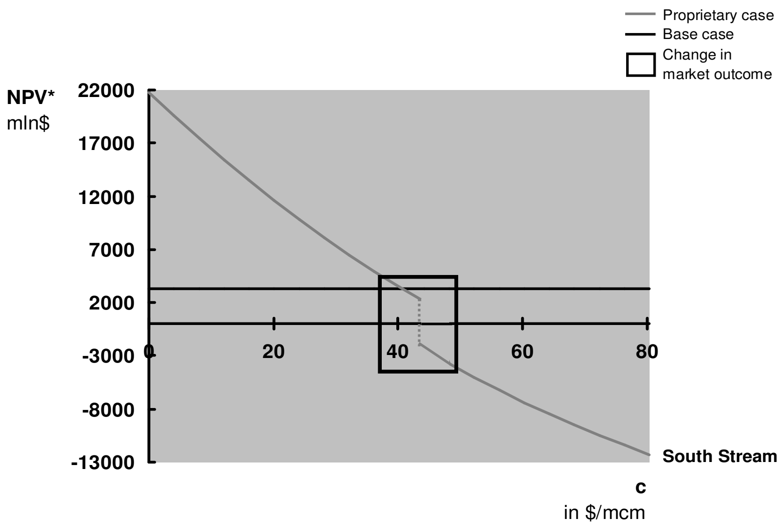


Source: own analysis.

3) NPV^{*}_{G} versus sensitivity to changes in unit operating costs

Refer to Figure 9.21, which shows the sensitivity of NPV^{*}_{G} to changes in OPEX (c). With a decrease in c, the NPV^{*}_{G} of the project rises in the direct various value components of the pipeline: both in the direct value of attaining greater economies of scale, as well as in the deterrence effect. Direct value rises strongly, given upward market potential and the absolute size of the SSEE gas market. The jump in the curve is related to the change in market outcome from monopolist (M) to leadership (S-L) after $40-45/mcm for Gazprom.

Figure 9.21 Overall net project value as function of unit operating costs, c



Source: own analysis.

9.3.7 Market-outcome scenarios

The market outcome scenarios are reviewed at an aggregate European level in Chapter 10. though at a sub-regional level Gazprom can end up as a quasi-monopolist, a dominant or a non-dominant firm as a result of its investment behaviour, or vice versa (also see Chapter 8). If Gazprom is to end up in a more dominant position at a sub-regional level in SSEE, it will have to invest more heavily than in scenarios where it ends up as a non-dominant firm. At the country or sub-regional level, Gazprom may end up as a quasi-monopolist or even as a monopolist.

At a sub-regional level, in the case of the SSEE region, Russia not only has a geopolitical interest in maintaining its influence in the Caspian Sea and Central Asian regions but also a geo-economic one. The loss of control over flows from this region to European gas markets through alternative routes (e.g., southern corridor) could spell disaster for Russia in terms both of lost market share and possible needed gas supplies for the domestic and export markets.

9.3.8 Reflecting on the application of the model and the conceptual toolbox

Model results: Discussion

According to the application of the model in this ex ante case, Russia essentially pre-empts Caspian supplies (to some extent) by making an early strategic investment in the form of South Stream. The South Stream serves as a strategic option for access to future gas demand growth in the SSEE gas market while acting as a deterrent or a barrier to entry to protect that market share. Thus a similar effect as was achieved by South Stream as by Blue Stream, except that in the case of the former it is essentially repeated on a larger scale and with lower unit costs, with a pipeline covering a longer distance.

The application of the real-options game model shows that there is an overall NPV value that goes beyond the mere static NPV value for the South Stream project, with an overall NPV of \$14 billion. This result is obtained despite the considerably high first stage strategic pipeline investment, which Gazprom is compelled to make (i.e., the irreversible of early commitment for South Stream). Yet as opposed to Blue Stream, South Stream yields a positive final, overall NPV. The sensitivity analysis of the overall NPV to unit costs provides an explanation for why this is the case: with a capacity of 63 bcm/y (and assuming optimal utilisation of the pipeline), unit costs are reduced to such an extent that sufficient direct value results. With an 8 bcm/y 'base case' pipeline covering the same distance, the overall NPV would have been negative (lower than -\$10 billion) at unit operating costs of some \$80/mcm.

The contribution of the model to the South Stream case is to serve as a contrast to the Blue Stream case. Where Blue Stream possessed only limited economies of scale over its length, South Stream possesses four times the capacity, accessing a market several times larger than the Turkish gas market in volume terms. Thus, if the upward potential, initial demand and economies of scale are great enough, the project can serve its potential role as an option on further growth and as a tool to shape the market structure to one's advantage. Results in the sensitivity analyses show that at lower levels of demand, the project naturally becomes unprofitable in overall NPV terms.

The conceptual toolbox: additional factors to take into consideration and scenarios

The conceptual toolbox helps to assess what other investment variables may be at play, such as regulatory risk. The toolbox specifies that Gazprom should only consider a strategic investment in the pipeline if it can attain a TPA exemption for its pipeline capacity within EU territory. Without a TPA exemption Gazprom has to release its capacity to third parties. Then, its investment can be seen as a 'shared' investment. According to Smit and Trigeorgis [2004], shared investments in a contrarian, competitive setting (i.e., quantity competition) never have a substantial value from a strategic point of view. In the gas industry it is even detrimental without binding commitments with competitor(s). The possible strategic value can only be achieved by aggregating supply flows from different suppliers (e.g., direct strategic value via economies of scale). Moreover, encouraged by the current financial-economic crisis in 2008/09, Gazprom is dependent on strong European mid-streamers in order to finance and organise its strategic investments.

In summary, Gazprom's investment policy with respect to the SSEE market could have different outcomes, given its competition, the prevailing market uncertainty, government policy and its ability to finance and organise its investment. Institutionalising the South Stream investment together with its partner(s) is an essential prerequisite for Gazprom if it wishes to successfully realise the project's success. Signing long-term contracts with European buyers, backed by vertical gas diplomacy, enables Gazprom to ensure its market position in volume term in the SSEE market. Alternatively, Gazprom may reserve (additional) capacity for short-term deals, contracting its own production through wholly owned subsidiaries such as GMT, for example. As a business model, the latter is driven more by a price-based strategy.

In a scenario involving a wait-and-see strategy, Gazprom may at least temporarily abandon its investment until a gas volume contract is signed to cover the pipeline investment. Postponing the investment may certainly also be motivated by European policies (e.g., involving TPA). Gazprom may still see South Stream as a priority in terms of it acting as a deterrent to its competitor(s). Depending on the level of competition, Gazprom may pursue a proactive strategy with regard to its competitors, in order to ensure its market position in SSEE.

As will be covered in Chapter 10, Gazprom could decide to invest in additional capacity in South Stream, partly on a commercial basis (i.e., additional supply contracts) and partly strategically in order to diversify transit country risk (mainly in Ukraine), which gives Gazprom the option to divert gas flows from existing transit countries. In order to evaluate gas infrastructure investment decisions, a decision and/or policy-maker should consider the infrastructure's commitment value vis-à-vis postponement value, in addition to its static value. However, it should also take into account 'practical' issues with respect to gas infrastructures, which is captured by the conceptual toolbox.

In the second case study, Gazprom, with the support of the Russian government, may deter jointly packaged Azeri, Turkmen, Iranian entry into the SSEE market (e.g., through the Nabucco pipeline). Here too, Gazprom may be inclined to act aggressively yet again in order to protect its position in the SSEE market and deter entry. Given its repeated announcements of enlarging the capacity (and thus the economies of scale) of the South Stream pipeline, one could see this as a form of signalling or coordination, i.e., a tacit message to potential competitors in this market. Deterring Iran, a large gas reserve-holder within economic reach of the SSEE market, may well be an important driving force behind South Stream (besides Blue Stream). By contrast, Gazprom and Russia appear to cooperate with North African exporters such as Algeria and Libya through shared investments along the value chain.

9.4 CASE STUDY 3: Gazprom versus competition in the NWE gas markets

Case studies 1 and 2 consider Russia and the Caspian region at country- and sub-regional levels. In Case study 3, the roles of pipeline gas versus LNG will be considered in terms of volume, also at a sub-regional level, with price risks discussed at the conceptual level. Using the same principles as was set out in the first two cases, the Northwest European (NWE)[479] market can now be analysed from Gazprom's perspective. The case is used to argue why Gazprom faces the same type of strategic problem in a market such as NWE as it does in SSE, even though different factors are at play here. The focus in this case is on Gazprom and a major up and coming LNG exporter, Qatar, which itself pursues a multi-market export strategy.

For Gazprom, the prize in this case is a large market share in NWE, a situation in which it can draw the market structure to its advantage. Just as in the second case involving an aggregation of Caspian gas exporters potentially bundling their export volumes through a pipeline such as Nabucco, strategic interaction is likely. Indeed, competition is possible between Gazprom and Qatar for market share in the NWE market, with pipeline gas on the one hand and LNG on the other shaping the balance of future possible supply scenarios. Following the same procedure as was carried out in Case studies 1 and 2, one can sequentially use the conceptual toolbox and the stylistic model developed in Chapter 8 to assess whether or not to invest strategically.

9.4.1 Background

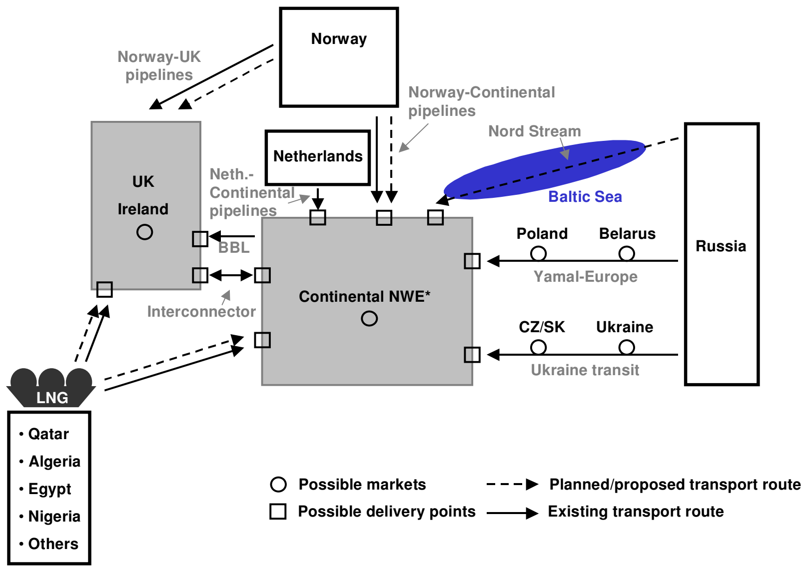
Centred on the North Sea, the NWE market is the most mature gas producing area in Europe. Gas production picked up after the discovery of the Groningen field (the Netherlands) in the late 1950s and Norway and the UK became important producers during the 1970s and thereafter. Gas consumption in this part of the European market increased steeply throughout the 1970s, spurring the development of infrastructure and sub-regional trading from Norway to the UK and the continent. The NWE market is, for all intents and purposes, a mature one in terms of infrastructure. Norway is linked to European markets through a network of sub-sea pipelines, while the UK is connected to the European continent through the Interconnector and the Balgzand Bacton Line (BBL). Both the UK and Norway are linked to the Netherlands which itself is an important supplier to the region. Germany, France, Belgium (and even Austria and Italy) are all off-takers of gas from the NWE region. Traditionally a supplier, the UK became import dependent in the early 2000s.

The European gas market in general, but NWE in particular, has undergone immense structural changes with the opening up of national markets to competition as the new EU regula-

[479] For this research, NWE is defined by Ireland, the UK, Denmark, Germany, the Netherlands, Belgium, Luxemburg, and France. In line with Case study 2, the demand for gas in NWE is aggregated for simplicity.

tions, sector-wide directives of 1998 came into effect. The aim of EU policy-makers is to create one single European internal gas market open to competition from within and outside the Union. This has fostered the view that there should be more spot trade, even though long-term contracts are expected to remain the bedrock for much of Europe's gas flows [CIEP 2008]. Of all the sub-regional European markets, spot trading has achieved the greatest level of evolution in the NWE market and short-term prices here have developed accordingly. Figure 9.22 provides a schematic overview of gas transport and supply to NWE (see also Map 5.1 in Chapter 5).

Figure 9.22 Schematic overview of competing gas supply and transport routes from pipeline and LNG suppliers to NWE market



* Denmark; Germany; the Netherlands; Belgium; Luxemburg; and France.
Note: excluding intra-NWE trade and production (except from the Netherlands). The overview is schematic and therefore not accurate.
Source: own analysis, based on company information.

9.4.2 Demand-side factors in the Northwest European gas market

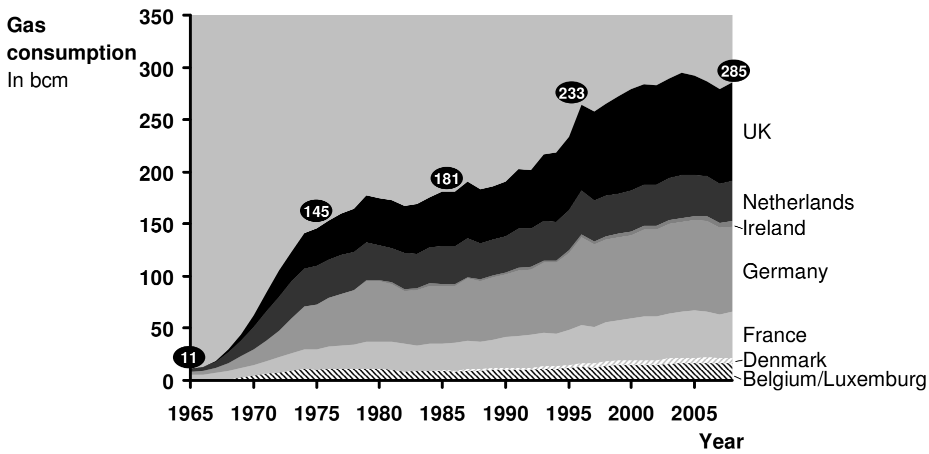
Per reference to the conceptual toolbox in Chapter 8, assessing market uncertainty is an important first step in ascertaining whether to make a (strategic) investment in new up- and mid-stream projects, as has been done in the previous two case studies. As is the case for the SSEE market in Case study 2 (and indeed for any market), volume (and price) risks play an important role in the NWE market as well, though relatively less so than is the case in the SSEE market. The NWE market holds much potential in the way of additional import requirements, a fact which fits into the overall pattern of declining pan-European gas production and rising import-dependency. Capitalising on rising Northwest-European import-dependency by capturing the increased market potential in this market may provide an incentive for suppliers to competitively establish a position in there. After all, Europe's Northwest European markets, such as Germany, the UK and France, include some of the most important economies in Europe.

One of the more traditional gas consuming regions in Europe and a natural hub for shorter-term gas trade due to its maturity, the NWE market is an important centre of consumption as far as gas is concerned. Gas enjoys a primary energy share of 40 percent in the UK, 38 percent in the Netherlands, 30 percent in Ireland, 24 percent in Germany, 24 percent in Denmark, 21 percent in Belgium and Luxemburg and 15 percent in France [BP 2009]. In absolute terms too, these national markets combine to form a very large market with considerable future needs, particularly in the face of the projected decline in regional production. According to BP [2009], the NWE market accounted for some 285 bcm worth of gas consumption in 2008, which accounts for 60 percent of total gas consumption in the EU, see Figure 9.23.

Almost in all countries, national champions, such as E.ON Ruhrgas and RWE in Germany and GdF Suez in France, are responsible for gas imports from outside their respective countries. The relative differences between the various NWE markets are noteworthy: The UK, Germany, the Netherlands and France account for the largest amounts of consumption. These facts and figures should lead one to believe that any Gazprom export strategy to this region (and to Europe in general) is likely to focus on these markets. Indeed, Gazprom's ambitions to gain access to the British market (via its 100 percent wholly-owned subsidiary GMT and its direct, already existing position in the German market (through a joint venture with Wintershall–Wingas) bear witness to Gazprom's interest in these markets and their possible place in its export strategy. For comparison's sake, these markets are comparable in importance to the Italian market in the SSEE market (see Case study 2).

Still, there are some uncertainties regarding additional (Russian) volumes to the NWE gas market. First, the current economic crisis of 2008/09 has resulted in a demand reduction in the short-term and probably in the mid- to long-term as well (see Figure 9.24 below). Second, the newly imported gas from remote areas, via long distance pipelines and LNG, will also require additional cross-border transmission capacity within the EU and thus also in NWE. However, EU regulatory barriers and uncertainties may hamper the corresponding investments, a factor which also impacts major greenfield investments upstream. This will increase the investment risks of the export pipelines from outside the EU to the EU member states as well [Correljé *et al.* 2009].[480] Third, there are some political debates about the (supplementary) role of Russian (Gazprom's) gas in the primary energy mix for security of supplies reasons (see also Chapter 6), largely as a result of the Russia-Ukraine gas disputes in 2005/06 and 2008/09. Though this is a more pressing 'issue' in East European EU member states, it could become an issue in the NWE region as well.[481]

Figure 9.23 Natural gas consumption in Northwest Europe (1965-2008)



Source: own analysis, based on BP [2008; 2009].

On the price side, market uncertainty is substantial. Gas prices are tied to oil and oil product prices in Germany and the Netherlands as well as France (and indeed this is the case for much of the bulk of Europe's imported and indigenously produced gas). In the UK and to a more limited extent in the continental countries, gas is traded on spot markets where spot price markers are an indication of short-term, gas-to-gas prices which respond more sharply and in a more volatile way to demand or supply shocks than do prices in long-term contracts. With oil prices rising almost inexorably from $40/bbl onwards in 2004, reaching $147/bbl in mid-2008, only to come crashing down to around $40/bbl again in late 2008, and back to $70-80/bbl in the winter of 2010, volatility in oil prices is high when taken over a period of five years. Oil prices have their impact on long-term contracts in Europe; though with a six-month

[480] See also Correljé *et al.* [2009] for an in-depth analysis of the current hurdles in cross-border transmission investments within the EU, with a focus on NWE.
[481] However, in reality NWE is better prepared for supply disruptions – compared to Central and (South-)Eastern Europe – owing to a sufficiently developed gas network and storage facilities. According to expert interviews, gas storage facilities within the NWE market could supply gas with a minimum of 3 months in case of supply disruptions.

time lag. Long-term contracts help cushion the effects of sudden demand movements on gas spot markets. Spot markets are centred on trading hubs which have achieved different levels of liquidity as well as volume (also see Chapter 5). A new trend is for LNG and pipeline gas suppliers to reserve capacity for short-term supplies to the wholesale markets and via the hubs, notably LNG producers and from Norway and Russia by pipeline, though volumes are still small [CIEP 2008]. The NBP, TTF and Zeebrugge are the region's most important spot markets, with physically trade volumes at NBP having reached 67 bcm in 2008, or around a quarter of total NWE consumption [IEA 2008a].[482] Indeed, an important difference between the SSEE and NWE markets is the presence and role of relatively well-developed spot markets, of which NBP is the most important and liquid one.

9.4.3 Various potential gas suppliers to the Northwest European market

The NWE market is supplied by a number of different suppliers in the form of both pipeline gas and LNG. Traditionally, NWE is not an LNG importing region. Only when France is included in the total LNG import balance is the share of LNG is worth mentioning.[483] Existing pipeline gas flows come from indigenous production, being greater in relative terms than corresponding domestic indigenous supplies in SSE. Another major difference between NWE and SSEE which is worth noting is that while Algeria is important in SSEE (particularly with regard to Italy), it is Norway which is an important together with Russia as far as pipeline gas flows are concerned. Per reference to Figure 9.24, there are four 'types' of gas supplies which shape and will continue to shape the NWE market:

1) *Volumes which are produced and consumed domestically:*

   From 2008 to 2036, the level of indigenous production, is projected to decrease from 173 bcm in 2008 to 91 bcm in 2020 and onwards to 45 bcm and 14 bcm by the years 2030 and 2036, respectively.[484]

2) *Volumes which are produced and consumed mainly within the NWE market but exported in an intra-European fashion:*

   The first layer in Figure 9.24 also includes those volumes, which are delivered through existing supply contracts. Volumes here include gas from the UK (to Belgium, Germany, France through the Interconnector) and from the Netherlands and Denmark to other

[482] The NBP hub saw physically traded volumes rise to 67 bcm and 961 bcm worth of traded volume in 2008 [IEA 2009]. The TTF and Zeebrugge each reached a level of 19 and 9 bcm of physically traded gas and traded gas 60 bcm and 45 bcm, respectively [IEA 2009]. The CEGH reached physical trade occurring at a level of 5 bcm in 2008, while traded volumes rose to 15 bcm [IEA 2009]. The yardstick for hub pricing is the replacement value of the gas rather than the market value principle; contractual prices for natural gas are always geared to the energy content of the gas involved [Energy Charter Secretariat 2008; Davis 1984].

[483] France imported 7.3 bcm from Algeria, 1.0 bcm from Egypt, 2.3 bcm from Nigeria and almost 0.4 bcm from Qatar, for example. Belgium also imports LNG, importing 2.3 bcm from Qatar in 2008. The UK is one of the 'newer' LNG importers, importing 0.3 bcm in 2008 from Algeria and 0.5 bcm from Trinidad and Tobago in 2008 [IEA 2009].

[484] This level of gas production includes what the Netherlands produces and consumes domestically.

NWE markets. The share of the volumes is set to shrink unless they are extended, and some of these extensions are likely.

3) *Volumes which are supplied through existing LNG and pipeline contracts from outside the NWE market and outside the EU:*
The third category of flows includes volumes from Norway, Russia, Qatar, Algeria, Egypt and Nigeria. These account for a significant portion of total volumes contracted in the projection period (volumes from these countries are set to reach 170 bcm in terms of contracted volumes by 2015). For this category of volumes, the utilisation rate of some existing pipeline and re-gas capacities is often below 100 percent. Suppliers could use the spare capacity in order to increase volumes, without any large greenfield investments. If the demand growth is substantial enough and if it is possible, suppliers could decide to increase the capacities of the current pipeline system via additional compression.

4) *Volumes which could arrive in the NWE gas market through new capacity in the form of LNG and/or pipeline gas:*
These volumes are yet to be secured through long-term contracts or through diverted or 'flexible' supplies. The last category of gas flows has yet to materialise and the relevant infrastructure is either under construction or has yet to be built especially as far as Norwegian, Russian and LNG flows originating from currently slated greenfield projects. A total of some 117 bcm worth of re-gas capacity (both under construction and proposal) is likely to be available in the NWE market from 2020 onwards. This capacity is provided by a number of new LNG terminals in France, the UK, the Netherlands, and to a lesser extent Germany, Belgium and Ireland.

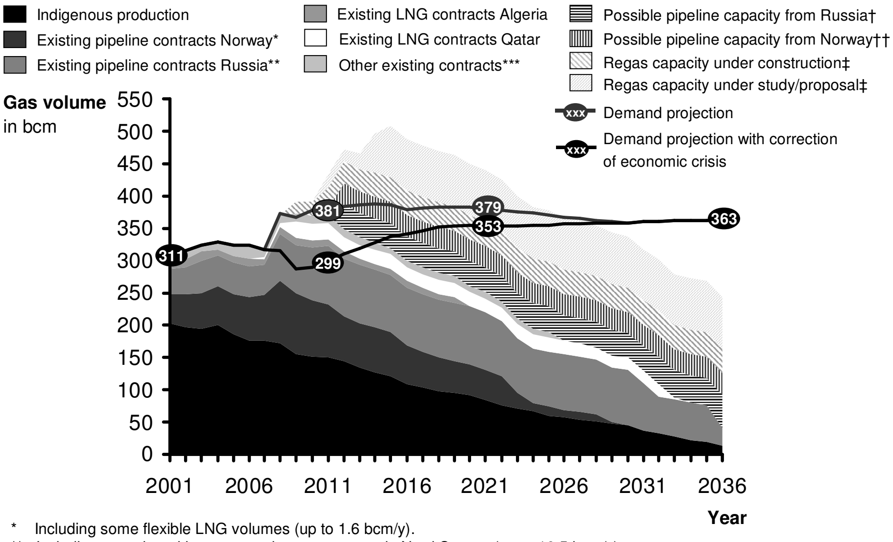
   Not all 117 bcm worth of capacity is likely to be utilised fully, with some currently planned utilisation resulting from newly signed long-term contracts. However, one must assume they represent a certain potential market share because the capacity in place makes throughput available. So as a rule of thumb, it is assumed here that, in order to provide a picture of what *could* come on stream, all slated re-gasification and pipeline capacity is included in the overall supply assessment.[485]

Consider Figure 9.24, here one can discern a high degree of oversupply when adding all the various potential capacities of infrastructural projects up with volumes provided through existing supply contracts as well as the volumes arising from the possible extension of these contracts (in a manner similar to Case study 2). The flows materialising on the basis of existing

[485] On average, around 70 percent for pipeline flows, and the average utilisation faction of re-gasification terminal is even lower.

contracts from suppliers outside Europe alone account for some 320 bcm in 2015 (including indigenous production of 120 bcm), i.e., with the exclusion of possible volumes rolled-over from existing supply contracts. In addition, aggregating all regas and pipeline capacity under construction, study or proposal, exporting countries can supply the NWE market with an additional potential of 221 bcm in 2015. The market structure of competition from a Russian perspective (by using the first matrix in Figure 8.2, Chapter 8) in NWE appears (again) fairly oligopolistic. Below is a more detailed analysis of the various gas suppliers likely to play key roles in the NWE market vis-à-vis Russia.

Figure 9.24 Existing and pending supply distribution over SSEE demand projection (2001-2036)

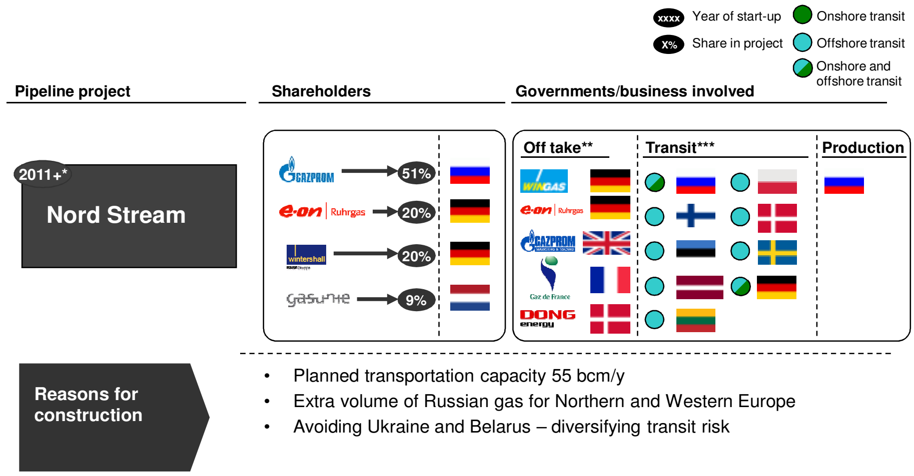


* Including some flexible LNG volumes (up to 1.6 bcm/y).
** Including new signed long-term volume contracts via Nord Stream (up to 16.5 bcm/y)
*** Among others, Egypt LNG (up to 5.7 bcm/y); Equatorial Guinea LNG (4.5 bcm/y); Nigeria LNG (4.3 bcm/y).
† Nord Stream (over capacity or self contracted via GMT: 11-51 bcm/y).
†† Europipe III (23.6 bcm/y) and Skanled (9 bcm/y).
‡ Mainly in France, UK and the Netherlands, but also one in Germany.
Note: Existing volume contracts are based on ACQ bcm/y. Linear trend extrapolation (via the method of least squares) after 2030 for indigenous production (based on 2020-2030) and demand (based on 2025-2030).
Source: own analysis, based on GIE [2009]; Cedigaz [2009]; CIEP [2008]; privately disclosed company data.

Possible new pipeline supplies from Russia

Currently, Gazprom is transporting its gas to NWE via the old Soviet pipeline system through Ukraine and via the Yamal-Europe pipeline, which is connected to the Wingas network in Germany and onwards. The Yamal-Europe pipeline has not reached its full load factor (currently utilisation is around 70 percent). Gazprom could decide to increase its volumes through the existing Yamal-Europe pipeline (by also building additional compression on that route). This investment decision offers the option to stall major investments with regard to new greenfield investments. The Nord Stream gas pipeline is designed to bring additional gas to Western and Northwest Europe from Russia. The gas pipeline runs across the floor of the Baltic Sea, avoiding the existing transit countries of Ukraine and Belarus with which Gazprom has recently clashed over gas contracts (2008/2009). Instead, the pipeline must transit the territorial waters of a host of North European nations, some or most of whom have reservations about the planned project [CIEP 2008] (see Section 9.4.4 below). In Nord Stream's first phase, the plan for the project is for the pipeline to be connected with the Shtokman gas field in the Barents Sea, once brought on-stream, even though Nord Stream likely to be completed before the Shtokman project is brought on stream. Initially, one of Nord Stream's two pipelines will be operational from 2011 onwards, with a transport capacity of 27.5 bcm/y.[486] A parallel pipeline will be laid to double the annual transport capacity to around 55 bcm/y – expected to come on stream as early as 2012, see Figure 9.25 [CIEP 2008].

Figure 9.25 The Nord Stream project



* From 2011 a transport capacity of 27.5 bcm/y, full capacity in 2012 (expected).
** Wingas, E.ON Ruhrgas Gazprom M&T, GDF Suez, Dong. Main off takers – other (transit) countries may take off gas as well.
*** The project could be extended to the UK. Then, Germany and the Netherlands will become transit countries.
Source: own analysis, based on Gazprom and Nord Stream information.

[486] Currently, 16.5 bcm/y worth of the capacity line currently under construction is already sold to companies by means of long-term contracts. A part of the remaining 39 bcm/y worth of capacity is already 'self-contracted' by GMT (6 bcm/y). The remaining capacity (33 bcm/y) is not coupled to any concrete gas flows, at least not yet [Nord Stream AG 2009]. However, this capacity could well be coupled to volumes in the pipeline if Gazprom chooses to commit such volumes, either through self-contracting or long-term contracts with buyers. Gazprom has signed an agreement with the following European companies: Dong Energy, Denmark (1 bcm/y); E.ON Ruhrgas, Germany (4 bcm/y); GdF Suez, France (2.5 bcm/y); Wingas, Germany (9 bcm/y). Gazprom holds a 51 percent interest in the joint venture, Dutch Gasunie 9 percent (in exchange for an option to Gazprom to buy a 9 percent stake in the BBL pipeline from the Netherlands to the UK), and the German companies BASF/Wintershall and E.ON Ruhrgas hold 20 percent each. Other parties have shown interest in buying a stake in the Nord Stream project. For example, Gaz de France Suez is negotiating its participation [Nord Stream AG 2009].

For Russia, the UK, France and Germany are key markets simply in terms of size, and so they form part of Gazprom's expansion drive in the NWE market. Being the largest markets by volume, these three markets' rising import needs offer valuable market share yet to be captured. From a Russian perspective, leaving any additional investments aside which it may need to build further economies of scale and expand its market share may relinquish Gazprom's market share to possible entrants. Through its subsidiary, GMT, Gazprom is aiming to expand its gas trading activities (e.g., self-contracting) mainly in the UK. At the same time, Gazprom's long-term contractual volume commitments with European mid-streamers, which are seen falling from 70 bcm in 2015 to 68 bcm in 2020 and 2025, respectively, may be renewed.

If Gazprom chooses to extend these contracts and the buyers are willing to do so, then this will help secure Russia's overall market share in the region. The Nord Stream alone will carry 16.5 bcm worth of long-term gas volume contracts in its first phase, while from 2012 onwards the pipeline could potentially carry another 39 bcm worth of gas, now held as excess capacity booked by Gazprom itself (6 bcm/y already contracted to GMT). All-in-all, the large number of potential gas-exporting entrants in the NWE market, at supply costs similar and often lower than those of Gazprom (especially per reference to greenfield investments with high LRMC, such as Yamal and to a lesser extent Shtokman) through LNG is likely to provide Gazprom with an incentive to make an investment in capacity expansion. Additionally, market uncertainty is low, with import needs for the NWE market certain to grow and prices remaining as unpredictable as they have historically always been.

Possible supplies from Norway and Algeria

Based on the available information about contracts, a certain amount will almost doubtlessly be renewed, holding mostly for pipeline gas from existing producers, such as Norway. Norway's exports are not likely to exceed 115 bcm by 2012. Almost all Norwegian gas will be exported to Europe in the coming decade(s). Newly produced gas from the Ormen Lange will be sold in the spot and short-term markets in the UK via the Langeled pipeline (around 20 bcm/y according expert interviews). Only gas from the Snøhvit field can potentially be exported as LNG to markets outside Europe (around 6-11 bcm/y in 2010-15). By making use of excess transport capacity, Norway could optimise its export revenues from gas sales [CIEP 2008]. Depending on fiscal and regulatory conditions and gas prices, StatoilHydro's oil and gas export strategy may yet shift, possibly resulting in an increase of Norwegian production and export [OME 2007; CIEP 2008]. As mentioned in Case study 2, According to expert interviews, Algeria is currently focusing on a growth strategy via pipeline supplies to Italy. Therefore, Algeria is not likely to exceed exports of 20 bcm/y to the entire French market, having either limited or fixed LNG export ambitions to that and other markets. Norway and

Algeria, though they are considerable and mature gas suppliers, are thus not likely to pose as much a threat as LNG flows do.

Re-gasification: Possible LNG flows to NWE

Indeed, the most important single threat in terms of volumes comes from the theoretical 130 bcm/y worth of volumes (assuming full utilisation of the corresponding re-gasification capacity). This capacity is owned either by mid-streamers (e.g., GDF Suez, E.ON Ruhrgas) or by vertically integrated international energy firms with a strong position in the LNG value chain through, for example, self-contracting strategies or a combination of both. Value chains such as those managed by ExxonMobil and Qatar Petroleum (from Qatari projects) can also form a threat in that Russian gas in the NWE market may have to compete with additionally contracted LNG from this joint venture (in excess of what is currently contracted).[487]

Assuming all the 130 bcm/y worth of re-gasification capacity are built, this capacity can make possible a vast flow of LNG to the NWE market. This could represent a major threat to Gazprom's potential market share in NWE. Since these flows could come from a number of different players, from Qatar to Nigeria, the competition can be said to be somewhat oligopolistic. In the long run, however, only Qatar, Nigeria and Algeria have significant market power in the Atlantic Basin and this has a direct bearing on market structure in the NWE market (also see Chapter 7). The NWE market will increasingly become part and parcel of the trans-Atlantic LNG market. Market power in the Atlantic Basin therefore also translates into market power in the NWE market. From an oligopolistic point of view, any amount of future LNG imports in NWE may act as a form of competitive entry with respect to Russian gas (in volume terms). As was explained in Chapter 7, Qatar pursues a multi-market LNG export strategy and much of its LNG volumes have yet to make their impact on the NWE market. Of the various potential players in the European market(s), and especially also in the NWE market, Qatar is the most significant newcomer in LNG terms. Qatar chose for a strategy involving economies of scale in its LNG shipping and liquefaction, not only in the US and in Asian markets, but also in Europe (for a more extensive overview of Qatar's sales and market strategy, refer to Chapter 7).[488]

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[487] South Hook LNG, Milford Haven, and Grain LNG terminal. Qatar Petroleum (67.5 percent), ExxonMobil (24.15 percent), and Total (8.35 percent) are the shareholders of South Hook LNG and the shareholders of Grain LNG are National Grid, BP, Sonatrach, E.ON, Iberdrola, Centrica, Gaz de France, part of a broader multi-market LNG strategy on the part of this 'NOC-IOC' partnership.

[488] According to expert interviews, Qatari LNG arrives in the NWE market at a cost of $3,29/mmbtu in 145,000 cubic meter tankers, $3.05/mmbtu in 210,000 cubic meter tankers and $2.96/mmbtu in the supergiant 250,000 cubic meter tankers, a ten percent total reduction in unit costs. Indeed, Qatargas chief al-Suwaidi has claimed that "we knew we would have to compete with pipe gas in a number of countries, especially Europe. So this was one of the drivers for pushing up sizes [of] trains and ships. We really wanted to compete in those markets" [WGI 2009f]. As in Europe, LNG is positioned to take market share away from current pipeline suppliers, which deliver gas mainly through short-term contracts, with al-Suwaidi seeing further opportunities to expand market share [WGI 2009f]. As a matter of fact, with the onslaught of com-

Gas supply costs to the NWE market

In terms of total or long-run marginal gas supply costs, of which the economies of scale in transport and upstream production are key determinants (see Figure 8.3 in Chapter 8), the UK and Norway are the most competitive sources of gas in the NWE market, due mainly to the proximity of production sites in the North Sea to the NWE markets. Sources such as Snøhvit LNG from Norway and Yamal are the more expensive possible sources of new gas for NWE, and if brought on stream in sufficient capacity, they could benefit from economies of scale. The total gas supply costs for LNG from Qatar and Nigeria are significantly lower (also see Section 7.7 on market power). According to the IEA [2009], indicative LRMC in 2020 for gas from Shtokman through Nord Stream costs $234/mcm compared with $204/mcm from Yamal, $91/mcm from Norway, $175/mcm from Nigeria (by LNG), $174/mcm from Qatar (by LNG), $177/mcm from Algeria (by LNG) for the NWE market. [489]

9.4.4 Other investment variables concerning Nord Stream supplies

Before applying the model, other factors which influence new gas supplies should be considered in a qualitative matter, in line with Barnes et al. [2006]. A number of investment variables should be taken into account with regard to the Nord Stream project, listed below.

1) Foreign investment climate in gas supplier countries

The factors to be taken into consideration as far as Russia's investment climate is concerned, have already been covered in Case study 2. For a more of detailed overview of the investment climate in Qatar, for example, refer to Chapter 7.

2) Transit, permit and regulatory risks

Although the Nord Stream pipeline circumvents onshore transit through third countries, the Nord Stream project leaders still had to consult with all nine countries around the Baltic Sea; and in five of these the project still requires (environment) permits. These consultations can delay the construction process, though the construction process appears to be underway [WGI 2010c]. The Nord Stream project also faces significant uncertainty about the timing of investments in German pipelines due to EU regulatory matters [Correljé *et al.* 2009]. Pipelines originating from outside the EU, landing on EU territory, where gas exits the pipeline and

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paratively cheaper LNG in Europe at low spot indexation, Qatar's sales have increased in Europe broadly while Russia's have fallen [WGI 2010d], though this is far from necessarily a zero-sum set of gains and losses.

[489] Based on expert interviews, an indication of the long-run marginal costs for the NWE market is given by the relative values of the long-run marginal costs of various sources. Take the Norwegian Troll gas field, for example, in the North Sea. It is the most expensive source of gas for the NWE market. LNG from Snøhvit, offshore Norway's northern coast, costs roughly half per unit as gas from Troll. Gas from Nigeria, also in the form of LNG, costs roughly a quarter as much as Troll gas while LNG from Qatar clocks in at 18 percent of Troll in per unit terms, comparable with LNG from Algeria. The cheapest source of gas in the NWE market is gas from the Netherlands' Groningen field, costing roughly 10 percent as much as gas from Troll. The long-run marginal cost of gas from Shtokman in the form of LNG and new sources in Yamal are likely to be a great deal higher relative to Troll.

enters the EU pipeline grid may also be subject to TPA. While subjection to TPA can act as brake on the strategic and proprietary value of its capacity, Nord Stream is not subject to TPA legislation. The Nord Stream companies are thus able to use Nord Stream's capacity in a proprietary manner.[490]

3) The geopolitical dimension

For a more extensive review of the broader geo-strategic context in which Russia's pipeline investment strategy fits (including Nord Stream), including the extra-regional role of the US, see chapters 3 and 11. Suffice it to be said here in the specific case of Nord Stream that within Europe, there is a rough division between European countries with a traditionally more trans-Atlantic relation with the US and the more continental actors. On the one hand, trans-Atlantic countries, such as the Netherlands, support the construction of the Nord Stream, while others such as the Baltic countries, Sweden and Poland generally oppose the project.[491] France, Germany (and Italy, as was mentioned in Case study 2), the more continental countries, but also the Netherlands tend to favour the project. Moreover, the European Commission assigned to the Nord Stream project a Trans-European Network (TEN-E) status, making Nord Stream a key project for European security of supply [Gazprom 2009a].

9.4.5 Organisational and financial institutionalisation of the Nord Stream project

Since the mid-seventies, the German-Russian gas relationship solidified through the establishment of the so-called Orenburg pipeline deal, backed largely by the German government, as mentioned in Part II of Smeenk [2010]. An important element in how Gazprom pursues the institutionalisation of the Nord Stream lies in how it uses vertical energy diplomacy to secure Nord Stream's success. Russia employs foreign policy tools such as government-backing of Gazprom's investment initiatives. In Nord Stream's case, Russia has nurtured close bilateral ties with Germany (and other off-take countries, such as the Netherlands and France), and agreement between government officials subsequently facilitated business-to-business progress. Thus political commitment acted in support of long-term take-or-pay contracts between Gazprom and German mid-streamers such as E.ON Ruhrgas at the firm level, where government support in the off-take countries can alleviate demand uncertainty. In model terms, Gazprom as a firm employed Russia's vertical energy diplomacy to secure upward demand potential.

[490] For some of the LNG re-gas facilities in the NWE market, such as South Hook re-gas terminal in the UK, TPA exemption is also granted, which provides LNG re-gas terminals with a similar, proprietary value. As for LNG, it is not exposed to any major transit risks in the same way as pipeline gas volumes are. However, re-gas terminals do face Not In My Backyard (NIMBY) issues in certain specific local municipalities.

[491] The Baltic countries favour overland alternatives, on the grounds of the Nord Stream's environmental risks, complaining simultaneously about deprivation of transit revenues the Nord Stream causes them.

At the firm level, Gazprom's vertical agreements with mid-streamers are in line with De Jong's [1989] joint venture coordination mechanism. Mature markets often feature greater tendencies towards cooperation between firms (also refer to Chapter 4). The mid-streamers, E.ON Ruhrgas and BASF, play a critical role for Gazprom in the German market through their position as incumbents in that market, and their political backing from the German government.

The Nord Stream project can be seen as part of a public-private 'win-win framework' between government-controlled companies in Russia on the one hand, and private entities or counterparts in off-take countries on the other, such as in Germany, via 'vertical swaps' value chain and joint ventures.[492] This type of agreements provides an upfront economic value and incentivises greenfield investments (also for smaller gas fields [Van der Linde 2007]. The public-private partnership between Russia and off-take countries can ensure Gazprom's market share in Europe and deter (to some extent) the flexible LNG flows.

In addition to the business model of long-term contract backed by governments, Gazprom increasingly engages in selling 'flexible supplies' not committed to country and regional markets, see also Chapter 10. Gazprom also applies this new business model in respect to the Nord Stream via gas sales of GMT in mainly liberalised markets, such as the UK. This business model is in the in line with De Jong's [1989] competitive coordination mechanism, which is mostly applied in growth markets, such as the UK (also refer to Chapter 4). However, it is uncertain if Gazprom may increase substantial volume growth via GMT due to possible difficulties of managing downside risks of this business model, particularly in light of the buyers' market since the end of 2008.[493]

The first business model of long-term contracts backed by governments fits into Russia's perception of the central role of the state in general, and the government in particular, in energy-related and strategic matters important to the national interest. In a broader sense, this ap-

[492] The asset swaps and joint ventures offer German companies security of supply in the form of access to upstream resources, while Gazprom could improve its security of demand by integrating in the EU downstream, towards end-consumers. Wintershall and E.ON Ruhrgas have a 24 percent share each in Serverneftegazprom, which is a Russian license-holder to the exploration of the Yuzhno Russkoye gas field, whereas Gazprom owns 51 percent. E.ON Ruhrgas and Gazprom also develop the Russian power market in another joint venture and E.ON Ruhrgas has a 6.5 percent stake in OAO Gazprom. E.ON Ruhrgas received further natural gas produced at the wellhead in Russia and is delivered through the joint venture by Gazprom, based on prices comprised of an average value of domestic Russian sales and Russian export sales. With Wintershall's agreement, Gazprom increased its stake in Wingas 49 percent. Wingas is active in transport, direct sales and storage in and outside Germany. In exchange for E.ON Ruhrgas upstream interests, Gazprom received minority stakes (up to 49 percent) in E.ON Ruhrgas' subsidiaries in Central European gas markets (e.g., Hungary). For an overview of these firm-level agreements, see also [Boon von Ochssée 2009b].

[493] For Gazprom, another driver may be the need to maintain open its options in its supply position, given its possibly tight supply balance in the mid-term [De Jong et al. 2010]. Even though it should be noted that recently domestic demand has fallen markedly.

proach also fits into Russia's perception of the importance of gas as a source of relative advantage, see Chapter 3.

Since this case study is about the interaction between pipeline gas and LNG flows, horizontal energy diplomacy in the case of Nord Stream is relevant insofar as Russia is expanding ties with fellow gas-exporting LNG countries. Russia pursues greater ties with these countries on both a bilateral basis and through the GECF (also see Chapter 10).

Currently the Nord Stream is privately funded, and officially it has not applied for any public funding. In line with Case study 2, the Nord Stream may be financed by means of a warehouse construction (also see the conceptual toolbox in Chapter 8), where the repayments of the loans of the greenfields are based on gas contracts between European mid-streamers and Gazprom. Such a construction facilitates access to a guaranteed income stream and therefore higher credit rating for the project, and therefore less expensive loans as a result of higher credit ratings. The business model of flexible supplies is exposed by relative higher financial risks.

9.4.6 Application of the model to the Nord Stream case

Similar to the South Stream case, the real-option game model can also be applied to the Nord Stream case. The goal is the same as in the previous two cases. Nord Stream is a project which is still under construction, whose effects, at the time of this writing, still lie far into the future, which is in line with the South Stream case (i.e., it is an ex ante analysis). In this particular case, entry is assumed to take place in the form of LNG. To the greatest degree possible, the assumptions below are designed to approximate real world figures and numbers in the context of specific market circumstances and gas infrastructure investments.

9.4.6.1 Assumptions and parameter values

Operational assumptions:

a. We assume the NWE gas markets collectively consists of a duopoly, with Gazprom on the one hand and a potential competitor on the other, with the latter acting as a potential entrant for new market demand with an 8 bcm/y pipeline, both on a distance of 2,137 km to the off-take market (offshore section: 2,220 km; onshore section: 917 km). An LNG supplier is assumed to act as a potential entrant. For simplicity, the operating unit costs for LNG entry are assumed similar to that of an 8 bcm/y pipeline.
b. Gazprom faces the choice in 2009 (i.e., stage I) of committing to building or deferring the construction of the Nord Stream pipeline across the Baltic Sea to Germany onwards in the face of potential entry by a competitor (see Figure 8.9 in Chapter 8).

Parameter value assumptions:[494]

a. **Average operating gas transport costs in the base case:** In the base case, both players are assumed to make commercial investments only, i.e., constructing small-diameter pipelines with a capacity of 8 bcm/y. In this case it means both players do not undertake early strategic commitment to the market, meaning the operational unit costs remain at $c_G = c_E = \$72.4\ \text{mln/bcm}$. At this point, neither player yet benefits from economies of scale. The competitor is assumed to have unit costs associated with a typical 8-10 bcm/y LNG train (e.g., such as those operated by the RasGas and Qatargas ventures in Qatar), the operating unit cost of which is comparable to some pipeline gas sources in the NWE market (assuming full utilisation of facilities, of course).[495]
b. **Average operating gas transport costs in the proprietary case:** The construction of the Nord Stream is a proprietary investment. Gazprom decreases its average operational unit costs from \$72.4/mcm to \$18/mcm as the pipeline has greater economies of scale (from 8 bcm/y in the base case to 55 bcm/y in the proprietary case). This represents the move away from the base case and towards the proprietary case. The competitor is assumed to use an 8 bcm/y commercial pipeline capacity at the same distance (i.e., it does not invest strategically) resulting in similar operating unit costs as an LNG chain (from liquefaction to re-gasification, see above).
c. **First-stage strategic pipeline investment (K):** The initial cost of building the Nord Stream, K (totalling \$14 bln), is defined as the difference between the CAPEX for Nord Stream minus the 'theoretical' CAPEX for a 8 bcm/y commercial investment covering the same distance, I (totalling \$6 billion).[496]
d. **Follow-up investment outlay by either Gazprom or the competitor (I):** Follow-up investment outlay, made after stage I and thus after the incumbent's strategic investment, corresponds with a base case commercial 8 bcm/y pipeline investment covering the same distance (\$6 billion).
e. **Initial demand parameter (θ_0):** For simplicity, initial gas market demand in the NWE gas market is assumed to be 95.83 bcm ($\theta_0 = 95.83$) at t_0 as detailed in the conceptual description in Chapter 8.

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[494] See the conceptual discussion held in the toolbox in Chapter 8.

[495] LNG from Qatar, for example, possesses roughly the same unit costs as pipeline gas from the UK and Norway according to expert interviews. In reality LNG is more flexible and price-sensitive between regional gas markets rather than produced and sold on the basis of quantity alone, see Chapter 8.

[496] In order to calculate the 'theoretical' CAPEX as well as the average breakeven operating costs per unit, account is taken of inflation, the WACC (k), the risk-free rate (r), fuel and compression costs, etc. (see Chapter 8). In this case, the real value is used for the offshore pipeline section, excluding the CAPEX for the compression. The 'theoretical' value of the CAPEX is used for the Russian onshore pipeline section to connect on the Russia's UGTS (see Chapter 8 for a definition of theoretical versus actual values of the different projects). The base case 'theoretical' pipeline CAPEX calculation is also based on 2009 input data, obtained from privately disclosed company sources. The inflation is assumed at 2.8 percent (based on the first half year of 2009), according to Eurostat data for the Euro area.

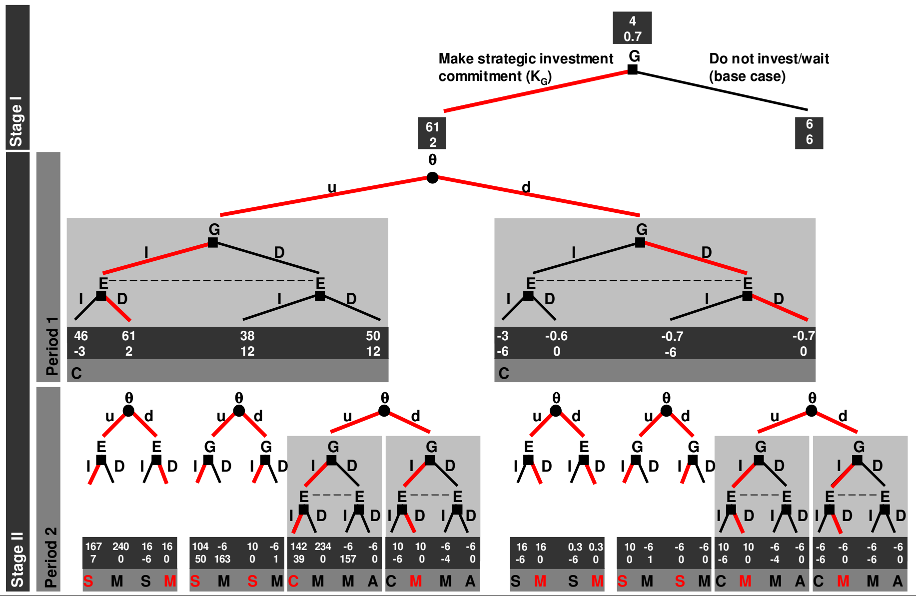
f. **Binomial up or down demand parameters (u and d):** In the model, demand is assumed to be stochastic, moving up or down with binomial parameters u = 1.84 and d = 0.54, both at the beginning of periods 1 and 2 in stage II. Starting at t_3 there is a 'steady state' of 25 years, i.e., no more upward and downward moves, as detailed in Section 8.4.5.
g. **The risk-free interest rate:** The risk-free discount rate is assumed to be 3.4 percent ($r = 0.034$).[497]
h. **The risk-adjusted discount rate:** The rate at which profits in the last stage are to be discounted by, i.e., the risk-adjusted discount rate, is set at 8.5 percent ($k = 0.085$).[498] The project's cash flows are discounted over a period of 25 years, acting as an annuity.
i. **Risk-neutral probabilities:** Given u, d, k and r, it can be determined that p = 0.32 and 1-p = 0.68.

Figure 9.26 is an overview of the various payoffs to Gazprom and the competitor in a decision tree, which is a direct application of Figure 8.9 in Chapter 8. Each node corresponds with an up- or downward move in demand and the resulting decisions of Gazprom (denoted in Figure 9.26 and elsewhere by the letter G) and the competitor (or potential entrant, denoted in Figure 9.26 and elsewhere by the letter E), respectively, to invest or defer (further) commercial investments ($G\{I, D\}$ and $E\{I, D\}$) in stage II while in stage I only Gazprom is assumed to invest as an incumbent. The highlighted (red) branches along the tree indicate the optimal actions along the equilibrium path.

Just as in Case study 1, for period 2 in stage II, we take the case in which demand has moved upward in period 1 (i.e., branch u), and do not elaborate here on either the case in which demand falls or the base case. Notice that Figure 9.26 will be approached through backward induction, i.e., bottom-up.

[497] The risk free rate is based on the yield-to-maturity in October 1999 of a 10-year Euro-denominated (or the equivalent thereof) German government bond [Tradingeconomics.com 2009].
[498] The WACC is based on information provided in expert interviews, where a WACC of between 8 and 9 percent was proposed as being appropriate.

Figure 9.26 Gazprom's proprietary case for Nord Stream vis-à-vis the competitor



Assumptions:
First-stage strategic pipeline investment by Gazprom: K_G = 14.0 bln$
Follow-up (second-stage) investment outlay by either Gazprom or its competition: $I_G = I_E = I$ = 5.8 bln$
Initial demand parameters: θ_0 = 95.83 bcm (with $\theta_1 = u\theta_0$ or $d\theta_0$)
Binomial up or down demand parameters: u = 1.84; d = 1/u = 0.54
Risk-free interest rate: r = 0.034
Risk-adjusted discount rate: k = 0.085

Operating costs:	c_G	c_E
No investment (base case)	72.39	72.39 $/mcm
Proprietary investment	17.39	17.39 $/mcm

Note: monetary amounts are in billion$.
Source: own analysis.

9.4.6.2 Model application and backward induction[499]

a. Stage II, Period 2

The upward and downward movements in demand in the leftmost branch of the tree (see Figure 9.26) and corresponding decisions to invest in follow-up capacity by Gazprom and the competitor (after a strategic investment has been made by Gazprom) yield the following dominant routes based on the state-contingent project values:[500]

- Sub-game 1: For Gazprom: 167, 16; for the competitor: 7, 0.
- Sub-game 2: For Gazprom: 104, 10; for the competitor: 50, 0.
- Sub-game 3: For Gazprom: 142; for the competitor: 39.
- Sub-game 4: For Gazprom: 10; for the competitor: 0.

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[499] All monetary amounts are noted in $ billions.
[500] See Figure 9.26 for dominant routes in the rightmost branch of the tree.

b. Stage II, Period 1

The values listed above are fed back into period 1, on the basis of which Gazprom invests commercially, while the competitor defers. In Game 1, the competitor is unable to obtain its highest possible payoff in period 1 of stage II, i.e., 2, given Gazprom investment in this period for a payoff of 61. In Game 2, rather both investing, both players opt for a deferral in order to avoid a duopoly outcome in period 1 in which both would be worse off than under a deferral. Gazprom obtains -0.7 rather than -0.6 and the competitor obtains 0. As Smit and Trigeorgis [2004] argue, Gazprom may also prefer to remain unpredictable. A similar result was obtained at this stage in Case study 2.

c. Backward induction of period 1 (stage II), to stage I

Finally, the period 1 payoffs for Gazprom help determine, again via a next step of backward induction, whether the strategic investment is worth making net of its initial capital investment, K_G, the amount invested in excess of a base case pipeline of 8 bcm/y. The stage I payoff for Gazprom is 61 while for the competitor it is 6. When the strategic investment is subtracted as well (i.e., the amount obtained from total CAPEX – I) the overall NPV (NPV^*_G) for Gazprom of building Nord Stream is 4, which is lower than the value under the base case (i.e., $4 billion for the proprietary case is lower than $6 billion for the base case). The model's application to the Nord Stream case conveys an overall NPV for Nord Stream that is lower than the base case NPV. This result suggests that it is better to postpone the strategic investment.

d. The various value sub-components

The model's application to Nord Stream yields value components in the same manner as in the Blue and South Stream cases, using formula 8.5. The game is initiated at an initial demand level of 95.83 bcm, and with the binomial parameters u = 1.84 and d = 0.54 determine a number of different demand levels result as in the previous two cases.

For simplicity, the following numerical explanation is based exclusively on the model's results in the last row in panel B, Table 9.3, specifically the case in which demand has risen twice to 324 $(i.e., \ \theta_0 \ x \ u \ x \ u)$. Here, Gazprom ends up as dominant leader firm (S-L), supplying 180 bcm/y via its existing infrastructure and the Nord Stream pipeline with a profit of 16. At this level of demand, and given the cost functions as a result of the proprietary investment, Gazprom has effectively been able to ensure its position as a dominant firm, the competitor compelled to follow with 36 bcm/y (S-F).

Table 9.3 Second-stage equilibrium state project values and strategic effects for different market structures and states of demand for the base and proprietary pipeline investment case

Panel A – Base Case

Demand θ	Market Structure (Static)	Quantity Q^*_G	Profit π^*_G	NPV_G	Market Structure (Dynamic)	Postponement value	Base Case NPV^*_G
28	Cournot Nash	0	0	(6)	Abandon	12*	6
52	Cournot Nash	0	0	(6)	Defer	6	0
96	Cournot Nash	8	0.06	(5)	Abandon	5	0
176	Cournot Nash	35	1	6	Defer	14	20
324	Cournot Nash	84	7	66	Cournot Nash	0	66

Panel B – Proprietary Pipeline Strategic Investment

Demand θ	Market Structure (Dynamic)	Quantity Q_G	Profit π_G	Direct value	Strategic Reaction value	Strategic Pre-emption value	Commitment value	Postponement value	NPV^*_G
28	Monopoly	5	0.03	0.3	0	6	6	(12)*	(6)
52	Defer	0	0	3	0	2	5	(6)	(-0.7)
96	Monopoly	39	2	12	3	6	21	(5)	16
176	Monopoly/Stackelberg	79	6	27	12	16	55	(14)	61
324	Stackelberg	180	16	54	21	24	100	0	167

* Additional 6 bln$ to postponement value because of additional investment (I) in order to realise total project's CAPEX.
Note: Totals may not add up due to rounding. Monetary amounts are in billion$.
Source: own analysis.

The proprietary case must be compared with the base case (i.e., panel A with panel B of Table 9.3) in order to determine the difference between making the strategic investment commitment and remaining at the original level unit costs, i.e., not building Nord Stream and sticking to an 8 bcm/y pipeline. In the base case, at the same level of demand, the NPV is 66 for both Gazprom and its competitor with each supplying 84 bcm/y via its existing and new infrastructure. In the proprietary case, Gazprom goes ahead with the strategic investment, creating a shift, which cannot occur when neither firm invests in additional economies of scale, remaining at the original operating unit costs $(c_G = c_E = \$72.4\text{mln/bcm})$.

The direct and strategic value

The net commitment values are shown in Table 9.3: The direct value of Nord Stream for Gazprom, attained due to the benefits of economies of scale alone is 54. The additional value of undermining the profitability of the potential entrant's investments is 21, i.e., the strategic reaction value, while the value of then altering the structure of the market altogether, the pre-emption value of Nord Stream, is 24. This last value is the value attained by shifting from a model outcome involving duopoly (C) to one where Gazprom ends as a leader (S-F).

The postponement and net commitment values
The strategic reaction value and the pre-emption values together determine the strategic value. The net commitment value, which is computed by adding the direct to the strategic value, is therefore 100 (=54+21+24). In this case the postponement value is zero, because in the base case scenario the NPV is also positive as a result of strong upward demand potential.

The overall net project value
Finally the NPV^*_G of Nord Stream for Gazprom is the NPV in the base case (66), added to the net commitment value (100) and the postponement value (0), which is 167 in total.[501] Note that this is not the overall net project value of Nord Stream to Gazprom.

9.4.6.3 Sensitivity analysis

Pursuant to the approach used in Case studies 1 and 2, the most significant and remarkable results are mentioned below for Nord Stream pipeline.

1) Overall net project value versus sensitivity to changes in upside market demand potential

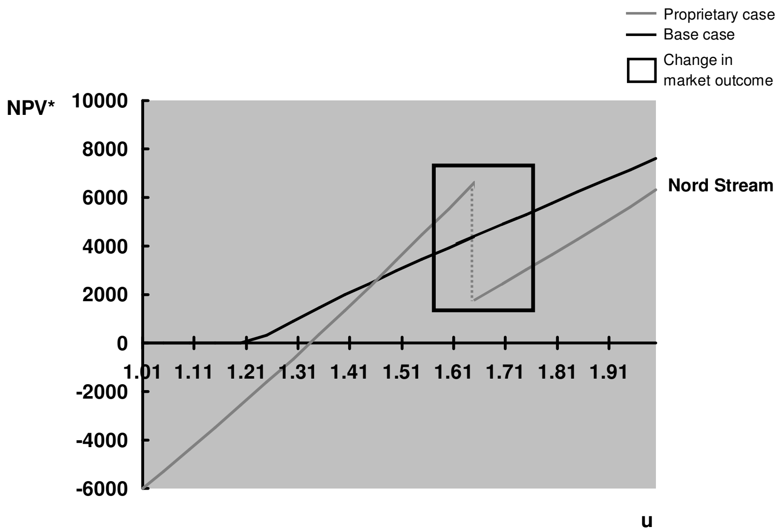
As in the previous case studies, the change in value of the upward demand potential parameter u, varying in the sensitivity analysis between values of 1.01 and 2, is positively related to NPV^*_G. In the base case of no pipeline with larger capacity (i.e., lower economies of scale), the project value increases monotonically (see the top part of Figure 9.27) with upward market demand potential, as expected from option theory. Considering the positive relationship between overall net project value and upward demand potential, the graph (lower part of Figure 9.27) exhibits a remarkable discontinuity. This 'negative jump' can be explained from the strategic competitive interaction in Gazprom's market. Gazprom is in a monopolist (M) zone due to its proprietary investment. That is, it enjoys being a monopolist until upward market demand potential reaches a value of 1.65, demand increases sufficiently for an entrant to enter the market, which is when the model outcome shifts from monopolist (M) to a model outcome involving Gazprom as a leader (S-L).

For the Nord Stream, the overall NPV is negative below the upward demand potential of u = 1.45. This means initial market demand must swing upwards by 40 percent per period in order for Nord Stream to be worthy of a strategic investment. Only between u = 1.45 and 1.65 the proprietary overall NPV exceeds the base case NPV before crashing down. Afterwards, it rises gradually, but well below the value and rate of increase of the base case NPV. An important difference between this case and South Stream is that market demand potential in the NWE market, though high (u = 1.48), is less promising than demand potential in the SSEE

[501] The postponement value is a negative number in case the static NPV is below zero for the base case, added, when applicable, by the option value when deferring a commercial investment (I) in period 1 in stage II.

market (u = 1.84). When we consider and compare the information included on demand potential in Case study 2 with that included here for Case study 3, initial demand yet to be 'covered' for South Stream is greater than is the case for Nord Stream. In the interval roughly of (1.45 < u < 1.68), the proprietary Nord Stream case NPV is greater than the base case NPV.

Figure 9.27 Overall net project value as function of upward market demand potential, u (with d fixed at 0.55)



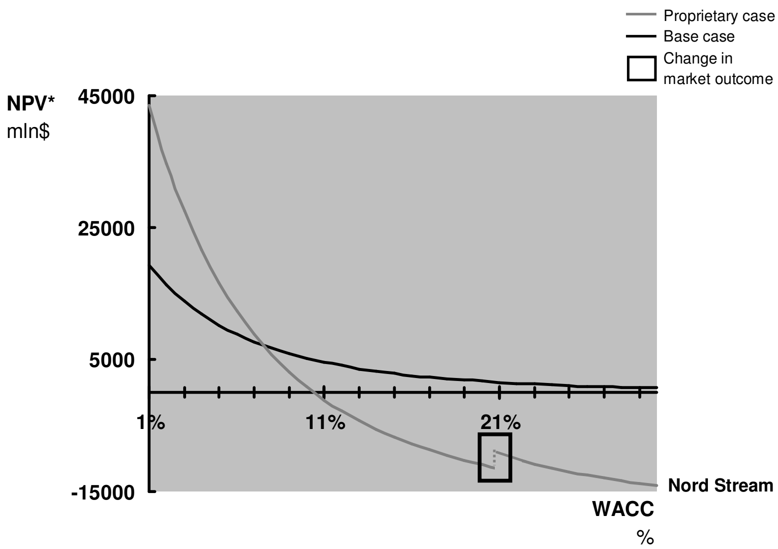
Source: own analysis.

2) Overall Net project value versus sensitivity to changes in the WACC

Refer to Figure 9.28 below, which shows the sensitivity of NPV^*_G to changes in the risk-adjusted discount rate k (i.e., the WACC). From the rise in the slope of the curve, it can be derived that the NPV^*_G rises substantially with a small decrease in k, both in the base and proprietary cases. This result is logical, because future cash flows are discounted at lower rates (i.e., a higher present value), with the NPV^*_G rising most rapidly in the interval (0 < k < 7). In the proprietary case, therefore, the critical value of k to invest strategically is around 7 percent. In the base cases NPV^*_G rises less steeply, though faster than it does in the corresponding graph for South Stream. This sensitivity analysis shows that when Gazprom accepts a lower WACC, the strategic value component values rise in the overall Net project value. In the proprietary case, NPV^*_G experiences a jolt at $k \approx 21$ percent. This small jump in the curve is related to the change in market outcome as result of the competitor's entry, as a result of an increase in the WACC for both players.

The main difference between Nord and South Stream is that upward market demand potential is lower in the former case. A much lower WACC is required for the Nord Stream in order for it to be attractive from a strategic point of view.

Figure 9.28 Overall net project value as function of the WACC

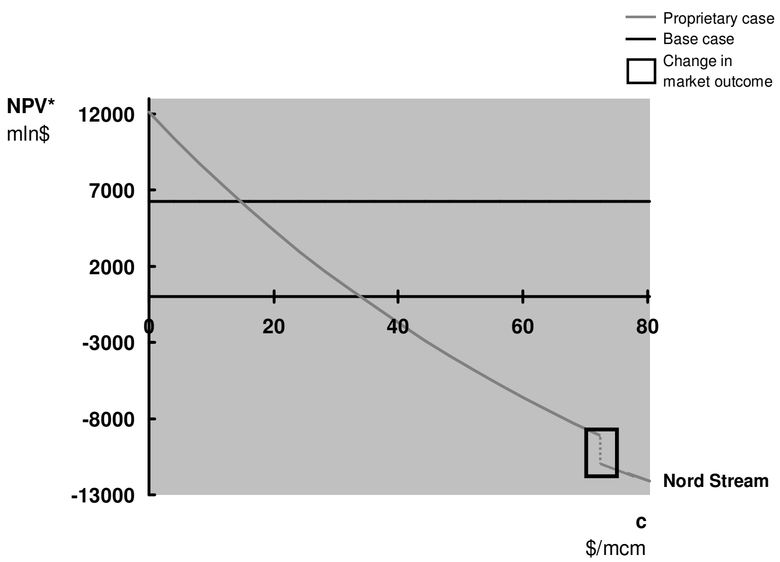


Source: own analysis.

3) Overall net project value versus sensitivity to changes in unit operating costs

Refer to Figure 9.29, which shows the sensitivity of NPV^*_G to changes in OPEX (c). Also similar to the South Stream case is the relationship between a fall in operating unit costs and overall NPV. Lower unit operating costs have an overall strategic impact on potential competition. Yet only at \$14.48/mcm and below does Nord Stream's overall NPV exceed the base case NPV (at a level of \$6,200 billion). South Stream, by contrast, becomes more attractive than its own base case version at a level of \$40.18/mcm. The small jump in the curve is related to the change in market outcome from monopolist (M) to leadership (S-L) after \$75/mcm for Gazprom.

Figure 9.29 Overall net project value as function of unit operating costs, c



Source: own analysis.

9.4.7 Market outcome scenarios

The market outcome scenarios are reviewed at an aggregate European level in Chapter 10. At a sub-regional level Gazprom can end up as a quasi-monopolist, a dominant or a non-dominant firm as a result of its investment behaviour, or vice versa (also see Chapter 8). At a sub-regional level, in the case of the NWE region, can end up in a more dominant position at a sub-regional level in SSEE. Gazprom would have to invest more heavily than in scenarios where it ends up as a non-dominant firm. Investing in brownfield rather in greenfield projects may enable Gazprom to take a more passive role and become a less-than-dominant firm. At the country or sub-regional level, Gazprom is not as likely to end up even as a quasi-monopolist in the NWE market. In this specific sub-region, the NWE market, Gazprom faces greater potential LNG flows and entry than in SSEE markets.

9.4.8 Reflecting on the application of the model and the conceptual toolbox

Model results: Discussion

The model's application for Nord Stream demonstrates that LNG can act as a powerful competitor in the NWE market (and other regional markets in general, for that matter) when it achieves unit costs similar to a base case pipeline of 8 bcm/y. Of course, this may lead one to think Case study 3 is essentially a pipeline-to-pipeline competition game (as in Case study 2).

However, the relationship between the various sources and in what form gas is supplied is based here on unit cost, so that it becomes irrelevant whether gas arrives in the form of LNG or pipeline gas, in volume terms. LNG has an interregional dimension that pertains to pricing rather than quantity or volume (see Chapter 10 for a discussion on pricing in this regard).[502]

The main model's main result is that Nord Stream's overall NPV (some $4.3 billion, under the proprietary case) is less than the base case NPV ($6.3 billion). The sensitivity analysis shows that with a substantial upward potential in market demand, Nord Stream becomes more profitable in overall NPV terms. In addition, the acceptance of a lower WACC by Gazprom vastly aids in facilitating a strategic investment and improves its overall NPV at a steep rate. In such a case, Gazprom sees gas pipeline transport as an option to ensure its position on the commodity market. Even as far as unit costs are concerned, the base case has more favourable chances at success than the Nord Stream does up to unit operating cost level of some $20/mcm, below which Nord Stream becomes attractive vis-à-vis the base case.

It is interesting to note that Nord Stream appears to enjoy some of the same benefits as South Stream does, primarily in terms of economies of scale and the size of the initial market demand. Yet despite a surge in market demand due to the upward potential of $u = 1.84$, Nord Stream remains less attractive than the base case in an important set of intervals (see figures above). Nord Stream's overall NPV, for example, exceeds that of the base case only when demand rises by 1.45 upwards to roughly 1.68, as the base case maintains its value and as the model outcome changes from monopoly (M) to leadership (S-F). The base case pipeline for the Nord Stream case remains as attractive as the proprietary case at around 7 percent. Nevertheless, the impact on the market's overall structure (i.e., the model outcomes discussed), may imply considerable value of the Nord Stream project.

The conceptual toolbox: additional factors to take into consideration and scenarios

The conceptual toolbox also helps assess what other investment variables may be at play, such as regulatory risk, just as in the case of South Stream. The effect of EU regulations as far as TPA is concerned may make such a wait-and-see approach more attractive, even though for now, Nord Stream is not treated by TPA legislation of the EU. In order to ensure its market position in volume term in the NWE market, Gazprom has already signed long-term contracts

[502] The novelty of an increasingly interregional gas market is that large volumes of gas, which could previously not be exported over long distances, are now within economic reach of the various regional gas markets and in sufficient quantities to support economies of scale. The choices Gazprom makes, particularly with regard to market uncertainty and the potential threat of entry on the part of LNG, are likely to affect the regional gas balance in NWE and therefore also in the Atlantic Basin (i.e., through interregional volumes). Competition does not necessarily manifest itself for Gazprom in the form purely of pipeline gas from potential competitors in the Caspian Sea region. Yet here only true giants reserve-holder such as Qatar or Iran able to sustain such large flows to regional gas markets. Gazprom may either compete with Qatar as an LNG entrant or it may cooperate with Qatar by postponing investment or jointly coordinating flows through a shared investment.

for 16.5 bcm/y, backed by vertical pipeline diplomacy. In addition, Gazprom has contracted 6 bcm/y of its own production via GMT for short-term deals. The latter business model, see also Chapter 2 in Smeenk [2010], is driven more by a price-based strategy. As will be discussed in Chapter 6, Gazprom could decide to invest in additional Nord Stream capacity, partly on a commercial basis (e.g., additional supply contracts) and partly in a strategic manner in order to diversify transit country risk (mainly in Ukraine). This provides Gazprom with additional benefit of having an option to divert gas flows from existing and troublesome transit countries. In order to evaluate gas infrastructure investment decisions, a decision and/or policy-maker should consider the infrastructure's commitment value vis-à-vis postponement value, in addition to its static value. However, it should also take into account 'practical' issues with respect to gas infrastructures, which is captured by the conceptual toolbox.

Pipeline gas flows versus LNG-driven gas flows
The flexible nature of the LNG value contrasts sharply with the rigidity of pipelines: the capacity of a re-gas terminal can be more flexibly used than a pipeline's capacity because of the added benefits of interregional LNG arbitrage and the negligible costs of reserving capacity in a re-gas terminal (versus the sensitivity of maintaining free capacity in a pipeline). Exclusive ownership of re-gas terminals (such as the one owned by ExxonMobil and Qatar Petroleum, see above) in various markets acts as a strategic option on future growth in various markets at the same time (from an interregional perspective). This reflects the added value of LNG which pipelines only have intra-regionally (in the case of several pipelines serving as alternative routes to different parts of a regional market. Of course, LNG flows as such are also exposed to downside interregional price risks. In the end, the balance of demand and supply in the NWE market affects the interregional availability of LNG, particularly in the Atlantic Basin.

9.5 Case studies: conclusion

The case studies act as illustrations of how uncertain demand and the potential entry of a competitor can be taken into account by combining real-options with game-theoretic principles. For all intents and purposes, the application of the real-option game model has shown that value can be derived from an increase in economies of scale in transport capacity for long-distance gas pipelines, which can act as a deterrent against possible entry (if unit costs are indeed actually brought down, which depends on the utilisation of the pipeline). These gas pipelines can be employed by Gazprom to protect and/or expand market share making early strategic investments. Regional gas market structures can thus be influenced by individual projects, which is inherent to an industry characterised by an oligopolistic market structure and a capital-intensive value chain.

Such strategic reasoning attributes to the Blue Stream, the South Stream and Nord Stream pipelines, as we have argued in the case studies, a strategic value beyond merely commercial elements involved. As a result, we argue that pipelines (and other such gas transport infrastructures and value chains) can serve as tools to ensure Gazprom's position as 'market maker'. Via the application of the real-option game model, we contribute the notion that such infrastructural investments are never isolated phenomena; they may fit into a broader, regional or extra-regional strategic agenda that is not simply about short-term profit-maximising behaviour. Simultaneously, the application and use of the real-option game model highlights the importance of a wait-and-see approach, i.e., a postponement strategy where large lumpy investments are mothballed until they may appear to be necessary to compete with others after all.

From the model's perspective, the Blue Stream emerges as a failure both from a commercial as well as an economic-strategic point of view. Greater economies of scale, combined with a greater initial demand, may have made the project more successful from the outset. Yet South Stream is accorded a positive overall NPV, owing partially to larger economies of scale and greater upward demand potential. Despite high economies of scale, the Nord Stream, by contrast, is accorded an overall NPV inferior to its base case NPV. Lower upward demand potential is an important factor in Nord Stream's overall net project value. The Nord Stream is important in that, conceptually, it takes into account LNG entry. Though LNG is assumed to correspond with an 8 bcm/y pipeline for reasons of simplicity, LNG entry in Case study 3 is less about a volume-oriented approach but rather about a price-oriented one. In the South and Nord Stream cases, the acceptance on the part of the investor of a lower return on investment vastly contributes to facilitating a strategic investment and improves its overall NPV at a steep rate. The sensitivity analyses with regard to the different input variables demonstrate that there is no single answer and highlight the importance of investigating changes in the value of overall NPV vis-à-vis input variables. In principle, the greater the probability of downside demand, the greater the value of postponing strategic investment. The case studies convey this point from a conceptual and a model perspective.

It should be emphasised again that the model is clearly a gross and crudely fashioned simplification of real world developments. The model can explain some of the strategic aspects of why Gazprom has constructed and may still construct various pipelines. These pipelines potentially serve as deterrents, which can alter market structures within regional gas markets, particularly in Europe. The case studies explain the nature and potential results of competition in regional and sub-regional gas markets and helps us to better comprehend the dynamics involved. However, the model cannot account for the interaction amongst more than two suppliers, where the gas industry is invariably characterised by more than two suppliers in any given market.

Other model assumptions, which remove it further from real world gas industry considerations, include the restriction to optimisation of quantities, whereas pricing plays an equally important role. The model also considers competition at a sub-regional and regional level whereas an interregional dimension is left out. Other issues such as taxes are also excluded. At the project level, the model cannot account for factors such as the financial and organisational feasibility. Another important omission in the model is inherent in the two-stage nature of competition between gas suppliers: while the model consists of only two stages, real world developments are often indefinite. Alternative fuels, such as nuclear energy, for example, may or may not become more attractive than gas as a function of political or economic preferences, especially when one player has a real dominant role in the gas market. This can adversely impact the potential of gas in wider energy markets.[503] A politically determined course, which seeks to exclude Russian gas, poses a serious risk to capturing additional gas market share for Gazprom, as do regulatory barriers and permit risks (e.g., TPA, antitrust regulation). On that note, the general investment climate also plays an important role in the various regional and sub-regional gas markets.

Vertical energy diplomacy helps Gazprom ensure, at a government level, to secure access to possible gas market demand growth and to minimise the likelihood of downward demand moves as prescribed in the model. European mid-streamers and off-takers play an important role in this regard, being the actors, at a firm level, that purchase Russian gas and have substantially interests in the value chain such as vertical swaps. Moreover, signing long-term contracts with European buyers enables Gazprom to ensure its market position in volume terms in the European market. Such a strategy is most likely in (near-)mature markets. Alternatively, Gazprom may reserve (additional) capacity for short-term deals, contracting its own production through wholly owned subsidiaries such as GMT, for example. As a business model, the latter is driven more by a price-based strategy and used to be applied growth markets. Gazprom also shares pipeline investments and other components of the value chain with regional European gas-exporting countries (particularly in North Africa), using government-level instruments, which pertains to horizontal energy diplomacy.

Geo-economic and geopolitical factors are also forces which the stylised model cannot account for and which can underpin strategic investments. The toolbox in Chapter 8, and the conceptual discussions in the case studies themselves, is an effort to account for these factors conceptually. Some of the factors the model leaves out may incline Gazprom towards making strategic investments. The individual games depicted by the case studies each lead to various sub-

[503] In contrast, the model ascribes a substantial value in the event that a player becomes dominant or a monopolist. From a practical point of view, such outcomes also have their drawbacks, resulting in lower corresponding values and other practical difficulties (e.g., by competition authorities and the pressure of substitutes).

regional gas balances and market outcomes, such as quasi-monopoly, dominant and non-dominant outcomes. As will be shown in Chapter 11, geopolitical forces may incline Gazprom towards a more aggressive investment strategy. An aggregate European level, these outcomes feed back into investment decisions, and ultimately have an important impact on the merit order, as will be discussed in Chapter 10 in Smeenk [2010]. In order to achieve the various outcomes, various levels of investment (both up- and mid-stream) can be made, depending on the outcome in question.

PART IV

Chapter 10

Towards interregional cooperation between gas-exporting countries*

10.1 Introduction

In case studies 1 through 3, an analysis was made of the various strategic moves available to Gazprom, primarily as an incumbent in sub-regional European markets. Attention was paid to the SSEE and NWE markets, in which various strategic situations were analysed from a historical vantage point (Case study 1) while the other two are more prospective in the sense that the model is used to derive inferences about expected strategic behaviour in the real world (ex-ante perspective). The case studies show, amongst other issues, that strategic investments can lead to first-mover advantages, but can also run into situations of market oversupply. The purpose of this chapter is to recapitulate Case studies 1 through 3 with a focus on the rationale behind Gazprom's (intended) investments and the impact on market structure in the European gas market as a whole.

This recapitulation serves as a backdrop to a conceptual discussion on possible demand and supply scenarios involving extremes of either undersupply or oversupply. Furthermore, the question will be addressed why exporters may wish to avoid the extremities in these scenarios. Section 10.2 aggregates supply and demand for Europe from a Russian perspective against the background of case studies 2 and 3. Section 10.3 provides a scenario analysis on Gazprom's market position in Europe and the implications thereof for its investment and Russia's export strategy. Section 10.4 addresses the rationale for overcapacity in Russia's export pipeline system to Europe in order (1) to reroute and diversify flows from the existing (Ukrainian) system; and (2) to capture additional economic rents through arbitrage opportunities, combined with a multi-market entry point strategy.

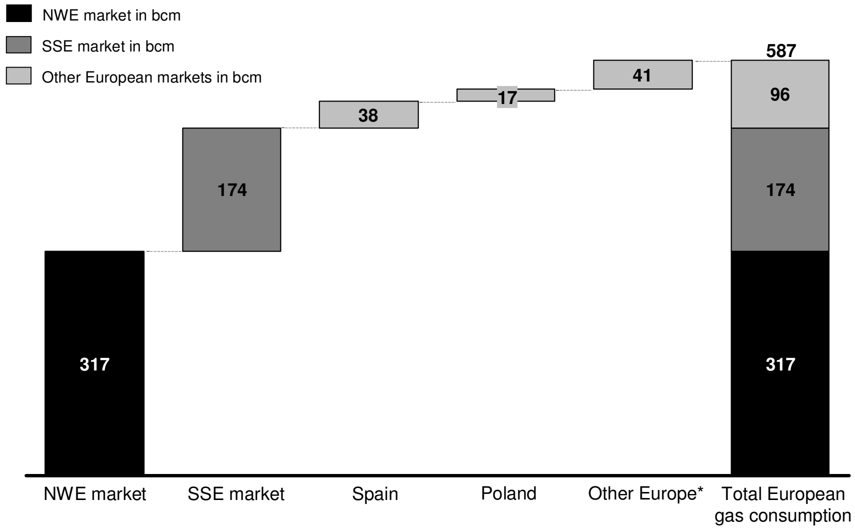
10.2 Aggregated supply and demand outlooks for Europe: A Russian perspective

A pan-European perspective is required to bring into view the various possible export strategies, and to ultimately determine Gazprom's and Russia's optimal investment portfolio. When considering the European market as a whole, pipeline investments such as Nord Stream and South Stream, become potential investments not only with regard to separate sub-regional markets but also to the European market as a whole. In this European market, the NWE and

* This chapter was partially written with Tom Smeenk.

SSEE markets still form the bulk (84 percent) of European demand, see Figure 10.1. Seen from a Russian vantage point too, the NWE and SSEE markets form the bulk of European demand and growth potential.

Figure 10.1 Breakdown of European demand by sub-region in 2008



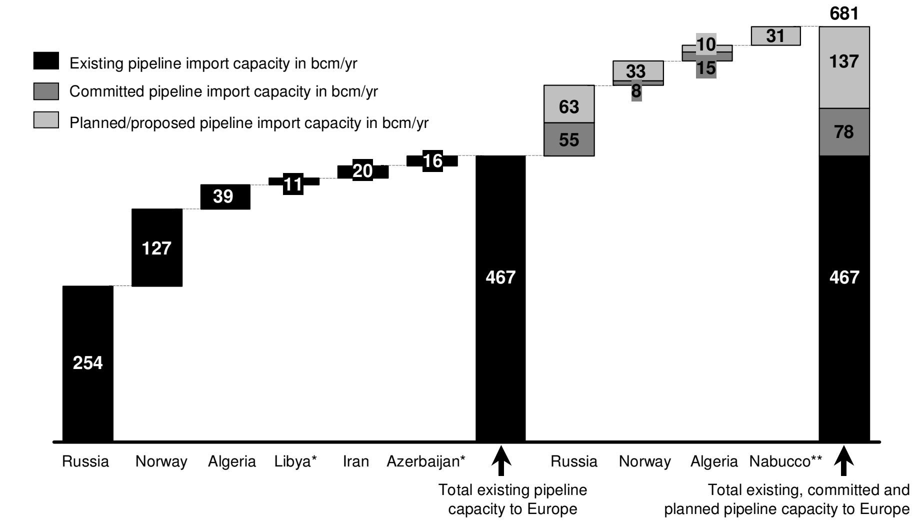
* Czech Republic: 8.7 bcm; Norway: 6.7 bcm; Slovak Republic: 6.3 bcm; Portugal: 4.8 bcm; Finland: 4.7 bcm; Switzerland: 3.4 bcm; Lithuania: 3.3 bcm; Latvia: 1.7 bcm; Estonia 0.9 bcm; and Sweden: 0.9 bcm.
Note: Totals may not add up due to rounding.
Source: own analysis, based on IEA [2009b].

On the aggregate demand and supply side and on a sub-regional (project) level, Chapter 8 and case studies 2 and 3 respectively, outline the demand projections and the different supply options.[504] The remainder of the European markets, Northern Europe, Central Europe and the Iberian Peninsula, all account for substantially less significant amounts of demand (16 percent of total European consumption). However, this does not imply that they play no role in Russia's export strategy, or that they do not offer any growth opportunities.[505] However, referring to Figure 6.8 in Chapter 6, one can discern that the countries in Central Europe, given their already high dependence on Russian gas, might not represent the greatest growth markets for Russian gas exports. The markets in the Iberian Peninsula, Spain and Portugal, are accessible in the long run through Russian LNG flows, see also Chapter 6.

[504] For an in-depth analysis on supply and demand outlooks for Europe, see for example IEA [2009] and CIEP [2008].
[505] In fact in its initial conception, the Nord Stream was to branch off to a number of different national markets, including Finland and Sweden (Northern Europe) and Poland (Central Europe). Central Europe further includes Slovakia, the Czech Republic, the Baltic States and Switzerland.

From a supply perspective (also see Chapter 5), there is some upside potential for additional developments regarding indigenous supplies, for example in the UK, from improved fiscal terms, and from unconventional gas [CIEP 2008]. For Europe, contrary to the US, the potential role of unconventional gas is still very uncertain and the prospects have not yet been quantified. Outside the EU, Norway currently supplies the UK and Northwest Continental Europe and it will increase its transmission capacity, as was mentioned in Case study 3. Sonatrach is focused in its export strategy on the Iberian Peninsula and Italy [IEA 2009a].[506] Gazprom is a main supplier of both the continental northern, central and southern European markets, and has proposed new pipeline projects. Other pipeline suppliers (Libya, Iran, Azerbaijan and other potential future pipeline suppliers, such as Central Asian countries, Nigeria, Egypt, Iraq) are rather small in volume terms, although they may increase their volumes in the mid-term via new greenfield projects [IEA 2009b; CIEP 2008].

Figure 10.2 Total existing, committed and planned export capacity to Europe by pipeline



* Including proposed capacity extension in the near future.
** Nabucco (or other so-called 4th corridor proposals) could use existing and new (yet to built) export capacity on the Eastern border of Turkey.
Note: Totals may not add up due to rounding.
Source: own analysis, updated from CIEP [2008].

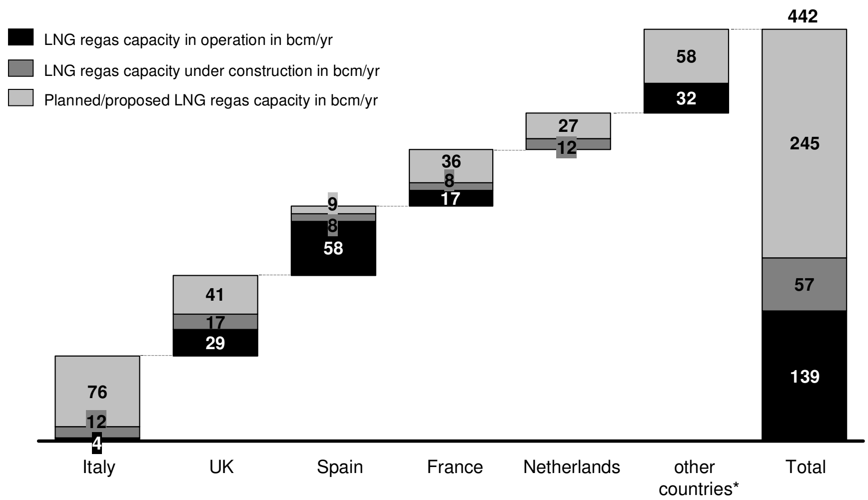
Figure 5.5 in Chapter 5 shows the current supply outlook within Europe, whereas Figure 10.2 summarises the total existing, committed and planned export capacity from gas exporting

[506] As mentioned in Case study 2, Algeria is planning to increase its supplies and transmission capacity to Italy. Currently, it is supplying Spain and Portugal via the Maghreb gas pipeline from its gas fields through Morocco to Spain. The Medgaz gas pipeline is designed to bring additional gas directly to Spain (Almeria) from Algeria. The pipeline will be operated from 2009 with a transport capacity of 8 bcm/y [CIEP 2008].

countries to Europe by pipeline. Most of the total pipeline export capacity to Europe has its origin in Russia, both existing and committed/planned. Other major gas infrastructure comes from Norway and Algeria, whereas both have (concrete) plans to increase their respective capacities to Europe. As mentioned in Chapter 5 and in case studies 2 and 3, LNG has made a contribution to European gas markets, mainly with supplies from Algeria and Nigeria, but this has been a relatively small portion of the total gas consumption. Southern and South-western Europe are traditionally dependent on LNG imports. In recent years, Qatar has acquired some market share in the European gas market.

The total European re-gas capacity is projected to increase in the coming decade to 442 bcm/y, including planned/proposed projects [IEA 2009]. Most of the current re-gas capacity is located in Spain, the UK and France. Most of the stated re-gas capacity is to be built in Italy, France, the UK and in the Netherlands. Figure 10.3 shows the total existing, under-construction and planned re-gas capacity in Europe. The (planned) capacity to Europe is estimated to be sufficient for the coming decades.[507]

Figure 10.3 Total European existing, under construction and planned LNG re-gasification capacity



* Belgium (9 bcm/y in operation; 9 bcm/y planned/proposed); Germany (14 bcm/y planned/proposed); Turkey (12.5 bcm/y in operation); Croatia (10 bcm/y planned/proposed); others countries (<10 bcm/y): Albania; Cyprus; Greece; Ireland; Lithuania; Poland; Portugal; Romania; and Sweden (10.7 bcm/y in operation; 0.3 bcm/y under construction; 24.8 bcm/y planned/proposed).
Note: Totals may not add due to rounding.
Source: own analysis, based on IEA [2009].

[507] Though in some regions within Europe, there are noteworthy problems with regards to interconnections. In addition, regarding geographical sources (i.e., pipeline or re-gas capacity from, respectively in a specific country) there might be bottlenecks as well.

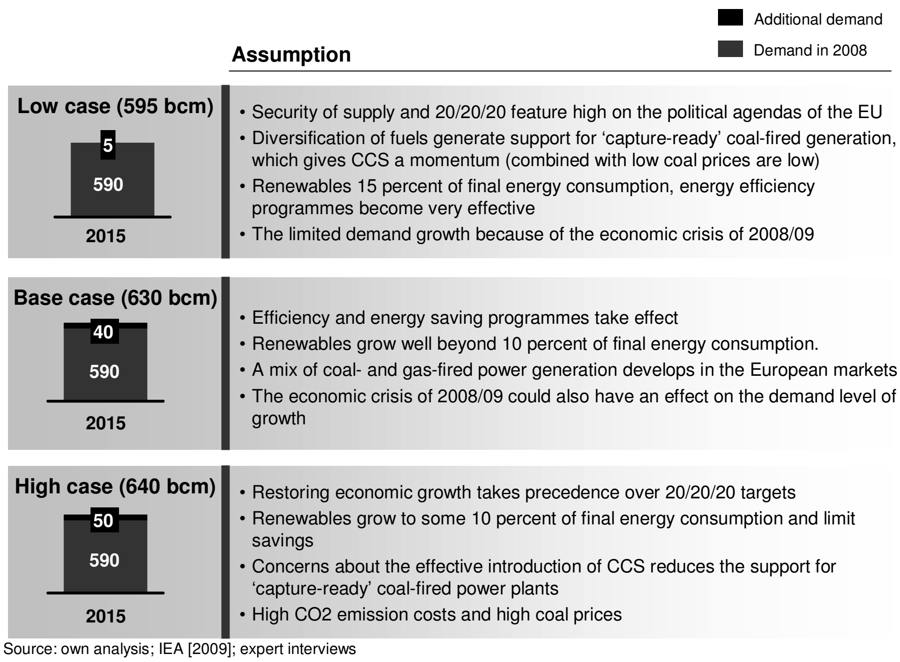
10.3 Russia's market position in Europe and implications for Gazprom's investment strategy – scenario analysis

According to CIEP [2008], uncertainties of the types and magnitude currently faced, lend themselves even less easily to forecasting than has been the case so far.[508] Scenarios form a useful tool to explore the limits of the diverging developments in the market, in order to understand their interaction and to identify possible future bottlenecks for formulating strategies [CIEP 2008]. Within the setting of CIEP research, various scenarios have been prepared for the year 2015 to explore the different roles that Russia could play in the European market. These scenarios address uncertainties surrounding both the supply side and the demand outlook. It is assumed that the developments of demand and pipeline/LNG supply are largely independent of one another. Russia (and Gazprom) chooses roughly its level of market penetration in Europe based on these variables [CIEP 2008]. In the following, it is assumed that Gazprom will retain its gas export monopoly for Russia.

10.3.1 European demand: Scenario cases

A range of 2015 gas demand levels in Europe are imaginable. See Figure 10.4 below.

Figure 10.4 Different demand scenarios for the European gas market in 2015



Source: own analysis; IEA [2009]; expert interviews

[508] The presented scenario analysis in this chapter is largely based on the LNG scenarios of CIEP [2008]. The scenarios are updated through CIEP analysis and expert interviews.

These scenarios hinge on different assumptions, mainly varying with the effectiveness of the 20/20/20 EU targets and the impact of the current economic crisis, ranging from 595 bcm/y to 640 bcm/y, implying limited, reduced and substantial demand growth.

10.3.2 Pipeline and LNG supplies from Russia's competitors: Scenario cases

On the supply side, for the purpose of this chapter, different scenarios have been developed for international supplies to Europe from pipeline and LNG competitors, from a Russian perspective. These competing pipeline and LNG supplies offer a large range of between 255 bcm and 385 bcm in 2015. Adding an estimated indigenous production of some 130-140 bcm in 2015, the competing supplies lie in the range of between 385 and 525 bcm/y. Figure 10.5 provides an overview of the different scenarios for pipeline and LNG supplies from Russia's competitors in 2015, based on availability/export ambitions and flexibility on annual contracted quantities (ACQ). Note that all country-related gas flows (including indigenous supplies) described in Figure 10.5 below correspond with pipeline flows.

The different scenarios for pipeline and LNG supplies from Russia's competitors in 2015 are explained below.

1) Low export pipeline and LNG supplies from Russia's competitors (255 bcm/y)

The low scenario of pipeline supplies from Russia's competitors are in line with current export ambitions of gas exporting countries and the reference scenario of LNG supplies, but the GALSI project from Algeria to Italy has suffered delays. Moreover, imports from Azerbaijan and Central Asia will have ceased, either for political or economical reasons. Therefore, fourth corridor's prospects have not matured into physical gas supplies in 2015, see also Case study 3. The development of 'unconventionals' in the US will be on hold, so that only the currently contracted LNG in 2015 (including flexible supplies) will find its way to Europe (105 bcm). The US market will absorb remaining LNG available in the LNG Atlantic market. Moreover, new supplies of LNG are slow to come on stream.

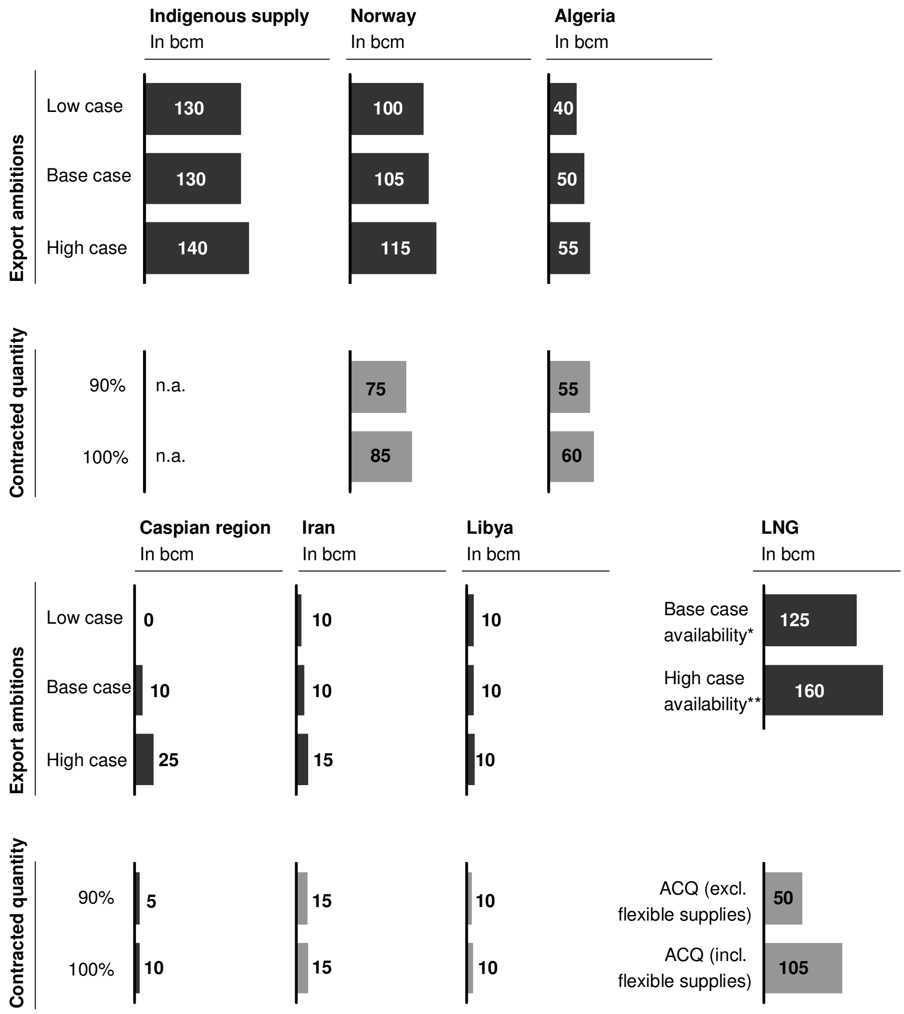
2) Current export ambitions of Russia's competitors (310 bcm/y)

Producers achieve their stated plans and commitments. The fourth corridor is modestly successful. Norwegian pipeline sales are limited to 105 bcm/y, including spot trade. LNG supplies will find their way to the European market and some 20 bcm additional volumes have been contracted. The US demand for LNG will be 35 bcm in 2015 [EIA 2009].

3) High LNG and pipeline supply from Russia's competitors (385 bcm)

All planned import pipelines to Europe have been laid and are used for additional supplies. For example, the first phases of the Nabucco pipeline and/or TAP/TGII are successful taking in mainly Shah Deniz II gas in Azerbaijan and possibly other Caspian gas (including Iran and Iraq). Libya has increased its exports with 3 bcm to 11 bcm in 2015, because of an extension of the Greenstream.

Figure 10.5 Pipeline and LNG supplies from Russia's competitors in the European market: Different scenarios for 2015



* US LNG demand at 35 bcm
** US LNG demand disappears
Source: CIEP analysis; Cedigaz [2009]; CIEP [2008]; EIA [2009]; expert interviews.

Norway also increases its exports to Europe with the new Europipe III (to 115 bcm in 2015). Algeria focuses its export strategy at pipeline supplies to the south European markets, which means 56 bcm in 2015, according to expert interviews. The call on LNG imports in North America is zero, resulting from more indigenous production of unconventional gas and a drive towards sustainable energy. Europe offers higher spot prices than the US and can take the LNG it needs out of the Atlantic Basin at market prices. Additional re-gasification capacity has been built to facilitate these supplies.

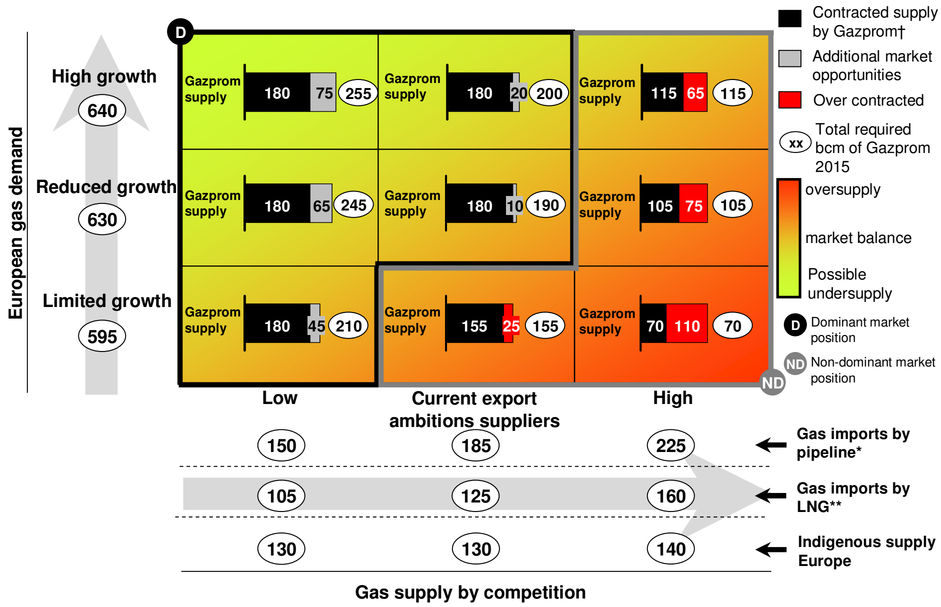
Indigenous supply

For the low and base cases, indigenous supply has been kept at the level of 130 bcm in 2015. In the high case, there is some possible upside potential (10 bcm), mainly from the UK.

10.3.3 Combined scenarios of demand and supply

It is assumed that the total of contracted Gazprom supplies in 2015 are in the order of 180 bcm/y, based on 90 percent of the standing and already signed long-term contracts (also see Chapter 6).

Figure 10.6 Gazprom's possible gas supply in Europe, based on combined scenarios of European gas demand and competition supply in 2015



* Including Norway.

** Low case: contracted supplies (incl. flexible supplies); base case: available LNG, with US LNG demand at 35 bcm; high case: available LNG with no US LNG demand.

† 90 Percent of Gazprom's ACQ to Europe in 2015.

Source: own analysis, based on Cedigaz [2009]; EIA [2009]; IEA [2009]; privately disclosed company data.

Taking the level of competitors' supplies as given, one can outline scenarios with respect to the level of possible Gazprom's supplies to Europe. The scenario-contingent outcomes of Gazprom's supply in Figure 10.6 above are simply derived by 'plugging in' Gazprom as a residual supplier. Either Europe is additionally supplied with LNG and competitors' pipeline volumes such that it is oversupplied to a certain degree, or LNG and competitors' pipeline volumes remain marginal. In the latter case, Russian volumes are assumed to dominate the European market at undersupply, with Russia free to seize remaining or residual demand. The result of combining the three demand cases with the three possible competitors' pipeline gas-versus-LNG combinations is shown in Figure 10.6, in the form of a three-by-three matrix. Based on Gazprom's supplies of 180 bcm in 2015, in four scenarios, Gazprom has over-contracted (25-110 bcm) unless Gazprom increases its level of flexibility within its take-or-pay contracts (i.e., lower minimum ACQ). The other five scenarios in Figure 10.6 suggest that possible additional supplies from Gazprom to Europe can increase to 75 bcm in 2015.

10.3.4 Market position and condition scenarios for Russia

The resulting market structure depends, in principle, on the investment decisions of Gazprom and/or its potential rival(s) with respect to their investments, actions and coordination games along the gas value chain.[509] On a regional European level, there are two scenarios with respect to Russia's market position in volume terms: (1) a dominant firm and (2) a non-dominant firm or fringe scenario (see also Figure 10.7). These scenarios result from different demand and supply (including pipeline gas and LNG) combinations, derived from the outcomes in Figure 10.6.

A quasi-monopoly scenario, which implies a market share above 70 percent, is a purely theoretical scenario on an aggregated European level, when one refers to Figure 10.6.[510] On a sub-regional and/or country level, a (quasi-)monopoly position may be possible; see also case studies 1 through 3. The market position scenarios are derived from the conceptual toolbox in Chapter 8.

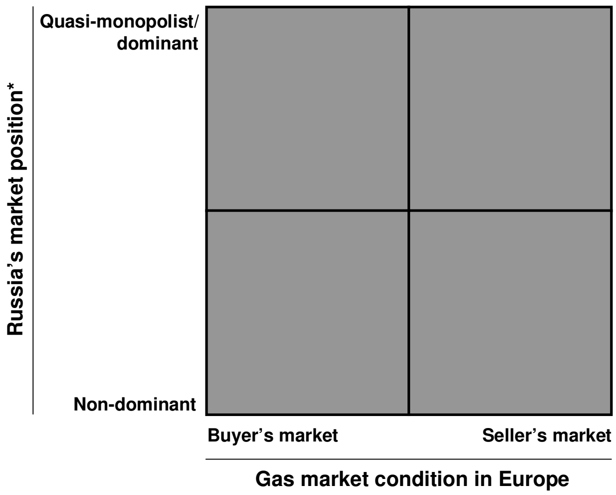
The level of success of Russia's investments depends on the market condition in Europe, which is essentially influenced by the dynamics on the demand side, and actions of competing suppliers and Russia itself. The likelihood of oversupply (i.e., a buyer's market as a market condition) rises as the number of rivals rises in volume terms, whether these volumes are supplied by a limited number of large firms or by more numerous firms. Regional oversupplies, in

[509] On a sub-regional level, see also the model and conceptual results in case studies 2 and 3 in Chapter 11.

[510] In the most extreme scenario in Figure 12.6, Gazprom has a market share of 40 percent on aggregated European level (see also a dominant market position scenario).

turn, can spill over in an interregional (price) dimension. Other market condition scenarios in addition to a buyer's market are: undersupply (i.e., seller's market) and market balance.

Figure 10.7 Different market position and market condition scenarios for Russia



* Gazprom's position as a gas supplier in Europe at a firm level.
Source: own analysis.

In reality of course, there are an endless number of scenarios or market outcomes imaginable with different combinations of pipeline gas and LNG volumes. Moreover, due to changing market circumstances, both on the supply and demand side, Russia's strategy outcome, and therefore Gazprom's investment actions, are part of a dynamic process. However, the essence here lies in the reasoning behind each type of scenario and the implications for Russia's gas export strategy to Europe.

The market is no longer assumed to consist of only two players (as was assumed in the stylistic model in case studies 1 through 3), but of Gazprom, on the one hand, and LNG suppliers on the other, some of whom also supply pipeline gas. There are essentially two possible market position scenarios to be sketched out for Russia regarding its position in the European gas market, where Russia is faced with either a buyer's or seller's market. The different scenarios, involving different market outcome positions for Gazprom, correspond with different levels of feasibility and different forms of coordination mechanisms with governments and firms in off-take markets and other gas-exporting countries. If Gazprom ends as a dominant player in Europe's gas market in the medium to long-term, it will behave differently than it would as a non-dominant firm. These different market positions Gazprom may end up in different levels of investments along the gas value chain.[511]

1) Russia as dominant supplier in Europe

In the dominant–or leader-follower–firm scenario, Gazprom's market share is between 30 and 70 percent. This market position occurs in 5 scenarios in Figure 10.6 (delimited collectively by a dark line), in which it has a market share of 30-40 percent in the European gas market. In these scenarios it is assumed that Gazprom further employs its market opportunities (10-75 bcm/y), e.g., supplying more than the 180 bcm/y, which is already contracted from 2015 onwards.[512] In such a dominant firm scenario, little additional LNG arrives in the European market and some competitors' pipeline supplies are postponed or abandoned.

Especially in the most extreme scenario, in which Gazprom supplies 255 bcm/y in 2015 onwards (40 percent market share), there is much pressure on Gazprom's investment ability to expedite the construction of its production and transmission capacity to Europe (see Chapter 12 in Smeenk [2010] for greater detail). The Russian government can also stimulate energy efficiency on the domestic market to free up Russian molecules for the export market(s). It is questionable, however, whether Gazprom could coordinate and finance these investments. Additionally, from a regulatory and substitute perspective, it may also not be desirable to have such a high market share.[513]

In a seller's market with Russia as a dominant supplier in Europe, Gazprom is the main balancing supplier; its marginal prices set price levels in Europe. In return, Europe will continue to be well supplied under current price regimes [CIEP 2008]. In a seller's market, new business models of flexible supplies present Gazprom with opportunities to optimise their profits, not through quantity-based decisions but rather through such pricing discrepancies (i.e., additional revenues via short-term and spot sales of GMT) [De Jong et al. 2010].

In the situation of a buyer's market, Russia has to compete heavily with other pipeline and LNG suppliers in order to remain a dominant supplier to Europe. Such a scenario could have a negative impact on Russia's market share, as well as on its price regime of oil-linked prices due to tension of lower prices on trading hubs (see also Chapter 6). The developments in the last years' gas market illustrate this fact. Due to the combined impact of a demand reduction

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[511] Chapter 12 in Smeenk [2010] discusses the different potential investment programmes Gazprom can embark on, given the various scenarios. The focus in this chapter is cooperation between gas-exporting countries.

[512] From a theoretical point of view, which is not included in the scenario-figure, if Gazprom decides to supply more than the market requires, the European gas market will be oversupplied.

[513] From a practical Russian point of view, such a market position in the European gas market may not be desirable, because of regulatory backlash, the threat of substitutes and possible organisational and financial problems regarding projects' institutionalisation (see Chapter 12 in Smeenk [2010]).

and developments around unconventional gas in the US (and LNG) altered the seller's market into a buyer's market. The lower prices on the European spot market resulting from the availability of uncommitted LNG (and pipeline gas) have weakened the rationale of oil-linked prices [Stern 2009a]. Consequently, Gazprom was forced to renegotiate some contracts with European off-takers, where it allowed temporarily lower off-take levels and an element of gas indexation in its take-or-pay contracts for a period of time to balance the market [WGI 2010b]. By means of this action, however, Gazprom creates the opportunity to postpone new Greenfield investments (e.g., new giant gas fields on the Yamal Peninsula) until demand is sufficient.

In order to mitigate the possible downside risks of Russia's dominant position in Europe in the mid- and long-term, especially in a buyer's market, Russia has different options to do so, both in relation with off-take countries and with other gas-exporting countries. Russia can employ, at the state and firm levels to strengthen such options: A combination between vertical energy diplomacy and the pursuit of new business models (covered in greater detail in Chapter 12 in Smeenk [2010]).

The implications for cooperation in a dominant firm scenario are that as a dominant firm, cooperation is more likely to be ad hoc and tacit, as only a small number of players are likely to concentrate market power in the European gas market, of which Gazprom has the largest market share. In a seller's market the need for such cooperation is lessened as gas-to-gas, or short-term prices are likely to exceed oil-indexed prices, and most players on the market capture maximum rents. In a buyer's market, the reverse is the case, and the need for binding cooperation becomes more pressing. In order to mitigate the negative effects of a buyer's market, a short-term solution for mid-streamers and Gazprom (and other gas exporting companies) can include renegotiating the price regime, and reduce their contracted volumes within long-term take-or-pay contracts with a certain percentage, in order to accommodate the increasing LNG and pipeline supplies from competitors. Either such cooperation amongst gas-exporting countries occurs through coordinated pricing in long-term contracts,[514] or limiting the amount of flexible supplies on the market. Of course, the whole idea of cooperation in the first place is to avoid a buyer's market, however, as the financial and economic crisis has shown, demand-side factors may not always be favourable.

2) Russia as a non-dominant supplier in Europe

In a non-dominant, or follower/fringe, scenario, Russia's market share is lower than 30 percent. This market position occurs in 4 scenarios in Figure 10.6 (marked by the grey frame). In theory, referring to Figure 10.6, Russia has a market share of 12-26 percent in order to balance

[514] The collapse of short-term prices can spill over into long-term contracts.

the European gas market. However, in reality, Gazprom has already contracted 180 bcm/y, which automatically results in an oversupply of 25-110 bcm/y in 4 scenarios because of an abundance of other sources of gas coming on stream (unless Gazprom increases its flexibility within the contractual obligations to balance the market, see above). In such a scenario, significant diversification into LNG and pipeline supplies from the Caspian region and others follow, be it for political or for industry-related reasons. Being a non-dominant or fringe player, Gazprom does not invest heavily in new projects in the mid-term to bring gas on stream.

As a reaction on the market condition of a buyer's market in Europe, Russia could decide to postpone new greenfields and become a non-dominant supplier. The risk mitigation strategies along the value chain of a non-dominant firm scenario are roughly equal to that as a dominant firm. The implications for cooperation of a non-dominant firm scenario are that as a dominant firm, cooperation is more likely to be formalised and explicit, as a limited number of players are likely to concentrate market power in the European gas market, of which Gazprom is only one significant party with a market share roughly equal to that of others. With a greater number of nevertheless oligopolistic firms, cooperation hinges on more binding commitments in order to avoid Cournot rivalry (which yields a lower level of payoffs than in a collusive optimum). Especially in a buyer's market, where spot prices fall below oil-indexed prices, binding cooperation becomes all the more pressing, as above.

Whichever scenario Gazprom ends up in, the interregional gas market's structure is in many ways hence determined by an aggregation of the flows resulting from Russia's past and potential pipeline investments: Blue Stream, Nord and South Stream pipelines in Europe, as well as eventual pipeline gas flows to China and other Asian markets. Russia's inclination towards one scenario or another in market outcome terms will require differing levels and types of investment along the gas value chain (see Chapter 12 in Smeenk [2010] for an overview of the various types and levels of investment along the gas value chain). In the end, a trade-off between cooperation and competition between large energy firms is likely to fundamentally shape the interregional gas market [Zhiznin 2007], and a desire to protect market share certainly is an important motive for competition. In the long run, Gazprom's pipeline investments may well lead to new market structures in other regional gas markets beyond Europe.

10.4 Towards dynamic collusion

Given demand uncertainty and possible actions taken by entrants, Gazprom may choose to invest early to pre-empt a potential rival or entrant (pre-commitment). Despite the deterrence effect of strategic investments, in a number of cases it may be better to avoid making strategic pre-commitments, especially in avoiding price competition in the long run. After all, strategic investments are cumbersome, and ultimately may prove to be unprofitable in the case of oversupply if other gas-exporting countries behave similarly. Oversupply becomes more poignant given the resulting jeopardy to long-term financing of risky gas production and transportation projects. Strategic investment decisions involve a trade-off between the values of postponement and pre-commitment [Smit and Trigeorgis 2004]. The postponement value points to a need for coordination with possible entrants given the risk of oversupply. Trade-offs between commitment and postponement values perpetually determine the tendency towards competing for market share and cooperating to avoid oversupply.[515]

The trade-off between commitment and postponement are particularly important, given the costly and capital-intensive nature of gas infrastructures. Gas market oversupply in volume terms ultimately leads to price effects, with potentially negative effects for long-term gas projects. In the real world, this issue calls into question making expensive (strategic) investments in projects (yielding lower short-run marginal and unit costs) without considering coordination with potential rivals and postpone investment. The question is, can it do so and risk losing its position in its European (and other potential) gas export markets? This is an important question that will govern many of Gazprom's investment decisions over the longer term. Short of speculating over the rise and shape of cooperation between gas-exporting countries, we can rely on the De Jong's [1989] dynamic market S-curve to highlight in a conceptual manner how such cooperation can evolve, i.e. in terms of its mechanisms, over the various dynamic market phases.[516] The point of departure is the option to postpone in the model and the scenarios from Section 10.3.

10.4.1 Limiting flexible supplies

During times of scarcity gas-exporting countries could cooperate through swaps, which work well under conditions of scarcity, and require significant stakes across the LNG value chain (liquefaction and re-gas).[517] However, under current market conditions, in a buyer's market, and in today's increasingly interlinked short-term markets, means must be sought to avoid excessive amounts of 'flexible' gas volumes. Oversupply in one regional market now easily feeds into other regions as the 2008-2009 global economic and financial crisis and developments in unconventional gas have shown. In principle, gas-exporting countries within various regional gas markets, particularly in Europe, could 'tweak' production levels to match ACQ demand requirements in long-term contracts during a period of oversupply. The result would

[515] Of course, in reality, the outcome depends to a large extent on the development of interregional factors in LNG flows beyond NWE and Europe, not just Gazprom's decision whether or not to invest in Nord Stream.

[516] As explained in Chapter 4, none of the phases explained here should be perceived in strictly separated terms or as being phases with a fixed duration, i.e., the underlying theoretical reasoning is fairly dynamic. The notions of interregional price competition and shared investments (also see Section 8.3.7 in Chapter 8) also play a role in this conceptual discussion.

[517] For now, private international energy firms, not national energy firms, dominate the trade of short-term interregional optimisation of flexible LNG volumes.

be limiting oversupply of intra- and interregionally flexible volumes. This is exactly the type of mechanism under discussion as of this writing: it corresponds with Algeria's call for a coordinated reduction of short-term, gas-to-gas volumes volumes in March 2010: "What do you do to bring in supply back into balance [with demand]? What do you do in OPEC? […] you reduce supply in the spot market. […] that is what is going to affect the spot price" [WGI 2010a]. A successful attempt to jointly limit flexible supplies would lead to higher spot prices, and would feed back into contractual negotiations with customers through indexation in long-term contracts [Forbes 2010].

However, because the various countries' long-term financing and their LRMC diverge, real production cuts are problematic, which is inherent to the capital intensive nature of the gas market. Algeria possesses relatively mature gas export infrastructure, however Qatar has only just begun operating its infrastructure roughly over the last decade. In addition, Qatar's high economies of scale provide it with the means to continue delivering to market at low SRMC without jeopardising the long-run profitability of its projects.[518] Suppliers would not consider shutting down LNG production for economic reasons as long as production can still cover SRMC [Forbes 2010]. For Russia too, the only way it can earn more money under current market conditions is by selling more volumes, according to Stern [WGI 2010a]. The above makes it very difficult for gas-exporting countries to take coordinated action in the short run to limit flexible supplies either regionally or in interregional terms. By doing so, there is always the fear for any one supplier, e.g., Algeria, Norway, etc., that other players will in theory simply have the incentive to expand their own 'flexible' production and snap up the market share left by that one supplier, the eternal game-theoretic conundrum.

10.4.2 The rise of coordination games and postponement of investments

As far as Gazprom's export chief, Alexander Medvedev, is concerned, the gas market's long-term agreements "make it impossible for the GECF to affect the pricing mechanism and influence the output volume." Indeed, possibly limiting flexible supplies in a coordinated manner is only a limited part of the solution of successful cooperation amongst gas-exporting countries, such that the costs of maintaining binding agreements and playing a balancing act for large gas producers could even exceed the benefits. It is tedious and would require immense technical, political and economic coordination. So far no actions by gas-exporting countries have led to any shifts in spot gas prices. For many new gas resources, huge investments involving long-term take-or-pay contracts are required while different projects operate in different lead times. Cournot-type, coordinated restraints on gas spot markets are possible, but restraining strategic competition for market share by coordinating capacity expansion is more feasible over the long

[518] The chief executive of Qatargas has said that shutting in supplies is "not even on our radar screen. It's not something we will consider. If someone has to shut down I can assure it will not be Qatar" [Forbes 2010].

run and lends itself better to the nature of the gas market.[519] Given the fact that the gas market is still expanding, such capacity games are likely to proceed for some time. In these games, investments act as signals. Indeed, as was concluded in Chapter 9, the model demonstrated at the conceptual level, that market structures are essentially the result of different possible 'coordination' games. Gazprom acts as a 'coordinator' of pipeline gas and LNG flows (under various imaginable scenarios). On the whole, this involves market outcomes between gas flows from the inner and outer gas market integrators (see chapters 6 and 7, respectively).

In the Blue and South Stream cases, Gazprom assumes a competitive or 'tough' stance vis-à-vis various potential rivals located in the Eurasian gas ellipse. The large-diameter pipelines can be seen as strategic tools designed to 'coordinate' other gas flows in the form mostly of pipeline gas. In the Nord Stream case, LNG could be deterred from the market in volume terms, though LNG is more price-sensitive and flexible, and possesses lower economies of scale (as an extension of Section 10.3.1). In the medium-term, these games may shift to mutual postponement of strategic investments and greater cooperation in these coordination games. Coordination through signalling, where combinations of investments lead to certain market conditions involving over- or undersupply, after the end of stage II in the model, so to speak, shifts towards actual coordination in the sense of 'strategic' cooperation. The key to strategic cooperation lies in the ability on the part of gas-exporting national energy firms to reach strategic understandings in the *longer run*, *before* such infrastructures are actually supposed to be built (also refer to Chapter 7).

The focus in this discussion need not always be Russia and Gazprom. Iran too had to witness Qatar taking the lead in LNG exports to markets Iran also considered supplying: Iran took into account Qatari competition when studying the feasibility of gas development plans for South Pars, for example [Marcel 2005]. Qatar's early investments in LNG export capacities, with the help of foreign private energy firms, locked Iran out of a number of gas markets. Especially in regional markets close to Iran (where Iranian gas is politically more 'acceptable' than in Western countries), Qatari LNG can easily out-compete Iran's pipeline gas; notwithstanding all the complexities involved in the Iranian gas sector (also see chapters 6 and 7). Qatar played its own coordination game with Iran, if perhaps inadvertently: invest heavily during a time when limited LNG exports had only just materialised to regional gas markets over long distances, and capture market shares ahead of other large gas reserve-holders (as discussed in chapters 8 and 9). Ultimately Iran postponed its investments in gas export projects for a range of reasons not directly related to Qatar.

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[519] This occurs after the global recovery from the 2008-2009 economic and financial crisis, for example, after 2015.

While conditions of a buyer's versus a seller's market move to and fray over the market, as described above in the scenarios, agreements to mutually postpone major projects, and to develop them in gradual stages, form a deeper core of cooperation for the longer run. The GECF offers gas-exporting countries the vehicle for such strategic supply calibrations, corresponding to horizontal energy diplomacy at a government level; this is in line with what was discussed in Chapter 7. For an overview of Russia's project- and government-level cooperation with other countries, and of GECF, Troika and OPEC members, refer to Map 7.1 in Chapter 7. forums such as the GECF offer gas-exporting countries the ability to communicate with each other about their plans, how much gas they intend to produce and when, as Khelil notes: "if the market demand is for 100 bcm and we supply 1000 bcm then we all have a problem, don't we?" [WGI 2009b].

Under uncertain gas demand developments, gas-exporting countries may wish to keep in check the development of their production capacity [Van der Linde 2005b]. Controlling capacity expansion is a preferred means of restricting output since capacity will limit the ability to cheat and the extent of actual production cheating, and it is more important for collusion in the gas market than it is in the oil market [Jaffe and Soligo 2006]. As such, forms of collusion in which "the Troika and GECF members can 'reach strategic understandings' on export volumes, schedules of deliveries, and the construction of new pipelines. They can also plan to jointly explore and develop gas fields and coordinate start-ups and production schedules" [Cohen 2008], is not unthinkable.

What form such 'strategic understandings' or cooperation can result and whether it is desirable from a Russian perspective depends in great part on Russia's perceptions of such cooperation (as will be discussed in Chapter 11). Other forms of cooperation are imaginable that do not include a cartel per se [Feygin and Revenkov 2007]. It would not be impossible for the forum to be more proactive in regulating how natural gas is traded, collecting data, coordinating policies, and consolidating cooperation between its members [Bahgat 2009]. Collusion is possible in a way where suppliers, most likely but not necessarily those with the greatest market power, agree in the first instance on delaying or coordinating investments over a longer period of time.[520]

10.4.3 De-concentration: Competitive fringes

As the industry expands in De Jong [1989] terms, players continue investing in capacities and infrastructure. Any group of oligopolists, which concentrate market power, is likely to face

[520] An imaginary example involves Russia delaying upstream developments such as the Yamal area and/or potentially midstream projects such as Nord Stream. Simultaneously, Qatar proceeds with its moratorium on the North Field and Iran agrees to supply Asian markets only.

industry de-concentration as entrants make their way into the market. A competitive fringe thus emerges. This is in line with De Jong's [1989] expansion phase. De-concentration in the interregional gas market has occurred in the past, mostly at a regional and later at an interregional level.[521] During the 1990s and 2000s, the rapid development of LNG exports in the Middle East, primarily in Qatar but also from elsewhere (see Chapter 7) then impacted the regional positions of Russia, Algeria, Norway and the Netherlands in Europe. These examples bear witness to situations in which incumbent suppliers, in this case in the European gas market, faced market entry from competitors. The impact of unconventional gas supplies in the US today is having a similar impact (see below), and it is being felt on a more interregional level through a decrease in the need for imported LNG in the US.

Cooperation without Russia in the long-term seems impossible in interregional as well as regional terms, especially in Europe [Jaffe and Soligo 2006]. Nevertheless, some suppliers may be able to compete against Russia (and any of its would-be collusive 'partners', in the Troika for example) in the form and shape of a collective competitive fringe by sharing investments (see below). Following Jaffe and Soligo [2006], let us assume there could be a 'core' group of countries such as Russia and a number of other gas-exporting countries, which succeed in cooperating, whatever the form of cooperation while a competitive fringe of 'non-core' group challenges the core group. This challenge may involve national energy firms and/or private international energy firms operating in countries outside this group. Can competitive fringe behaviour, on a regional and/or interregional level possibly be discerned for the gas market, given the discussion about collusion above?

As Finon [2007] notes, the core group of the Troika, plus Algeria, could be challenged by other countries which move ahead with investments anyway (supposing the Troika restrains long-term investments), i.e. a form of fringe behaviour [Finon 2007]. Indeed, As Jaffe and Soligo [2006] note, hindering the GECF as a whole is the fact that several members had been accelerating LNG development projects quickly to take advantage of first-mover opportunities in the market and therefore have no interest in cartelising project development, at least by the mid-2000s. From a game-theoretic point of view, reneging on agreements (non-cooperative behaviour) on the part of a 'fringe' of non-dominant players is also a possibility in a dominant firm versus non-dominant firm type scenario. This group can undermine such a collusive outcome between 'core' group countries.[522] The following possible competitive fringe-type market

[521] Regional examples of de-concentration include the development of gas supplies in the North Sea, during the late 1960s and 1970s, which competed with existing supplies from the Netherlands in the NWE market, for example. The entry of Soviet gas in the European gas market, during the 1970s and 1980s, then captured market share from suppliers such as Algeria, the Netherlands and Norway. See Part II in Smeenk [2010]. Here, chapters 5 and 6 cover the Soviet gas industry and Chapter 7 covers Gazprom's gas strategy in Europe during the 1990s.

[522] Non-dominant and/or fringe players, such as small gas exporting countries and Private international energy firms, can potentially show cheat behaviour since they can 'always' explore market opportunities, if possible,

structures are imaginable at regional levels in the gas market and can act as a challenge to any core group of gas-exporting countries (also see Map 7.1 in Chapter 7) in a type of 'cartel-versus-fringe' type of market structure:

1) Fringe behaviour between national energy firms

Scenarios are imaginable in which national energy firms within or outside the GECF compete with Russia and other Troika members, acting as a 'competitive fringe' of pipeline gas and LNG suppliers at regional and sub-regional levels (as is also analysed in the cases). Such competition would primarily involve volume-based competition. An example is the 'gas loop' concept, once on the drawing board during the 1990s to transport gas from Iran and other Middle Eastern countries to Europe through Turkey.[523] The loop could have acted as an important shared pipeline investment capable of competing with Russian pipelines. Also imaginable are situations in the shorter run in which competition comes from existing national energy firms such as StatoilHydro in Norway. With its extensive network of sub-sea pipelines and a flexible production system, Norway has low SRMC in transport and can more easily expand and reduce short-term volumes in the NWE market (also see Section 10.3.6 below). As a mature supplier, Norway can arbitrage between the different sub-regional markets in Europe and act as a 'fringe' player in these markets. Another illustration is Algeria's acknowledgment, at the April 2010 GECF meeting, of possible market share loss to key non-GECF gas producers such as the US and Australia from effecting a reduction in spot deliveries, a suggestion it made just prior to the meeting [WGI 2010e].

Egging et al. [2008] show by applying their *World Gas Model* that any form of collusion between the large gas-exporting countries is likely to overwhelm the smaller conventional gas reserve-holders, both by pipeline and LNG [Egging et al. 2008]. Indeed, gas production from a fringe of smaller gas reserve-holding countries, is likely to peak long before that of larger, when the market power of the core group is likely to be greater [Jaffe and Soligo 2006]. Even Qatar could act as a 'competitive fringe' on its own, in a world where the 'core' group and the GECF consist instead of a number of very large, dominant interregional players. With a vast and mature LNG export capacity, Qatar will be able to compete with other gas-exporting countries on SRMC across various regions, pending volume and price developments. Qatar's drive to secure market share in western, and later eastern Europe have often comes at the expense of Russia's market share [WGI 2009k]. Qatar's status as a GECF and Troika member is

[523] As early as the beginning of the 1990s, there were plans for a gas trunk line loop over Middle East countries, which could aggregate Middle Eastern supplies in order to supply regional countries, Asia and Europe by pipeline and LNG [UNIDO and Chiyoda Corp. 1994]. The United Nations Industrial Development Organisation (UNIDO) and CHIYODA Corporation of Japan (CHIYODA) had jointly taken this project initiative. According to their estimates, this project could have resulted in pipeline and LNG gas supplies of 35-40 bcm to Europe in 2020. This project was abandoned due to political and economical reasons.

no guarantee that it will not act as competitive fringe player on its own whenever it sees fit.[524] The April 2010 GECF meeting left implicit the idea that if Algeria were to reduce spot sales, fellow GECF members such as Russia and Qatar may well capture the resulting market share in European markets [WGI 2010e].

2) Fringe behaviour resulting from private international energy firms

As mentioned in Section 10.3.1, the private international energy firms, having a stake in many value chains and often fully vertically integrated, can act as cheaters, chipping away at the potential economic rent of the national energy firms by optimising short-term trades on their own accounts.[525] Private international energy firms can be seen as fringe players acting at the expense of a group of dominant firms (both at a regional as well as an interregional level). In interregional gas market terms, such behaviour has become especially likely owing to the rise of the new business models for marketing LNG, where private international energy firms play a leading role. Especially within the markets in the Atlantic Basin, and the basin as whole, may involve such 'fringe' behaviour.

In the Pacific Basin too, Australia possesses enormous potential in acting as a source of competing 'fringe' gas, already making its presence felt in the Pacific Basin[526] According to an industry analyst, Australia "doesn't think like GECF members, like national energy firms, or even like Norway, which has GECF observer status. There is no national oil company developing its gas, but rather [private international energy firms] that are interested in maximising shareholder value" [WGI 2009k]. A means for the GECF and Troika countries to counter such cheating behaviour on the part of the private international energy firms active in upstream sectors of key gas-exporting countries, is to compel these players to abide by certain volume restrictions in their market-or-pay contracts with the national energy firms.

3) Unconventional gas and floating LNG

As discussed in Chapter 5, of notable impact has been the development in recent years of unconventional gas production, especially in the US.[527] Its development has reduced US gas import requirements, thus competing primarily with LNG as another source of marginal gas in the US. In and of itself, unconventional gas acts as a significant 'competitive fringe', feeding into the interregional dimension by reducing LNG US import requirements. In a way, unconventional gas in the US has the same effect today as the mandatory oil import quotas had in US oil market in 1958. The large international oil companies at the time were under pressure

[524] The role of the private international energy partners in Qatar's LNG export projects should also be taken into account.
[525] Such competition is primarily price-based, primarily but not exclusively in the realm of LNG, also increasingly involving intra-regional pipeline gas supplies.
[526] Also refer to Chapter 7.
[527] Unconventional gas has become economically viable at relatively low prices of under $5/mmbtu [IEA 2009c].

from the Iranian and Saudi governments to produce more oil and needed an outlet for all this production, while US policy was aimed at restricting imports.[528] Similar ‘fringe potential’ can be derived from developments in floating liquefaction. Across the world, pockets of stranded gas reserves have become attractive enough to exploit (mainly by private international energy firms) through reusable offshore floating liquefaction facilities. This development increases potential volumes for regional markets ‘on the fringes,’ most likely in small amounts and outside the normal re-gas and liquefaction chain. Offshore re-gasification technology is also likely to play a similar role further downstream.

So Russia’s gas strategy should take into account the formation of coalition-building amongst potential would-be competitors, within the GECF, or even within the Troika. Qatar too appears to act independently and opportunistically in deciding upon its market allocation of LNG volumes.[529] Qatar can act as a ‘fringe’ player on its own, given its market power, global reach and multi-market sales strategy.

10.4.4 Shared investments and sales consortia

Ultimately, regional oversupplies, caused by coordination games with little to no cooperation and thus overinvestment, in turn spill over from the regional dimension to the interregional one. Overcapacities ultimately give way to price competition as the industry matures (see Chapter 4 for the theoretical background to this reasoning). From a dynamic market perspective, gas has yet to experience a further evolution in its product lifecycle. The impact on interregional LNG flows and their prices cannot be ignored, even in a volume-oriented framework such as that used in chapters 8 and 9. In the real world, a growing share of interregional LNG trade is to become exposed to greater interregional competition through interregional price differentials. The gas glut of 2008-2009 demonstrates that an approach to prices is vital amongst gas-exporting countries. In the future, the share of LNG trade in total international gas trade (i.e., both intra-regionally as well as interregionally) is likely to approach the share of pipeline gas trade, by which time price effects in one region will directly and profoundly affect market conditions in another. Shared value chains on a regional and interregional level, is one of the potential means to jointly share price risks, and avoid potential price-driven competition, in times both of a seller’s as well as a buyer’s market.

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[528] In the 1950s, new US oil producers were forced to compete with newly emerging cheap oil imports from the Middle East, primarily from Kuwait, Saudi Arabia and Iran. A the time, large international oil companies were in a difficult position to curb production (especially in Iran and Saudi Arabia), and could not restrain competition without offending the US government so shortly after the publication of the report of the Federal Trade Commission on international oil company attempts at restricting competition [Van der Linde 1991]. US policy was still aimed at conservation of US oil reserves and stabilising the oil price by a ‘restrictionist’ output policy. Ultimately in late 1960 this led to the establishment of OPEC.

[529] Also see Case study 3 in Chapter 9.

Hence the next step beyond mutual postponement of project investments is to share investments along the gas value chain, a more concrete form of firm-level investments facilitated first by horizontal energy diplomacy at the government level. Such shared investments can materialise at a regional and at an interregional level. Chapter 8 includes a brief description of the logic underpinning shared investments, In order to avoid price competition, suppliers could cooperate by sharing project investments and their economies of scale [Smit and Trigeorgis 2004]. Gazprom's most notable shared investments are with Algeria, Libya, Nigeria in North Africa and possibly the South Pars project under the Gas Troika initiative (see Map 7.1 in Chapter 7). The Atlantic Basin is home to the largest markets by volume (the US and Europe), which also see the greatest amount of spot trade (i.e., room for flexible supplies), and thus also the greatest price risks. Remarkable, therefore, is the shift in member countries in the GECF, in which almost all members (except for Venezuela and Bolivia) are either actual or viable future suppliers to the European and/or Atlantic LNG market [IEA 2009].[530]

If the IEFs were to gain sufficient control over the interregional LNG value chain (regasification, liquefaction and pipelines) they would be able to exercise greater interregional market power. If and when only a small group of suppliers controls a large share of the (interregional) gas value chain, real collusion amongst gas-exporting countries can shift to a new level (partially through shared investments and sale consortia, see next sections). For now, the interregional value chain is too fragmented amongst private international energy firms and markets for such collusion to be successfully coordinated on a large scale.

10.5 Price competition

In the long run, the industry will enter a mature phase of gas' product life cycle, and overcapacities eventually lead to price competition, not just on a small share of interregional trade as in the mid-2000s, but over a greater share of gas volumes traded at an interregional level. In the long run, gas-exporting countries must ensure, whatever the price of gas, they must cover their LRMC, ensuring that they do not enter price competition. Shared investments can be employed to minimise price competition, players with established and mature infrastructures are best able to weather price competition. These are able to continue competing for market share on the basis of low SRMC. In this regard, Gazprom has an interest in having overcapacity and established infrastructure (see Chapter 12 in Smeenk [2010] for a further rationale for Gazprom underpinning over-capacities). By extension of De Jong's [1989] theory, in some future mature gas market, short-term prices are likely to determine overall market prices rather than being of marginal as is the case still today. In this future market, Gazprom could become

[530] Other important LNG exporters such as Brunei, Malaysia, Indonesia as well as the UAE did not go on to become permanent members, pointing at a realisation on the part of some countries that cooperation is more necessary for those supplying the Atlantic Basin.

the Saudi Arabia of the European gas market, by tuning flexible supplies on the back of mature infrastructures such as the Nord Stream, for example. Suppliers with the lowest SRMC (or OPEX) can play a pivotal role once infrastructure is built, as the model suggests. In the long run, lower unit costs achieve a similar effect. In order to avoid price competition in long-term contracts, a common approach to pricing could be developed by the GECF or through more tacit agreements.

10.6 Conclusion

Beginning with the notion of the postponement value as derived from the application of the model in Chapter 9, we can derive a certain value from agreeing not to compete in capacity terms, from a gas-exporting countries' perspective. The bottom line in this chapter is that after the players in the model have cast their dice throughout the game, i.e., after stage II, 'life goes on' so to speak, and many market developments have an impact on the potential for cooperation between gas-exporting countries, especially at an interregional level. It is tricky to extrapolate current market developments into the future and make inferences on the basis of such extrapolations. For lack of a crystal ball, dynamic market theory and concepts introduced in Chapter 8, offer some intuitive insights into how cooperation could evolve within a dynamic interregional gas market. The scenarios at the beginning of the chapter are designed to capture the degree of uncertainty and the range of possibilities for market developments and outcomes.

These scenarios cleared a path for a discussion about the potential evolution of cooperation amongst gas-exporting countries. In the short-term, cooperation begins with the coordination of flexible supplies. Then, in the medium-term, as the market becomes more uncertain with expansion, oligopolist firms play capacity coordination games and mutually postpone capacity expansions. In the continuing expansion phase, which can last decades, de-concentration can occur at various moments as new suppliers enter the market. As the industry matures, or even in the expansion phase, gas-exporting countries may seek to avoid price competition by jointly developing value chains and projects. By sharing a common value chain with high economies of scale, the parties can effectively take advantage of upside possibilities in the case of a seller's market, though account must be taken of fringe competition. Cooperation will be tested in times of a buyer's when downside risks materialise.

At various points in the industry's development, especially during an expansion phase, de-concentration can occur as new entrants make their way to the market. A number of practical examples include the impact on regional gas markets of LNG from the Middle East and unconventional gas production in the US illustrates such a development. Collusion in the interregional gas market may be challenged by competitive fringe behaviour, including the development of unconventional gas and interregional gas development consortia, built up by private international energy firms. Either way, with the largest gas reserves in the world, Russia has enough critical mass to affect the interregional gas market in ways it sees fit, and is likely to play a leading role in whichever form of cooperation may arise and its potential failure. Because of the uneven and asymmetric development of the world's various regional and sub-regional gas markets, there is no single yardstick by which to measure maturity. In the very long-run, when the theoretical maximum capacity is reached in the market's development, competition increasingly shifts towards pricing, where players with large-scale and mature gas export infrastructures are best positioned to protect market shares.

The real-option game model's application and its outcomes demonstrate that, from a theoretical point of view, there is value to be derived from agreeing not to compete and to mutually postpone investments. In the long run, the GECF and the Gas Troika can act as platforms for a dialogue between gas-exporting countries to reach agreements on long-term supply calibration, and perhaps a more common approach to pricing. Within these organisations, Russia's role has yet to be determined. As will be sown in the next chapter, there is a delicate balance between choosing to compete, from a Russian perspective, and choosing to cooperate and postpone investments.

Chapter 11

The geopolitical boundary solutions to strategic collusion

11.1 Introduction

At the firm level, Gazprom can end up in different European gas market outcomes as a quasi-monopolist, a dominant or non-dominant firm, involving varying degrees of over- and under-supply. From an economic perspective, such scenarios may lead Russia to invest strategically or not. At the level of the Russian government, Gazprom's decisions are guided by factors which go beyond economic rationale when it comes to geopolitical forces. The case studies in Chapter 9, together with Chapter 10, pertain to the economic fundamentals of the problem; this chapter is designed to add another dimension to the real-option game and toolbox-based approach, namely the additional geo-strategic and geopolitical complexities that come into play because of Russia's position in the international political system and how it perceives that system.

As was explained in Chapter 3, shifting Russian perceptions of US intentions and actions in and around Russia's periphery in zero-sum terms influence Russia's course of action. An important question is whether Russia can truly wean itself off of its zero-sum view of the outside world and move towards one involving relative advantage and interdependence where both rivalry and cooperation exist. Developments described in Chapter 3 show that regionally, within the post-Soviet space, Russia perceives the world in zero-sum terms. However, with regard to gas-consuming, Russia faces its interdependence with other geo-strategic players (e.g., EU countries and the US), home to important gas export markets. Russia is also interdependent with other gas-exporting countries.

As was argued in Chapter 3, US geo-strategic ambitions are based on a drive to secure a diversification of gas flows in and away from the Eurasia gas ellipse. For Russia such a US ambition comes as a geo-economic threat, and if successful, the US could undermine Russia's ability to secure its gas interests both in the post-Soviet space (in terms of volumes for Russia's own needs) and in European gas markets (in terms of lost income). Ultimately this could have adverse consequences for Russia's economic security. The geopolitical dimension of gas flows can be appreciated by perceiving Eurasia as one vast chessboard in which the various geo-strategic players jostle for potential gas flows from the Euraisan gas ellipse.

Based on what we know from chapters 2 and 3, the US will counterbalance Russia geo-strategically in Eurasia. Russia's perception of the US as a geo-strategic competitor may induce Russia to compete geo-strategically with the US. The impact at the political level of Russia's strategic investments on market structures in European gas markets offers Russia a means to compete geo-economically and geopolitically with the US in the rimland. From an economic and geopolitical point of view, the option to compete with other gas-exporting countries may seem warranted, especially if Russia wants to compete with the US for influence in Europe. What then are the implications of the above for cooperation between gas-exporting countries? Russia faces an important dilemma: is it going to compete with other gas-exporting countries or not, given its geopolitical inclinations?

If avoiding gas market oversupply is an important motive for cooperation of some sort amongst gas-exporting countries, then the question remains: What form of cooperation is most desirable and feasible for Russia, given the nature of regional and interregional gas market(s)? The answer to this question should be held in the light of Russia's perceptions of the outside world. What form of horizontal energy diplomacy, so to speak, is then most suitable from a Russian point of view, given its position in and perception of the international political system?

11.2 Western challenges to Russia in the Eurasian gas ellipse[531]

Aiming to secure its position by influencing the emerging geo-strategic dimension to gas flows as a result of the changing international political system, the US seeks to create spheres of influence in Eurasia. It does so in order to prevent one single power or coalition of land powers from dominating the Eurasian continent. This is done either in the form of military and economic alliances or by establishing key regimes which are politically receptive to US policies in the rimland.

Before assessing the impact of Russia's perception of the international political system on its possible cooperation with other gas-exporting countries, we must acknowledge the geographical scale at which the West seeks to undermine Russia's position in the Eurasian gas sphere. From a realist and geopolitical perspective, the US will not sit by idly and allow Russia to strengthen its hand in Eurasia (by extension of what was discussed in Chapter 2).[532] A Russian ability to aggregate and/or guide gas flows in Eurasia, and the effect of Russia's pipelines on

[531] The term used here is 'Euro-Atlantic' in this context because today, there is not only a US drive to ensure Europe's gas supply diversity (also refer to Chapter 1), there is also an EU-level drive, in part encouraged by the US.

[532] As early as 1992, the US Defense Planning Guidance had as one of its main objectives the prevention of the re-emergence of a new rival to the US. The guidance went on to argue that in order to achieve this objective, the US would have to prevent any hostile power from dominating a region whose resources would be sufficient to generate global power [Clarke and Halper 2005].

geopolitical relationships between the US and its Eurasian allies, comes as an important challenge to US power in Eurasia. It upsets the balance of power in Eurasia: Russia would be able to gain control over concentrated economic-strategic resources in Eurasia and expand its geopolitical influence in the rimland (e.g., in Europe).

Recently, however, the Obama Administration appears to have softened its stance on Russian gas in Europe. Bressand [2010], for example, argues that "the Obama Administration's effort to 'reset' relations with Russia has reduced the divergences of views between key continental European countries and the US regarding the risks associated with dependence on Russian gas. Washington's all-out opposition to the Nord and South Stream pipelines has been replaced" by an effort "to engage Russia constructively," as stated by Richard Morningstar, the US Special Envoy for Eurasian Energy [Wall Street Journal Europe, 2009]. Be that is it may, the current geo-strategic posture of the US conveys that it seeks to directly control the rimland, especially the Eurasian 'middle ground'.[533] This region provides the main gateways[534] to central Eurasia (i.e., Central Asia and its surroundings) and is wedged between Eurasia's major powers, Europe, Russia, China and India. The US drive to diversify gas flows from the Eurasian gas ellipse and to curb the dependence of its European allies on Russian transit is a geo-strategic given for Russia, whatever its desired course of action. While Russia aims to increase its options (i.e., export routes for gas flows), the Euro-Atlantic community seeks to reduce Russia's and increase its own, with the US is an important driving force.

Gateways enable a diversification of gas flows from the Eurasian gas ellipse while also 'servicing' US allies in Europe with non-Russian gas, and breaking Russia's monopoly of influence in the region. The establishment of greater control over the transport of oil from the Persian Gulf region and the Eurasian middle ground, as well as EU and NATO expansion, provide the US with a firm foothold in the rimland.[535] The rimland can be used as a staging ground for a further diversification flows from the Eurasian gas ellipse.

There are two areas of interest for the US within the Eurasian gas ellipse: the Central Asia and Persian Gulf regions, which contain the vast bulk of conventional gas reserves in the ellipse outside Russia. In Central Asia, key to the US strategy in the resulting 'pipeline politics' has been drawing up pipeline routes through pro-US countries in the rimland and skirting the territory of possible or actual geo-strategic rivals such as Russia and Iran (e.g., the SCP and BTC pipelines), by using the aforementioned gateways. What began as the 'new great game'

[533] The Eurasian middle ground corresponds with a region inside the rimland lying between Europe, parts of the Middle East, Russia and East Asia, i.e., southern Central Eurasia, Iran, Iraq, Afghanistan and Pakistan.
[534] Gateways are discussed in Chapter 2.
[535] For any eventual US hegemony in Eurasia, the tying in of the Ukraine and the Caucasus countries is vital, being important pivots, both in terms of energy corridors and as areas for force projection [Brzezinski 1997].

during the 1990s,[536] i.e., a competition for access to oil and gas in the post-Soviet Caspian Sea region, has grown to become a geo-economic competition for gas flows from the Eurasian gas ellipse, refer to Map 11.1 below.

11.2.1 Gas flows from the Caspian Sea/Central Asia regions

The main geo-economic prize for the US in undermining Russia's economic security is Central Asia, specifically the Caspian Sea region (c.f., the heartland) upon which Russia relies for gas volumes (see Chapter 6). The region's central geographical position provides it with a unique capability to supply pipeline gas to Russia, Europe, Asia and the Middle East [IEA 2009b]. As was explained in Chapter 6, this region plays a pivotal role in Russia's gas supply portfolio. Since 2001 the region has been firmly fixed in a US-NATO effort to ensure a long-run Western presence in Central Asia [Zhiznin 2007]. US and NATO forces are likely to remain for the long-term to keep options open in this regard [OSCE 2006].

From Russia's perspective a US strategy aimed at diversifying gas flows from the Caspian Sea region can undermine Russia's economic security as 'diverted' gas flows, originating from Central Asia and the Caspian Sea would no longer flow to the Russian domestic market. The domestic gas market, as was mentioned in Chapter 3 is an important obligation for Gazprom because it is a political priority for Moscow, while in addition Central Asian gas flows allow Russia to export volumes to European gas markets. This in turn compels Russia to develop its domestic gas resources in Yamal, for example, an investment which is likely to also require exports to Europe and elsewhere by pipeline or LNG. Oversupply could again result because of the sheer size of volumes likely to be made available from investment in Yamal's resources. Hence gas flows in Eurasia are 'driven' as much by geo-economic forces as they are by geopolitical ones.

Traditionally Central Asia's energy holdings are restricted to Russia according to the US perspective, they could not exercise effective economic or foreign policy independence, and the US thus supports the independence of the Caspian Sea littoral states [Blank 2007]. With the advent of China in the region, this situation has changed. For the US (and the Euro-Atlantic community), equal access for western firms therefore relates strongly to the larger objective of safeguarding these states' independence, sovereignty and prospects for secure development. In the case of the Caspian Sea/Central Asia region, securing upstream access has no value unless viable alternative export routes are developed to transport gas flows. In the US view, control of

[536] The new great game involves a complex interplay between the Central Asian and Caspian Sea countries, neighbouring countries such as Iran, Turkey, Pakistan as well as extra-regional powers such as Russia, India, the EU, the US [Amineh 2003] and more recently, China. For more on the evolution of and details concerning the 'new great game' see Amineh [2003], Olcott [2006], CIEP [2004], Dekmejian and Simonian [2003] and Klevemann [2003], amongst others.

transport routes themselves is important to its own power base in Eurasia. US policy is thus geopolitically tainted rather than purely commercial.[537]

The Azerbaijan–Georgia–Turkey corridor, which was spearheaded by US ties with Azerbaijan, is the first exit corridor established by the US after the fall of the Soviet Union. Case study 1 in Chapter 9 touched upon the complexity of this case and the role of the US in facilitating this corridor. Brzezinski refers to Azerbaijan as "the cork in the bottle containing the riches of the Caspian Sea basin and Central Asia" [Brzezinski 1997, p. 47].[538] It became the centre of a wider post-1991 US campaign to secure oil and gas flows, which by-passed enemies such as Iran and would break Russia's standing monopoly on these flows [CIEP 2004].[539] Turkey, a NATO member, and Georgia, also both played a pivotal geo-economic role in facilitating the construction of the BTC and SCP pipelines.[540]

During the 1990s, the US became a strong proponent of the trans-Caspian gas pipeline, which would act as an extension of the trans-Caucasus pipelines into Central Asia [Dekmejian and Simonian 2003; Amineh 2003; CIEP 2004].[541] The US has been keen to persuade President Berdymukhamedov of the benefits of a gas pipeline to carry gas across the Caspian Sea to European markets [MEES 2007b].[542] In 2008, the US stressed the importance of diversifying Europe's gas imports because "Gazprom is rapidly gaining control of both the supplies and the transmission lines and they will soon encircle Europe," emphasising the importance of the

[537] The symbolic and political value of the corridors, transiting across countries in a region still bearing the marks of the Soviet era, outweigh the economic costs involved [OSCE 2006]. However, the US government has had to pressure IEFs to invest in pipelines they do not wish invest in, because of the costs and risks involved; the IEFs require a stable investment climate in order to achieve their commercial objectives and secure their investments [CIEP 2004].

[538] Indeed, Azerbaijan's location is important because the "independence of Central Asian states can be rendered nearly meaningless if Azerbaijan becomes subordinated to Moscow's control." Azerbaijan's own and very significant oil (and gas) resources can also be subjected to Russian control, once Azerbaijan's independence has been nullified," and Brzezinski goes on to note that, as far as Russian influence is concerned, "[a]n independent Azerbaijan, linked to Western markets by pipelines that do not pass through Russian-controlled territory, also becomes a major avenue of access from the advanced and energy-consuming economies to the energy rich Central Asian republics. Almost as much as in the case of Ukraine, the future of Azerbaijan and Central Asia is also crucial in defining what Russia might or might not become" [Brzezinski 1997, p. 47].

[539] Indeed, the driving force behind US policy in the region is anti-monopoly while the driving force behind Russian (and Chinese) policy is quintessentially monopolistic in nature [Mann 2006]. The objective of US policy-makers is not only to obtain oil and gas from Central Asia but also to control the flow to oil and gas markets in the West and in Southeast Asia [CIEP 2004].

[540] This corridor helps explain American enthusiasm for Azeri membership of NATO, which would further help embed Azerbaijan in a pro-US nexus in the Caucasus from Baku to Turkey, creating a solid transit link for the corridor itself and forestall the formation of a possible Russian-Iranian alliance or strengthening thereof, whether of an energy-related, economic or political nature [OSCE 2006].

[541] The legal status of the Caspian Sea, the broader geopolitical complexities of the region and Russo-Iranian cooperation as well as the role of Blue Stream (as was discussed in Case study 1 in Chapter 9) have all so far combined to impede any further progress on the trans-Caspian route.

[542] In 2007, the US was even willing to finance trans-Caspian feasibility study, following Russian moves to secure Azeri and Turkmen volumes earlier that year.

trans-Caspian option along with Nabucco as alternatives to South Stream [PIGR 2008j]. Tense relations between Azerbaijan and Turkmenistan over their shares of the Caspian Sea have also aided in stalling any discussion about the pipeline.[543] The trans-Caspian corridor, together with the trans-Caucasus corridor, could offer long-term prospects for increased European dependence on Caspian Sea/Central Asian gas and reduce European dependence on Russian gas [MEES 2008e].[544]

While the trans-Caspian gas corridor, starting with the SCP, offers one way out for Caspian gas, the TAPI pipeline offers another way, albeit speculative at this stage (also see Chapter 6). The TAPI has been back on the table since the Taliban's 'removal' from power in 2001, with the US keen to promote the TAPI pipeline as a means of enabling Central Asia to reduce its economic dependence on Russia. The pipeline is an alternative to the rival IPI project (see Chapter 6), as the US also seeks to isolate Iran [PIGR 2008i].[545] Iran (under a pro-US regime) and Afghanistan[546] offer interesting prospects for bringing oil and gas from the Caspian region to the Indian Ocean, and to potentially important US allies outside the NATO alliance such as Pakistan and India. The call among US policy-makers and military planners in 2009 for more US and NATO troops [Financial Times 2009g] supports the view that the US is determined to maintain its position in the region by supporting an important pro-US regime in Afghanistan.[547]

At stake for the US is an important foothold in between Central Asia (in the heartland) on the one hand, and Pakistan and India (in the rimland) on the other; a geo-strategically vital area of influence. For the US and its NATO allies, the perceived geo-strategic stake is high in the quest to maintain a long-term presence in the energy-rich Central Asian region (and within the Eurasian gas ellipse), where Afghanistan offers long-term prospects for a US presence on the crossroads between Central Asia, the Middle East and East Asia [Jalalzai 2003].

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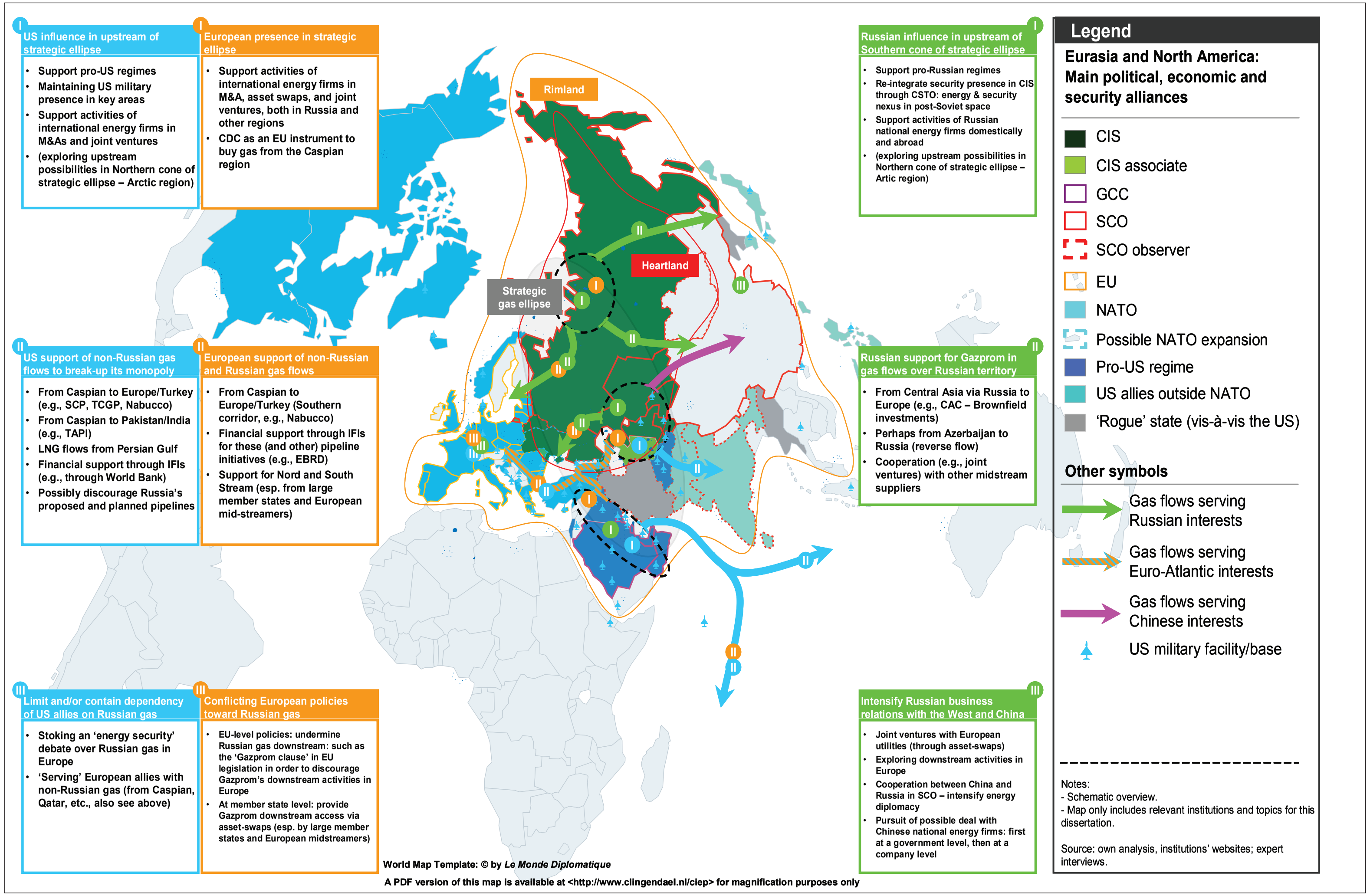
[543] Azerbaijan and Turkmenistan enjoy improved relations as of late, particularly since the advent of Niyazov's successor in Turkmenistan [MEES 2008e].
[544] Resolving the legal status of the Caspian Sea would form a crucial, initial step in this process.
[545] The establishment of the Baku-Tbilisi-Ceyhan (BTC) pipeline and the South Caucasus Pipeline (SCP) bear witness to this strategy.
[546] An important potential geopolitical pivot for the Soviet Union, Afghanistan lies roughly placed on the imaginary border between the Heartland and the rimland, immediately to the South of the Soviet Union in the rimland. This provides Afghanistan with immense geo-strategic importance for any foreign power and has indeed has long been the site of geopolitical competition. The Soviet Union did not invade Afghanistan merely for an ideological cause; the geo-strategic stakes were high too. Remarkably, Yuri Andropov, Head of the KGB at the time of the Soviet incursion in Afghanistan, believed the US was planning to use Afghanistan and a pro-US Iran and Pakistan as part of broad new front against the Soviet Union in the south and to push into Central Asia from that region [Brzezinski 1997]. Conversely, the US believed the Soviet Union was bent on using Afghanistan as a platform for eventual domination of the Persian Gulf (in and of itself a weakening of American influence in the Rimland).
[547] While the battle to defeat the Taliban rages on for the US and its NATO allies, energy interests continue to play an important role in the background. The US has already established permanent bases in Afghanistan and many in US policy circles see US and NATO presence as permanent [Lutz 2006].

Map 11.1 Geopolitical spheres of influence, forces and gas flows



11.2.2 Gas flows from the Persian Gulf: Iraq and Qatar

For the US, the Persian Gulf region in general, and Qatar in particular, is an immense source of potential gas flows. By pipeline (e.g., Iraq) and LNG (e.g., Qatar) these two countries act as a potential counterweight to Russia's pipeline gas dominance of European gas market(s). In addition, flows from Iraq and the Persian Gulf to Europe could also help service other US allies in the rimland. The American on-the-ground military presence safely lodges Qatar in the US sphere of influence (which does not preclude Qatar from cooperating with other gas-exporting countries or companies). With the decreasing need in the US for LNG imports, there is less emphasis on maintaining energy security in the Gulf for LNG tanker traffic. Nevertheless, oil supply security, the potential geopolitical threat of Iran, and long-run interests in the Eurasian middle ground provide the US with sufficient reason to keep Qatar within its sphere of influence as a geo-strategic lynch-pin for US Central Command (CENTCOM).[548] Exxon Mobil's close partnership with QP certainly goes hand-in-hand with a strong US military presence in Qatar, protecting it from regional rivals such as Iran.

Despite post-2003 instability in Iraq, it is now in the US sphere of influence. With considerable Iraqi gas reserves, the playing field has been levelled for foreign investments (also see Chapter 7), notwithstanding difficult upstream conditions for the firms in question.[549] In 'rimland' terms, the 2003 Iraq war fits into the wider geo-strategic vision the US has of controlling the Persian Gulf region and securing the most important oil reserves for the long-run.[550] Besides the political developments in Iraq, geopolitical forces in the region at large should also be taken into account.[551] From a geo-economic point of view, Iraqi gas flows to Europe have become plausible since the removal of the Hussein regime in 2003. In the geo-economic competition for the Eurasian gas ellipse, this has tilted the playing field in favour of the Euro-Atlantic community in the long run.

[548] In the case of the Persian Gulf, transport is less of an issue since LNG is free of transit issues, though the Strait of Hormuz bedevils tanker traffic from the Gulf. Iran's position vis-à-vis the Hormuz Strait is one of the reasons why Iran forms an important bottleneck for US policy in the region and a major security threat.

[549] Iraq offers potential gas for Europe in the longer run, as Matthew Bryza explained: "the US, Turkey and government of Iraq have a trilateral working group […] that aims to lay the foundations for investment in Iraq's gas sector to get its [gas] production going and complement Azerbaijan's production for a project like Nabucco, or the Turkey-Greece-Italy pipeline" [AGC 2008b].

[550] For the US, Iraq and the possibilities for privatisation of some of the largest untapped oil reserves in the world, could also potentially undermine OPEC's ability to regulate the oil market In the long run [Boon von Ochssée 2006]. Regime change in Iraq became necessary in the US calculus for geo-strategic reasons as well, centring on concerns about preserving Israel's power base in the Middle East, securing access to oil reserves and flows and containing Iran's regional ambitions [Noreng 2006]. As former US president Carter notes: "[T]here are people in Washington […] who never intend to withdraw military forces from Iraq and they're looking for ten, 20, 50, years in the future […] the reason that we went into Iraq was to establish a permanent military base in the Gulf region, and I have never heard any of our leaders say that they would commit themselves to the Iraqi people that ten years from now there will be no military bases of the United States in Iraq" [CNN Larry King Live 2006].

[551] Consider the ability of Iran to affect Iraq's stability and sovereignty, as well as the geopolitical roles of neighbouring countries such as Saudi Arabia and Turkey with regard to Iraq.

11.2.3 The role of the EU and the European powers

During the 1990s it was the US which became an important geopolitical and geo-economic factor in Eurasia and, specifically, in the post-Soviet space. The expansion of the EU to include 27 member states in 2004, and a neighbourhood policy that now overlaps with Russia's near abroad policy, has already made the EU a new player in the post-Soviet space. Hence, alongside the US, the EU has become a more independent actor with soft but relatively few hard powers. EU-level initiatives, such as the 'Southern Corridor' and the CDC (see Case study 2, Chapter 9), which run parallel to US drives to create alternative gas flows from the Caspian Sea region to Europe as discussed above, bear witness to Europe's efforts to formulate an external gas strategy. The EU was hitherto mostly concerned with internal developments such as absorbing new member states (which the EU still struggles with today) and the development of an internal gas market. European views however have become more receptive to rhetoric about over-dependence on Russian gas and this catalysed a 'security' debate over the matter after the 2006 Russia-Ukraine gas row [Saunders 2008].[552]

The Southern corridor: Gas from both the Gulf and Caspian by pipeline to Europe

While the US advocates its own gas transport corridors, the EU also toys with import route diversification schemes, primarily embodied on paper by the so-called 'southern corridor' and the CDC. With EU expansion, and new possibilities for gas exploration and production in Iraq, the geo-economic significance of Iraq and the Caspian Sea increased. The so-called 'southern corridor' is the EU's latest pet project to tie in gas flows from Azerbaijan via the Caucasus (Shah Deniz, phase II), and from the Persian Gulf region. A vast arc of gas resources can thus be accessed by the EU, with the main conduit potentially being the Nabucco pipeline. So far this pipeline lacks a gas reserve base. Ideally, the Nabucco would bundle supplies from all these countries. While Nabucco has been on the drawing board for a number of years, the notion of Iraqi gas supplying Europe is new (as discussed above and in Case study 2, Chapter 9). Interconnections between Nabucco and the AGP are also on the drawing board. EU energy ambitions have come to lead a life of their own in spearheading the discussion over gas from the regions mentioned above, transcending US influence there.

11.3 Towards strategic and ad hoc collusion

From the section above, and given what we know about Russia's gas interests in the post-Soviet space and in Europe, it is clear that Russia faces a geo-strategic challenge from the US. In Russia's view, the US seeks to undermine Russia as a geopolitical power in Eurasia. The analysis carried out in chapters 8 through 10 point to the economic underpinnings of deciding whether or not to compete, in which Gazprom's perspective was taken. Various forms of coop-

[552] The US is also aware that it will not likely win broad support in Europe for a tougher line against Russia, especially as far as gas supply security is concerned [Saunders 2008].

eration between gas-exporting countries at a firm level and other related aspects were discussed in Chapter 10. Yet another leap is needed to arrive at the issue of whether or not Russia, at the government level, is willing to cooperate with other gas-exporting countries. This hinges on Russia's perception of the outside world.

11.3.1 Competition versus cooperation: Russia's ideas

Russia may ultimately proceed with investing strategically, and thus compete with gas-exporting countries at large, because of the following main points:

1) Scenarios in which Gazprom ends up with a greater market share and thus a greater income, in and of themselves enhance Russia's economic security. This security buttresses Russia's state coffers and enhances its relative advantage in the international political system. This is a particularly attractive option if Russia perceives the structure of the international political system in Hobbesian terms.
2) The resulting increased gas import-dependency of its European markets (as a result of the realisation of an aggressive investment policy), and the countries through which and to which its gas pipelines are laid (and the gas which flows through them), offer Russia further political currency with the relevant governments on the receiving end of the value chain. Positioning itself as aggregator of gas resources in Eurasia provides Russia with geopolitical strength vis-à-vis the US. Proceeding with its strategic investments along the entire gas value chain, including the mid-stream pipelines discussed in Chapter 9 may, in Russia's perception, strengthen its position as a geo-strategic player.

From a geo-economic perspective, the SSEE market is the most sensitive sub-regional European market for Russia, given the points above. It is imperative that Russia keeps out potential flows from Iraq, Iran and the Caspian Sea region, because the gas reserves of the ellipse could lead to important market share losses, particularly if transported by pipeline. As Case study 2 has demonstrated, the South Stream is endowed with a special geo-strategic, rather than only economic-strategic value by making such pipelines obsolete when built on time.

From competition to cooperation

The development of the interregional gas market and separate regional gas markets bear witness to the increasing interdependence of gas-exporting countries' export ambitions. As illustrated in Chapter 10, if other gas-exporting countries also decide to invest strategically, gas market oversupply can result. Rather than being strengthened, Russia's economic security would be weakened, as would its aspiration of resurrecting its position as a geopolitical player. Gas market oversupply could jeopardise Russia's domestic economic situation, which it has tried hard to stabilise during the 1990s. Russia may wish to gain a greater market share, but the threat to its economic security, because of the prospect of gas market oversupply, should compel it to seek cooperation with other gas-exporting countries if it wishes to protect its economic security.

Russia is dependent on gas markets (and other geo-strategic players) for gas export revenues. Additionally, Russia must take this world of interdependence into account. Chapter 3 illustrated that at a global level, Russia is aware of its interdependence with other geo-strategic players. The Russian energy diplomacy within the GECF and the Troika further highlight its preparedness to cooperate with other gas-exporting countries. Russia's identity as a great power will determine the shape and form such cooperation may take later on in time, as will be argued below. Because Russia increasingly perceives the world in terms of relative advantages, cooperation with other gas-exporting countries is an attractive option for Russia, both at the country and at the firm level.

11.3.2 Barriers to binding, open and explicit cooperation

If Russia chooses to cooperate because it successfully perceives and acknowledges its interdependence with other gas-exporting countries, then what shape is likely to be most suitable according to the Russian perspective? At face value, cooperation may seem desirable to avoid oversupplies. However, Russia may perceive formal, binding commitments to cooperate as an option that could undermine its policy independence [Finon 2007]. As Stern notes, the impetus Russia has given to the GECF and its joint foundation of the Troika with Iran and Qatar compels a reassessment of earlier dismissals of the GECF as an organisation lacking any substance [Stern 2009]. As discussed in Chapter 7, Russia has taken a more active role in the GECF and co-founded the Troika in the period 2006-2008. Ultimately, how these organisations will evolve and develop in the future, depends on how Russia behaves as a great power. The fact that Russia's is the biggest (conventional) gas reserve-holder in the world definitely plays an important role in this respect.

For Russia, cooperation with important gas-exporting countries in and outside the gas ellipse translates into political power because of Russia's ability to gain influence vis-à-vis the US in the rimland. Such cooperation also enhances Russia's bargaining position vis-à-vis the EU. The possibility of organising political cooperation and cohesion through common interest in a comparatively new dossier, i.e., in the sphere of an expanding but uncertain, interregional gas market, offers Russia additional international political clout. International, horizontal energy diplomacy may therefore prove to be expedient, as long as it does not affect Russia's sovereignty. A number of barriers to open and formal cooperation *à la* OPEC persist. Depending on gas market and political developments, cooperation in the interregional gas market may develop tacitly[553] or become more explicit. Below it is argued why, from a Russian perspective, cooperation is likely to remain ad hoc:

1) Cost of maintaining long-term binding commitments

From a theoretical point of view, lasting and formal collusive outcomes are notoriously unstable, especially because binding commitments are required (see Chapter 4). In the interregional gas market, very long-term commitments would be needed to sustain effective collusion *across all* regional and interregional projects [Finon 2007]. Parallel behaviour and tit-for-tat signalling also offer means to collude, short of full cartelisation. The geopolitical complexities involved, as discussed above, also make binding commitments difficult to achieve. In addition, if Russia were to play the role of a swing supplier in a more liquid European gas market, it would have to bear the significant costs inherent to being a balancing supplier just as Saudi Arabia does in the oil market.

2) Policy independence

A Russian desire to maintain its policy independence and its self-perception as a great power may incline it to refrain from full, formal cooperation (rather than merely as a regional, less comprehensive power such as Saudi Arabia as far as the world oil market is concerned) [Finon 2007]. Russian leaders prefer to adopt an independent energy policy without limiting their choices by joining a collective grouping [Bahgat 2009]. Russia's arm's length cooperation with OPEC (and, at times, its tendency to expand production when OPEC withholds volumes), as well as its refusal so far to join the oil cartel points to Russia's desire to steer an independent course [Nefte Compass 2009].[554] Consider how Russia has attended OPEC meetings as an observer, and informally attempted to influence deliberations, without actually being a member and without carrying the burden of being a swing supplier [Finon 2007]. Russia has also tried to strengthen its influence on OPEC's decision-making by promoting bilateral relationships with individual OPEC member states [Elass and Jaffe 2009].[555]

[553] As opposed to formal forms of cooperation such as OPEC., tacit collusion is more politically expedient and better suits the rather divergent nature of interests between the various gas-exporting countries, also refer to Chapter 4 for a definition of tacit collusion.

[554] It is worthy to note that during late 2009, Russia is reported to have exceeded oil production levels it agreed upon with OPEC amid a period of dampening oil prices in 2008-2009, with the structure of the Russian oil market also being an important factor to take into consideration (also see Chapter 3) [Gulf News 2009]. Besides, unlike many OPEC countries, which have only one NEF and thus have more direct and simple control over their oil sectors, Russia has two government-controlled National energy firms in its oil sector while the remainder is outside the control of the state. On other occasions as well, Russia preferred to act unilaterally in deciding upon oil production vis-à-vis OPEC, free riding on the back of efforts to restrain production by the oil cartel (e.g., in 1999 – 2000). Russia's behaviour with regard to OPEC in oil market is telling. This behaviour points to a Russian desire to act independently of what courses of action other oil and gas producing and exporting countries recourse to, notwithstanding the economic circumstances.

[555] Russia monitors OPEC specifically to prevent adverse impacts on its decisions on Russian crude exports and maintain price stability [Lee 2007].

From a historical point of view, OPEC agreements have only been truly successful from a supply point of view on a limited number of occasions [Van der Linde 1999]. The advantage of the Troika is that it includes very few members able to possibly influence the geography of the interregional gas market in the very long-run (beyond 2020-2030). With few very large (potential) players in the interregional gas market, it is easier to collude and make agreements on strategic investments than it is in cases involving a greater number of members in other oligopolistic settings. Even a slight increase in the number of players tends to vastly increase coordination difficulties and encourages cheating. Through pipeline-for-LNG swaps in the short run, and agreements of a more long-term nature (see Chapter 10), Russia and Qatar alone can have a considerable impact on the structure of the interregional gas market by calibrating their activities in Asia-Pacific region and Europe, leaving the US as a residual LNG market.[556]

Russia's self-perception as a great power that pursues its own goals and objectives independently of other countries goes hand-in-hand with its self-perception as the largest conventional gas reserve-holder. Possible cooperation with other gas-exporting countries fits into a wider framework for Russia, in which the power it derives from its position as a powerhouse in the gas world is can be used as a bargaining chip in other dossiers. Russia requires room in its policy-making in the gas sphere in order to have the freedom of manoeuvre to gain or make concessions on other matters of importance to its international standing.

3) Diverging interests of the top three gas reserve-holding countries

The membership of the GECF is large and therefore politically cumbersome [Jaffe and Soligo 2006]. This may point to a motive for Russia to set up the Troika: maintaining its ties in the sphere of potential cooperation with the limited number of the world's top gas reserve holders. In and of itself, this points to Russia's ostensible preference for tacit collusion. With such a small grouping, formal agreements are less necessary than is the case when many actors are involved. Whatever the shape and form of collusion that best suits the rigidity of the interregional gas market in the long run, with Russia as an important actor herein, relations between Russia and Iran[557] and between Russia and Qatar (i.e., within the Troika) are of crucial importance in the long run. Relations with Qatar may well be strongly influenced by that country's relationship with the US, thus possibly complicating or acting as barrier to Russia's scope for cooperation with this small sheikhdom.

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[556] After a meeting between Russian and Qatari gas delegations, Gazprom issued a statement saying it had discussed the 'high potential' for LNG deals with QP, as well as pipeline gas sales to Europe and Asia [WGI 2010d].

[557] Bilateral Russo-Iranian cooperation (also see Chapter 6) is more of a tactical nature than a form of long-term strategic congruence or a hard alliance [Amineh 2003]. It is difficult to establish whether Iran and Russia may act as rivals or partners on a permanent basis, they likely to remain loosely partnered. Given the geopolitical and geo-economic relationship of Russia and Iran alone, as well as their sway over Central Asia, a hotly contested region for involving 'pipeline politics' (also see below), cooperation between these two countries predisposes collusion in the interregional gas market to geopolitical as well as geo-economic forces.

Both countries' interests may diverge widely: Qatar's reserves are very high relative to its population size, and the need to maintain output to generate revenue is not as urgent as in Russia's case. In addition, Qatar's heavy reliance on LNG exports provides it with much more flexibility than Russia, which for now mostly relies on pipeline gas exports [Bahgat 2009]. For Russia, Iran may act either as a rival or as a potential partner, the line between cooperation and competition between Russia and Iran may prove to be very thin depending on market or geopolitical circumstances [Lee 2007] (also see Chapter 6). There is no guarantee both countries may not seek to compete for gas flows and markets in the future [Finon 2007]. Qatar also sees Iran as an important security threat to the Gulf at large as well as to itself, while both countries also still have to resolve issues concerning the shared North Field (i.e., South Pars for Iran). Further complicating matters are the many common interests that Qatar has with the US.

4) Dependence on gas earnings and security of demand

Russia remains as dependent on markets for it gas earnings as these remain on Russia for gas supplies. In dealing with the US and Europe as well as China, i.e., other great or emerging powers, Russia's tacit alignment with other gas-exporting countries may be more politically expedient than explicit and formal cooperation. Explicit, formal cooperation may constrain Russia's foreign policies on other dossiers. Russia is therefore not likely to engage in open cooperation with other gas-exporting countries at the expense of relations with European customers, who may perceive any ostensible attempts by Russia to collude 'against' consumers with apprehension. These consumers could pursue strategies which may undermine gas demand in Russia's gas export markets. In other words, security of gas demand is an important priority for Moscow.

5) Market division and long-term contracts

The carving up and division of markets through the establishment of long-term contracts, which lock in customers, suits gas industry dynamics and fit the nature of the gas trade, which does not require explicit or more formal collusion. The rise of new business models for LNG and pipeline gas challenges the solid underpinnings of these long-term contracts. A tacit agreement between Russia and Iran for the latter to supply Asian markets and stay out of the European gas market is a workable example of tacit market division, wherein the geographical location of suppliers and markets play a key role. Of course, as Case study 1 has shown, this is also the result of Russia's deterrence of Iranian gas flows to Turkey and beyond.

6) Gas market development and pricing

As has been argued in Chapter 10, overcapacities over time eventually translate into price competition. With the collapse in gas demand observed in 2008-2009, the LNG gas glut is placing extensive pressure on long-term oil-indexation [Stern 2009a]. In the long run development of the interregional gas market, and congruent with industrial organisation theory as far as the shift in competition in capacities to prices, issues such as pricing may well become more pressing in a steadily more global gas market. Here, some level of more formal collusion can be imagined, where Russia would require more formal commitments and binding agreements with other gas-exporting countries.[558] For the time being, Russia and other gas-exporting countries wish to stick to oil-indexation, regardless of the volumes of flexible supplies in the form of LNG and pipeline gas, which now exert downward pressure on oil-indexed contracts.

Towards strategic collusion

Given the barriers to open, explicit cooperation listed above, Russia's nature as a great power and the obvious need for some type of coordination mechanism to avoid oversupplies (also see Chapter 10), what form of cooperation does Russia prefer? Until the interregional gas market fully matures, which is a long-run prospect, Russia will prefer ad hoc collusion with other gas-exporting countries, relying on tacit bilateral agreements and coordination through the GECF and/or Troika. Such tacit collusion can occur on capacity schedules, by mutually postponing investments, or by sharing them. Russia may in some scenarios even desire to compete rather than cooperate. The previous chapter argued that a bandwidth of scenarios exists. The upshot is that Russia will not commit to formal and binding agreements à la OPEC, and yet binding agreements are key to a cartel's success if it is to survive, i.e., agreements must be stable. Russia will opt for so-called 'strategic collusion', which involves collusive behaviour or parallel behaviour on coordinating capacities, for example, falling short of outright cartelisation because it is not a permanent outcome.

11.3.3 Russia's integrated gas strategy in Eurasia

The geo-strategic underpinnings of the US presence in the rimland, and its geo-economic potential to affect gas flows from the Eurasian gas ellipse, call for a comprehensive integrated Russian gas strategy. A Russian strategy should be 'integrated' in the sense that Russia's foreign policy is to be integrated with and complementary to firm-level policies, i.e., at the level of its national champions. It lays beyond doubt that China's presence in the region is now also a 'fait accompli', and it too seeks to establish a long-run sphere of influence, particularly in Central Asia. Also of great importance is the potential of China (and other Asian economies) as both a market for Russian gas and as a rival geo-strategic player in the Eurasian gas ellipse that seeks to monopsonise gas flows from both the Central Asian and Persian Gulf regions. Russia is likely to use institutions such as the Shanghai Cooperation Organisation (SCO) and the

[558] Ironically, OPEC and other oil producing and exporting countries that also export gas can (see Map 8.1) can manipulate gas prices in long-term contracts by propping up oil prices (taking into account a time lag between oil prices and gas prices, however). Thus by effecting oil prices, the OPEC countries can indirectly influence gas prices in long-term contracts [Hallouche 2006], while according to Zhiznin [2007], OPEC countries wish to avoid over-exporting LNG in order to prevent a decrease in oil prices [Zhiznin 2007].

CSTO as a nexus of political and economic cooperation in the energy sphere vis-à-vis China, especially in Central Asia and perhaps beyond.[559]

11.4 Conclusion

From a Russian perspective, the US attempts to suffocate Russia's gas and other interests in Eurasia. This is Russia's heritage from the 1990s: a Hobbesian view of the world in which Russia is compelled to compete geo-strategically with the US. Strategic investments provide Russia with geopolitical power and are *geo-economic* tools that provide Russia with geopolitical currency in the rimland. However, the risk of regional gas market oversupply thus also arises.

Russia hence faces a dilemma: it seeks to defend its position in Eurasia, having to compete geo-strategically with the US yet must take into account its interdependence with geo-strategic players and other gas-exporting countries in a steadily more globalised world. In the former case, losses to the US are seen in zero-sum terms, particularly in the post-Soviet space when it comes to geopolitical influence as well as gas interests. In the latter case, room is made for economic and strategic cooperation with other gas-exporting countries because Russia does not necessarily perceive the world in zero-sum terms vis-à-vis the US. In this case, Russia desires to avoid the domestic economic instability resulting from considerable gas market oversupplies abroad.

Coordination is to be pursued between Russia and other gas-exporting is unlikely to resemble explicit OPEC-type collusion or cartelisation of the interregional gas market. Given Russia's self-perception as a great power and its geopolitical perception of the outside world, strategic collusion within the GECF or within the Troika or a combination of both is more likely. Such collusion is *strategic* in that it serves a certain purpose for Russia, but is never a permanent given for Russian policy, and is likely to hinge more on key bilateral relations with key gas-exporting countries. Moreover, Russia wishes to maintain room for manoeuvre in its policies outside the gas sphere, requiring it to keep its options open in its commitments to other gas-exporting countries.

Economically and strategically it may be beneficial for Russia to cooperate with other gas-exporting countries but its identity as a great power and its geopolitical aspirations prevent Russia from making any binding commitments. Even though it has taken greater interest in playing a leading role within the GECF in recent years, and is one of the drivers of the Gas Troika initiative, formal cooperation is unlikely to suit Russian interests, as Russia is a power

[559] Depending on geopolitical relations mainly between Russia, China and the US, the SCO could be used as a forum for Russia and China to defend their common Eurasian interests against the US. A Kissinger-style US foreign policy of playing off Russia against China could diminish the likelihood of such a partnership between these two Eurasian powers.

with the desire to maintain policy independence. In addition, the interests of gas-exporting countries differ widely: while Russia's preference for long-term contracts and oil-indexation encourage Russia to take an independent stance on issues such as pricing.

In the bid for the control of gas flows, the Eurasian gas ellipse will become a field of increased competition in the longer term, particularly if the US pursues its goal of servicing its European NATO (and other) allies. The struggle to influence the playing field in the Eurasian gas ellipse adds a geopolitical character to possible gas market coordination that neither standard cartel theory nor the real-option game model can capture. What is more, as discussed above, Russia's decision whether to compete or not with other gas-exporting countries hinges to a large extent on its perception of the international political system. The decision on Russia's part not to compete with other gas-exporting countries–and by extension successful collusion–is subject to *geopolitical*, rather than merely *economic* boundary solutions.

Chapter 12

Conclusion and discussion

First and foremost, this study dealt with the scope for Russia's cooperation with other gas-exporting countries, and how such cooperation can strengthen Russia's position as a geopolitical player. The first step in this study tackled the question as to whether Russia is still focussed on geopolitical power, or whether it wants to be part of a globalising economy and/or political order. The answer is: A bit of both. On the one hand, Russia's seeks to restore its place in the international political system and must, in its perception, defend its geopolitical and geo-economic interests. On the other hand, at a global level, Russia seeks to become an important player in international affairs, where it must take into account its own interdependence with other actors in the international political ssystem. Russia's ideas about that system and its structure are a key element in defining the boundary solutions for cooperation between Russia and other gas-exporting countries.

In that world, gas is swiftly becoming a more strategic commodity. At a state level, Russia's capability and willingness to collude (with other players in the interregional gas market) can ultimately translate into geopolitical power by securing its economic well-being. Russia's perception of its potential pipeline investments and how they can act as economic-strategic tools to safeguard Russia's position in European gas market(s) also matters. For Russia, the potential of gas as a conduit for the re-integration of political ties between Russia and countries in the post-Soviet space as well as in Europe proper, acts as a powerful driver for Russia's long-run power base in Eurasia. However, a zero-sum view of the world could incline Russia to compete geo-strategically with the US at a global level, possibly leading to adverse economic effects for Russia. It remains constrained by the interdependent nature of the international political system, and is duly aware of this fact.

Gas market oversupply could undermine Russia's economic security. Given the nature of Russia's identity as a great power, tacit and strategic collusion with other gas-exporting countries is more favourable than open and explicit cooperation in the form of OPEC because Russia wishes to avoid binding commitments. This can challenge US hegemony by affecting the Eurasian geopolitical make-up in Russia's favour. Its export position in Europe draws in the US as an important actor, in what is a complex geo-economic game to control and influence gas flows in Eurasia, in terms of both size and direction. Section 12.1 provides a summary and conclusions of this study. Section 12.2 includes a discussion and deals with recommendations for further research.

12.1 Summary and conclusions

The objective of the research objective was stated in Chapter 1 as being: "To identify, in light of Russia's position in the international political system, what shape and form of collusion with other gas-exporting countries is feasible for strengthening Russia as a geo-strategic player in the structure of the international system." From this research objective, four research questions have been derived. This section is organised into four sections, aiming to give answers to the four research questions posed in Chapter 1, in accordance with parts I through IV. Firstly, the concluding remarks on the positioning of Russia in a changing international political system and the role of gas herein are discussed. Secondly, Russia's overall position in the interregional gas market and the nature of other gas-exporting countries is summarised. Thirdly, Gazprom's investment policy and its relationship with Russia as a state are reviewed on the basis of the application of the model in the case studies. Finally, we review the scope and nature of cooperation in an interregional gas market from a Russian vantage point, taking into account the counter policies of the US as geo-strategic adversary.

12.1.1 Russia's perception of the international political system and the role of gas

Part I helped us understand the first research question in Chapter 1: In a globalising world with interdependent actors, does Russia seek to become a geo-strategic player in the structure of the international political system? What is Russia's perception of this structure and interdependence and how does this perception affect its dealings with the outside world?

Comparatively poor in reserves of oil (but certainly also an important producer thereof today), Russia has discovered a long-run source of economic security in natural gas. Russia realised that while oil revenues fill Russian state coffers in the short run, gas holds the potential to do so in the longer run. For Russia, the fact that gas is a resource it abundantly possesses, offers it ample potential for economic security and enhanced geopolitical power in a world where gas is increasingly a commodity of strategic significance. In gas and gas flows, Russia has found the means to re-integrate, through gas trade and the fixed nature of gas pipelines, its spheres of influence within its own strategic space. Gas, its development and export, can form the basis of Russia's geo-strategic power also because it can serve as an instrument of political integration with states, not only in the post-Soviet space but also in Europe proper. At the project level, Russia's gas pipeline investments can serve as tools hence not only of a geopolitical nature, by tying in countries into long-term dependency relationships, but also of a geo-economic one.

A newly emerging Russian gas strategy, combining domestic gas sector reforms with foreign policy and with commercial diplomacy through Gazprom, is coalescing around both internal and external priorities. Indeed, such an economic-strategic approach is common also in the other gas-producing and exporting countries. In order to maximise the value of its gas resources, Russia requires an integrated gas strategy, pertaining to the up-, mid- and downstream components of the gas value chain. This strategy has thus far consisted of 1) reforming and securing the stability of Russia's domestic gas sector; 2) securing access to Central Asian gas; 3) securing access to gas infrastructure in important transit countries and 4) securing access to existing and possibly new gas export markets. Given the role gas plays in its national interest, Russia's actions are likely to be more economic-strategic (and politico-strategic) rather than purely market-driven.

Particularly when it comes to gas and gas flows, Russia's perception of the world in geopolitical terms shapes its approach in using its gas resources and the gas industry, in the service largely of its national interest. Russia faces many challenges in its domestic gas market and the need to modernise its gas infrastructure. In light of the above, Russia has again become a geopolitical adversary for the West in the post-Soviet space. The realisation also that the US and its Western allies could undermine Russia's position in Central Asia, and therefore also the gas flows upon which it depends, drives Russia to assert itself in the region. Russia's approach to international politics is geopolitical in that it hinges on limiting and curtailing the reach of US influence in the post-Soviet space (i.e., within the heartland). This flows forth from a zero-sum perception of the world.

In a way, Wendt's view of immaterial forces and perceptions pertain to agents' desires and perceptions of the 'rules of the game' in the international political system. It was out of a desire to become a more active player in the international political system that Russia turned to gas as a source of relative economic advantage in an increasingly multi-polar world. The changed perception of the rules of the game and of energy resources as enablers helped shaped Russia's course(s) of action. With its role as an important potential gas supplier to China and Europe, Russia ensures not its own economic security, but empowers Russia vis-à-vis other great powers at large.

The Russian leadership nevertheless remains mindful of the need to diversify and modernise the Russian economy, amongst other issues. Russia is aware that it lives in an interdependent world, where it cannot act as a 'loose Hobbesian cannon', but must seek a less confrontational approach. At a global level, Russia's perception of the structure of the international political system ultimately feeds into its course of action within the international gas market. The world is changing, its great powers becoming more interdependent, and in this changing world Russia remains vulnerable with its over-dependence on energy export earning. Aware of this changing international political context and the importance of relative advantages, Russia is bent on modernisation and must take into account the impact on its gas export markets of other exports from other gas-exporting countries.

12.1.2 Russia's position in the interregional gas market

Part II assisted us in answering the second research question Chapter 1: If gas is to play an important role in Russia's post-Cold War ambitions, how is the gas market evolving and where, at the company level, i.e., Gazprom, does Russia stand? Which are the most important gas-exporting countries in a dynamic interregional gas market? What platforms for cooperation (already) exist in the interregional gas market?

Russia's gas strategy is translated from an economic- and politico-strategic dimension to investment policy and strategy at the firm level, where Gazprm acts as an agent of its principal, the Russian government. Gazprom's emerging export strategy illustrates how Russia is shifting from a captive, regional European setting to a more global one, as it plans to diversify its pipeline gas exports (to Asia and within Europe) and enters the LNG markets with its own projects. Gazprom, which itself is experiencing an important transition at home and abroad, is in the midst of a rapidly changing and dynamic interregional gas market. This interregional gas market is changing in terms of both regional market structures and of gas pricing and trading. Regional, previously isolated gas markets now are becoming steadily more exposed to interregional flows where modes of trade are undergoing profound changes.

Long-term contracts remain predominant, but increased flexibility can be discerned, driven by new business models amongst other factors. The gas industry is thus experiencing a shift from a point-to-point form of trade in gas, with captive suppliers and buyers, to a more interregional, flexible form of trade. Short-term trade in LNG increasingly offers trade between multiple parties and markets. The quick expansion of LNG, during the 1990s and 2000s, has further interlinked and interconnected various regional markets, compelling their demand centres to compete with one another for interregional supplies. The gas market is still interregional and rigid rather than global and liquid.

Of the various regional gas markets, Europe is the most exposed to both pipeline and LNG flows and imports. Europe's gas import sources include gas supplies from Russia, Norway and Algeria, and it is expected that Europe will become sharply more import-dependent in the coming years. The US is less dependent on gas imports, provided mainly by pipeline gas from Canada and some LNG from other sources. Recently, unconventional gas production in the US seriously impacted prospects for further gas imports. Japan, Korea and Taiwan are net

LNG-importing countries, whereas emerging Asian countries such as China and India are only just becoming more import-dependent. On the gas trade and pricing side, European gas trade is based on long-term take-or-pay contracts, with indexation to oil and oil products, with some spot sales based on gas-to-gas competition mainly in the NWE market. US gas trade, by contrast, is mainly based on spot sales. Asian gas trade is based on long-term take-or-pay contracts, with indexation to oil and coal products, while some Asian buyers buy individual LNG spot cargoes. Together, the European and US markets form the basis for trade in the Atlantic Basin while the Asian markets, with Japan as the most important demand likewise forming the Pacific Basin. The former is characterised by shorter-term trade while the latter sees more long-term trade.

Long-term forecasts of gas demand in the world's most important regions are also prone to great uncertainties, due to various reasons. These uncertainties are related to the level of economic growth, government policies regarding the use of gas in its energy mix, the relative (oil and) gas price (volatility) development vis-à-vis its substitutes, CO_2 emission costs and CCS developments, and the development of different (price) regulatory regimes. Due to declining indigenous supplies in Europe, it is expected that European imports will grow. However, there are also scenarios that assume a decrease in European gas imports in the mid term, which illustrates the uncertainty prevailing in the market. In the coming decades, though uncertain, largely due to the development of unconventional gas, some additional LNG import may be required in the US. It is expected that gas imports will grow in Asia. However, in absolute terms Asian consumption is expected to remain relatively low, when comparing it to the US and European markets.

For the purpose of this study, those gas exporting countries that are destined to shape this interregional gas market can be separated roughly into two camps: the inner and the outer gas market integrators. The inner integrators consist of Russia and the Caspian Sea/Central Asian gas-exporting countries, namely Azerbaijan, Turkmenistan, Kazakhstan, Uzbekistan as well as Iran. All four post-Soviet countries pursue gas export market diversification opportunities even as they appear to leave to Russia the role of aggregator of gas flows on the Eurasian continent. In addition, the fact that they are landlocked leads them to continuously seek diversity in their exports to Asian markets as well as Europe. However, they remain strongly tied to Russia and are important in the latter's gas balance.

For Russia, Iran is of geo-economic significance within the Eurasian gas ellipse and plays an important role as a fellow *potential* gas exporting country. Russia and Iran also have a number of geopolitical interests with regard to one another. The post-Soviet countries, together with Russia, account for the bulk of interregional pipeline gas trade. The structure of the interregional gas market will continue to change as import-dependencies widen and as gas exporters such as Russia possibly expand pipeline gas exports to Asia even as its own LNG export plans materialise. The Russian pipeline gas export expansion plans are mirrored by significant increases in interregional LNG flows, mainly from the Persian Gulf, North and West Africa. The outer integrators see their greatest interregional gas market potential fulfilled by LNG exports, being countries with access to the open sea.

In the long run, Qatar and Russia are the most important integrators at an interregional level; with Qatar far and away in the lead as far as LNG exports to various regional gas markets are concerned. The discussions between Russia and Qatar on potential cross investments and gas trading highlight the awareness of both countries of each other's long-term roles in an interregional gas market. The partnership between these countries is likely to have significant long-term effects on the market structure of regional gas markets, particularly when shared investments and further the coordination of capacity expansion come into play. Meanwhile both Iran and Qatar have the potential to affect long-run market structures in various regional markets, with Qatar doing so through LNG through a multi-market export strategy and Iran by means of possible combination between LNG and pipeline gas exports. However, for the foreseeable future, Iran's gas export potential is likely to remain dormant.

For Gazprom, Europe still offers the most growth opportunities in the long run. In its traditional European market, Gazprom faces competition mainly from other pipeline suppliers: Norway, Algeria, and the Netherlands. These countries, except for the Netherlands, are expected to retain their market share and power. From Gazprom's perspective, these are significant partners in the European gas market. Other important players in the Atlantic Basin include Nigeria, Libya, the UAE, Yemen, Egypt and potentially in the long run, Iraq. Together with Qatar, some of these countries are bound to play an important role as liquid LNG hubs, midway between the Asian and Atlantic LNG markets. The Pacific region has seen the rising share of LNG exports from Australia, next to more traditional suppliers in the region such as Indonesia, Malaysia and Brunei.

Gas reserve concentration and market power are an indication of which countries have the most potential to affect market conditions in the long run. As for concentration in reserves and the market power of these key gas-exporting countries, some 70 percent of world's conventional gas reserves are located in the strategic gas ellipse, while three countries possess over half of the world's conventional gas reserves: Russia, Iran and Qatar. Market power can be measured at a regional and an interregional level. In the Atlantic basin, the most important LNG players in terms of market power are Algeria, Trinidad and Tobago and Nigeria. Qatar will play an increasingly important role in various regional gas markets, swiftly becoming an important interregional player, both in the Atlantic and Pacific LNG suppliers. Private international LNG players, the IEFs, are not to be underestimated: through vertically integrated value chains, technological know-how and expertise, these players engage in commercial trades potentially at the expense of the bigger government-driven national champions.

Currently, the GECF is the only platform with broad membership that draws most gas-exporting countries together within a single platform. Until 2006, little interest was shown in this organisation, and it was not taken seriously by either industry observers, or key gas-exporting countries such as Russia. Since then, the attention to the GECF has reached new levels. Russia, Qatar, Iran, Algeria and Venezuela appear to be the most active members, though Russia's interest has only been recent. In late 2008, Russia, Iran and Qatar formed the Gas Troika, a ruling body of three, where perhaps a number of key long-run decisions are decided upon tacitly. The GECF and the Gas Troika can hardly be referred to as attempts to cartelise the interregional gas market. The comparison between the GECF and OPEC is a layman's mistake. Nevertheless, potential for future cooperation between gas-exporting countries exists; it is merely the form and definition of such cooperation that differs from OPEC. Rather, it is shared gas production and export projects that take relations between the various gas-exporting countries a step further. An assessment of both regional and interregional gas market trends and the position of key gas-exporting countries aids in answering the overall research objective.

12.1.3 Gazprom's gas investment strategy and the Russian state

Part III contributed to answering the third research question in Chapter 1: Based on the empirical analysis of a number of case studies, what factors influence Gazprom's gas investments? What are some of the uncertainties and complexities Gazprom must deal with at the firm level?

Given demand uncertainty and possible actions taken by entrants, a firm may thus choose to invest early to pre-empt a potential competitor. However, a fundamental aspect of the real-option game approach is that the combination of interaction between downside demand risk and potential entry may, in various scenarios, warrant a wait-and-see approach, i.e., postponement of investment in gas transport infrastructure. As a result, the corresponding investment decisions involve a trade-off between the values of postponement and pre-commitment. In Chapter 8, we argued that the decision to invest in accordance with the aforementioned three levels of planning is, therefore, based on an overall NPV criterion that integrates the net strategic (game-theoretic) value and the flexibility (option) value. Based on these value components, we can distinguish between the value of having a strategic option to compete (strategic 'option-game' value) and foregoing this option to compete now (the value of the option to postpone strategically). These values collectively are an addition to the traditional direct (static) net present value, which is equal to the future expected cash flows from investing immediately.

At the project level, Gazprom can potentially affect the market structure to its advantage, if it invests in certain projects early on. In this manner, Nord and South Stream as well as–from a historical point of view–Blue Stream, act as expensive and lumpy options on future gas demand growth ahead of potential competitors. On the basis of the different case studies, an analysis was made of the various strategic investment decisions available to Gazprom, primarily as an incumbent in sub-regional European markets. For Gazprom, early commitments in the form of early gas infrastructure investments hence ensure access to its commodity position in its export markets. These infrastructural investments pertain primarily to growth opportunities, where additional room in the market is created due to, for example, rising demand or declining domestic production in various consuming markets. In so doing, these gas pipelines can also act as deterrents with regard to other potential gas suppliers or gas-exporting countries.

The application of the real-option game has shown that value can be derived from an increase in economies of scale in transport capacity for long-distance gas pipelines, which can act as a deterrent against possible entry. In the model, the economies of scale reduce unit costs in the long run (and in SRMC), i.e., the direct strategic value of the project. Due to the economies of scale of its pipelines and the corresponding value chains, Gazprom is in a strong position to deter a potential entrant's investment (i.e., the strategic reaction value). In the end, it can capture a relatively high market share and influence the market structure ex-post over a long period of time (i.e., the strategic pre-emption value). Conversely, postponing investment may prove to be just as attractive in the face of downside demand risk(s), for example. These elements together make up the real value of such investments, in addition to the actual static value. Regional gas market structures can thus be influenced by individual projects, which are particularly inherent to an industry characterised by an oligopolistic market structure, and a capital-intensive value chain.

The case studies began their analysis at a country- or project-level, moving on to a subregional, and then ultimately moving to a European regional level. On the basis of case-study 1, which pertained to Blue Stream, the pipeline acted as a deterrent with regard to potential gas flows from Iran and Turkmenistan. According to Case study 1, the project backfired both commercially as well as strategically, due in part to the pipeline's limited economies of scale and the pipeline's utilisation rate after its completion. As far as the real-option game model is concerned, the pipeline may well have had a greater direct and strategic value if its economies of scale had been higher (and thus its operating costs per unit would have been lower), combined with higher gas demand growth in Turkey. Despite the pipeline's commercial and strategic failure on the basis of the model's application, in reality it successfully deterred other potential gas suppliers as a result of its construction. In a way, Gazprom's economic-strategic behaviour manifested itself first with Blue Stream, affording it a dominant market share in the Turkish gas market.

The SSEE market and NWE markets were also dealt with in case studies 2 and 3, respectively, where the South and Nord Stream pipelines came into play. These sub-regional gas markets currently account for almost 85 percent of current aggregate European gas demand. Their expected import requirements are making these regions potential growth markets for Gazprom via both the existing Blue Stream, and the proposed South Stream for the SSEE market and Yamal-Europe, and the Nord Stream (which is planned and currently under construction) pipelines, respectively. From Gazprom's vantage point, the SSEE markets are exposed to potential competition from pipeline suppliers in North Africa and the Caspian region (especially Azerbaijan and Iran) as well as to more distant LNG suppliers. In the case of gas supplies from the Caspian Sea region, other factors of geopolitical nature come into play. In the case of Nord Stream, the future threat to Gazprom's position in NWE markets will come mainly from LNG supplies (especially Qatar and Nigeria), where it currently competes with indigenous (especially Dutch and British) and Norwegian pipeline supplies.

According to the model application's results, when Gazprom decides to build the South Stream pipeline early on, it results in a positive overall net project value, owing partially to larger economies of scale and large upward demand potential. Depending on the upward demand potential in NWE, the Nord Stream pipeline also has a deterrence effect on LNG flows for example. However, the project's overall value is negative according to the Case study 3. Additionally, the acceptance on the part of the investor of a lower required rate of return vastly aids in facilitating this strategic investment, and improves its overall net project value. The regional European case provides the rationale behind Gazprom's investments and the impact on market structure in the European gas market as a whole. Gazprom can use its pipelines to protect and/or expand market share by investing strategically early on. In turn, this recapitulation serves as a backdrop to a conceptual discussion on possible demand and supply scenarios involving extremes of either undersupply or oversupply. On a regional gas market level, Gazprom ends up either as a dominant or a non-dominant supplier. At sub-regional levels, in Europe, Gazprom can end up as quasi-monopolist.

The real-option game model is a stylised 'product' of industrial organisation theory, economic game theory, and financial theory concerning the valuation of investments. Because of the stylised nature of the model, a conceptual toolbox has also been introduced in Chapter 8 to accompany the model. The model's value lies in its exact application, whereas the toolbox is more conceptual. The model's added value lies in the quantitative underpinning of a more intuitive understanding of strategic investments. The toolbox is designed to bring in a number of other factors which are at play with regard to investments in gas infrastructure projects, such as organisational and financial feasibility issues regarding gas infrastructure investments and geopolitical factors. A joint application of the two broadens our insight into the phenomena under consideration.

In reality, Gazprom is backed by the Russian government and its efforts to secure a project's access to market through vertical energy diplomacy. Here political ties between Gazprom, Russian government officials and key (former) government officials in existing and potential consuming countries play a key role. This is part and parcel of Gazprom's strategic-economic approach, which is intertwined with the intereststs of its principal, the Russian government. Having said that, it may well be that Russia as a state pursues export policies and projects from within its geopolitical and geo-economic perception of the outside world. Particularly its perception of Europe as an important gas market, upon which it depends for important export revenues, also plays a role.

While the model's strength lies in its quantitative underpinning, a number of qualitative factors may thus also be at play. The pursuit of these projects' construction, and their impact on gas market structures, are in essence also linked to Russia's identity and self-perception as a geo-economic competitor for gas flows from the Caspian Sea region. This perception on Russia's part feeds into its investment strategy, potentially making it more proactive and aggressive than would be the case for rational economic agents. This is an example of a factor which the model cannot capture, of course. In fact, the economic analysis used in the case studies shows that there are economic and strategic rationales underpinning the projects in question. These projects can impact regional and sub-regional gas markets, serving as economic-strategic tools to enhance Russia's geopolitical clout. It is Russia's perception of the necessity to strengthen its geopolitical position that may feed into and affect economic decisions taken, as described in the case studies.

By extension, a strong geo-economic competitive position vis-à-vis other gas exporters, can ultimately be translated into geopolitical power. This process occurs through the impact on market structures in consuming countries of gas pipelines and flows. In addition, political relations with consuming countries are deepened with increased long-term gas import-dependency. Greater market share leads to greater economic security, we could say, and hence strengthens Russia as a great power. Indeed, this can be seen as an extension of geopolitical perceptions discussed in Chapter 3. Here, from a Russian perspective, greater market share is translated into geopolitical power. 'Strategic pipelines' are hence not just tools designed to capture market share, but also act as political integrators with import/consuming markets, more often than not located in countries with which Russia has important political ties. An integrated economic-strategic approach to Russia's and Gazprom's gas investment strategy helps us pursue the research objective.

12.1.4 The scope for cooperation between gas-exporting countries

Part IV helped us answer the fourth set of research questions in Chapter 1: Given Gazprom's and Russia's investment strategy, how and to what extent can collusion take place in an interregional gas market? How does Russia's perception of the international political system affect the desire for and feasibility of collusion or cartelisation? What geopolitical boundary solutions affect Russia's possible gas strategy?

If demand does not recover soon, competition between gas-exporting countries may ultimately lead to price erosion in the long run. Yet it is expected that the situation of plentiful supplies, or better said 'under demand', will continue for several years. The dynamic and interregional nature of the gas market is illustrated by the reduced projected need for LNG in the US and the knock-on effect on LNG flows to European gas markets it has had, which in turn have displaced traditional pipeline gas supplies in that market, albeit to a limited extent. In any case, the expected rise in demand and import-dependencies in the world's main regional markets during the coming decades will precipitate the need for comparatively greater interregional gas flows in the medium-term and beyond (from 2015 onwards).

For the foreseeable future, the minimum contracted amount of gas–or even less–will be provided through long-term oil-linked contracts, and there will be limited space for pipeline spot and LNG supplies and/or new long-term contracts, for the time being that is. Clearly, Russia's pipeline gas must increasingly compete with other gas flows, both in the form of pipeline gas and LNG. Indeed, gas-exporting countries have become increasingly interlocked and interdependent in their export strategies. Yet a prolonged period of oversupply could pressure gas producers into acting to support prices, one way or another. The question is how and in what form and whether Russia is willing to partake in or join some form of cooperation, i.e., is Russia willing 'to play ball' with other gas-exporting countries.

Swaps between intra-regionally flexible pipeline gas supplies and interregional LNG, and short-term optimisation by allocating gas volumes between regional gas markets, offer the best mechanism for cooperation in the short-term. A number of mechanisms for cooperation between gas-exporting countries are imaginable, depending on the level of gas market development in terms of dynamic market theory. Shutting in short-run production on a scale similar in scope and nature to the one OPEC employs to manage its supply to the world oil market, is currently both technically and economically unfeasible. However, gas flows accountable for short-term volumes traded on various spot markets could be limited or trimmed to a limited extent.

When the model and its application come into play in the line of reasoning taken above, it is the resulting postponement value that expresses the *economic* boundary solutions for cooperation, which is essentially derived from conceptual market outcomes. Mutually agreeing to postpone investments either tacitly (through parallel behaviour) or openly (through formal forums such as GECF) is a form of collusion, in the sense that investments could be coordinated (coordination games). In the longer run, shared investments aimed at avoiding interregional price competition with regard to gas-to-gas prices could add further salience to such collusion. These shared investments are centred on the Atlantic Basin and European gas markets, where the price uncertainty and share of flexible gas supplies are greatest. This also reflects the membership of the GECF.

So from the point of view of these different market outcomes, cooperative outcomes may result if the players involved manage to avoid making strategic investments. Supposing cooperation is possible, colluding gas-exporting countries still face competition in different ways from other sources of gas, i.e., a competitive fringe. The much acclaimed revolution in unconventional gas production, primarily in the US, has helped foster the impression that this type of market behaviour is possible. However, colluding gas-exporting countries also face competition from IEFs, which have better control over the gas value chain (for now) and access to advanced gas exploration and production technologies. What is more, gas-exporting countries could always become each other's competitors. For example, as a relative newcomer or entrant in various regional gas markets, Qatar appears not to act as a team player, even competing for market share. Other gas-exporting countries may act just as much as rivals as private energy firms in both volume- and price-based competition in a dynamic interregional gas market. The market structure of the interregional gas market will be determined by the complex interplay between players with mature gas infrastructures versus those which are still expanding their export capacities amidst both volume and price games via contractual renegotiations and gas-to-gas markets.

The laying of strategic pipelines could ultimately provide Russia with the means to engage in price competition as the industry matures through lower, short-run marginal cost. Russia's willingness to do so depends on whether it acts as a profit or an income maximiser, that is better able to bear the cost of strategic investments (in contrast to private international energy companies). In essence, from a Russian perspective, Gazprom could become an important swing supplier to markets with great liquidity and flexibility, primarily through intra-regional (pipeline) gas volumes by pipeline, in various sub-regional gas markets. Much depends on how Russia desires to position itself when gas demand recovers in Europe and elsewhere. Herein, gas infrastructures are key elements, as the case studies have shown. The investments associated with these infrastructures fundamentally affect the market structure of regional gas markets.

From a Russian vantage point, the GECF and Troika act as potential platforms for further coordination between important gas suppliers. Direct bilateral relations between Russia and other oil and gas-producing countries play an part in such energy diplomacy. Security platforms such as the SCO and the CSTO offer Russia the means to re-integrate relations in Eurasia, hand-in-hand with energy interests. The Troika has the advantage of a small number of members, which include the top three reserve-holders of conventional natural gas. Within this group, Russia and Qatar have the greatest ability to affect the interregional gas market's structure in the medium-term, beyond 2015. For Russia, Qatar–and to a lesser extent–Iran, will be key players in determining the long-run balance of the interregional gas market, i.e., a balance between inner and outer integrators. Cooperation between few, very large countries within the Troika offer Russia the possibility of deciding upon the most important pipeline and LNG flows together with Iran and Qatar by tacit means. Russia's cooperation with Central Asian (consider Russia's inclusion of these countries into its own Commonwealth of Independent States (CIS) frameworks) countries differs fundamentally from its behaviour with regard to Iran and Qatar, as well as other gas exporters (consider the GECF). Explicit and formal cooperation is likely to face a number of obstacles, including differing interests between the various key gas exporting countries, pricing issues (oil versus spot indexation) and Russia's desire to maintain its policy independence (as its abstention from membership of OPEC illustrates). Russia is likely to prefer ad hoc, tacit or 'strategic' collusion to open, formal and binding commitments, making any form of formal collusion involving binding agreements redundant.

In the end though, how Russia positions itself in this interregional gas market will hinge on geopolitical factors. A greater gas market share in Europe and other regional markets can provide Russia with geopolitical power as well as economic security. In addition, it would provide Russia with the means to compete directly with the US in Eurasia as a geo-strategic player. While Russia could pursue its pipeline investments as instruments to secure greater market share, with the aim of enhancing its geopolitical power (by altering regional and sub-regional market structures to its advantage), this type of behaviour may also lead to the gas market oversupply currently observed in gas markets. After all, other gas-exporting countries may behave similarly for want of greater gas market share.

Given the discussion above, if it is to successfully maximise the long-run value of its gas resources, and thus ultimately ensure and buttress Russia's geopolitical power, Russia must also take into account other potential gas flows in its gas markets. If Russia's view is driven by an awareness of its interdependence with these actors, where rivalry and cooperation can co-exist, and where energy diplomacy is a key element, Russia's collusion with other gas-exporting countries can be successful. In other words, if Russia successfully balances the idea of being a geo-strategic competitor to the US with the realisation that its economic security is at stake, then Russia will lean towards a view involving relative–rather than absolute–advantages. The geo-economic tug of war over gas flows from the Eurasian gas ellipse is in that sense a game of relative advantage where each geo-strategic player seeks to reduce the options available to its adversary. Russia will seek a more calibrated investment strategy in which coordination with other gas-exporting countries is possible. If Russia decides to compete, because it perceives its geopolitical position in Eurasia as more important than its stable coordination with other gas-exporting countries, than all formal and informal coordination is useless. In other words, Russia's perception of the international political system and its ideas, as well as its identity as a great power, directly influences the likelihood, shape and form of cooperation between itself and other gas-exporting countries. Thus Russia's geopolitical perception and ideas act as the *political* boundary solutions to such cooperation between gas-exporting countries.

In trying to address the last research question, and therefore to pursue the research objective, we can conclude that Russia's cooperation with other gas-exporting countries can be explained to a largely extent by means of an economic-strategic approach, lodged in a geopolitical framework. However, the theoretical toolbox is an insufficient explanatory tool when it comes to in identifying and evaluating Russia's cooperation with other gas-exporting countries, because of its limitations. Although, the conceptual toolbox tries to fill gap between theories and the practical application, further research is required, such as games involving prices and other dynamics, in order to understand factors which influence Russia's scope for cooperation with other gas-exporting countries (see also 12.2.2 for further research).

12.2 Discussion and future research

This section evaluates and positions the findings, which are yielded from the underlying research objective. The objective also serves as a way to contribute to the decision-making process of policy- and strategy-makers in respect to cooperation between gas-exporting countries from a Russian perspective, and its implications for Europe. Therefore, a number of recommendations are made. Given the limitations of this study, various recommendations for future research are provided.

12.2.1 Discussion and recommendations

The discussion about the shape, form and nature of cooperation between gas-exporting countries has been a vividly debated one throughout the industry, academic circles and amongst policy-makers. What we contribute to the general discussion is an illustration behind the reasoning towards and underpinning of greater cooperation between gas-exporting countries in an interregional gas market. Russia's investment strategy, characterised by an economic-strategic approach, can have a long-lasting impact on the structure of the interregional gas market. The impact of geopolitical factors must also be taken into account, and hence an exclusively economic approach to this topic is inadequate. The impact of investments on geopolitical relations and vice versa cannot be captured by any single model and cannot be quantified.

In a dominant strand of the literature within the field of political science, gas infrastructural investments are largely rationalised from a political point of view, whereas economic reasons are given less attention. In the dominant strand of the economic literature, stylised models are applied in order to understand investment strategies of actors in the gas market. However, these models are inherently limited in analysing real-world cases because of their assumptions and abstractions from real-world behaviour of actors involved. Our results tell a different story. The model helps to explain the economic-strategic value of gas infrastructures, which transcends the commercial value as far as deterring entry and the option value are concerned. In addition, our qualitative tools offer a reality check on the model's results. Functioning as a prism through which to perceive the economic-strategic behaviour of key actors involved, the model acts as a bridge between purely economic reasoning and the geopolitical dimension involved. The model's results demonstrate the uncertainties which gas-exporting countries face in an increasingly interregional gas market, and how geopolitical factors can influence decision-making.

The application of the conceptual and real-option game framework have yielded a number of recommendations to Russian strategy-makers regarding Russia's positioning with respect to other gas exporting countries. Moreover, lessons can be learned of this study for European policy- and strategy-makers.

1) **Recommendations regarding Russia's position with respect to other gas-exporting countries:**

a. *The real-option game model and real-world restrictions:* The real-option game cannot account for the geopolitical forces which invariably affect gas infrastructure investments. Also, the model cannot account for the complexities of the interregional gas market. Nevertheless, the economic and financial crisis of 2008-2009 highlights the need for greater long-term coordination between gas suppliers. If Russian policy-makers aim to develop an approach to domestic gas investments, they must take into account similar decisions in other gas-exporting countries. If at the firm and state levels decision-makers decide to apply a stylised model for real-world strategic investments, they should embed this model in a conceptual framework, which covers other internal and external investment indicators.

They must also take into account the geopolitical complexities pertaining to some important gas-exporting countries. The development of new business models and market circumstances in the interregional gas market calls for a reassessment of the limitations of strategic investments, in order to avoid an excessively risky financial exposure and organisational difficulties, both in the midstream and upstream section (especially in the case of a buyer's market). In order to manage such risks and financial exposure, a firm-level stylistic approach to major gas investments should be accompanied by state-level political commitments to other gas-exporting countries.

b. *Factors influencing the level of formality of cooperation:* Cooperation between gas-exporting countries is not a topic to be seen in a vacuum. It is a topic that is strongly interwoven with various developments. The form and nature of cooperation between gas-exporting countries depends on Russia's and Gazprom's choice of business models, which go hand-in-hand with political commitments to other gas-exporting countries and companies (as discussed above) on the one hand, and to gas-consuming countries on the other. The liberalisation and de-integration of European gas markets during the 1990s and 2000s has driven actors in the gas markets towards new business strategies. For Gazprom, the role of mid-streamers and off-takers is as important as potential relations with fellow gas-exporting countries. Such factors will undoubtedly influence the institutionalisation and level of formality of cooperation between gas-exporting countries. The uncertainties borne of liberalisation in European gas markets have encouraged greater discussion amongst gas-exporting countries. Shared capacity investments along the gas value chain are one way in which gas-exporting countries try to regulate uncertainties and supplies in the long run.

2) Implications for European policy-makers:

While security of supply and affordable supplies is a European priority from a consumer's perspective, export earnings (i.e., security of demand) are important to the economic security of gas-exporting countries. European gas market policy-makers should be aware of such interests. The ongoing liberalisation of European gas markets, and the accompanying regulatory uncertainties, is encouraging greater cooperation between gas-exporting countries. The 2008-2009 international financial and economic crisis has arguably further underlined the importance of further discussion amongst gas-exporting countries in making investments that affect regional and sub-regional gas market structures. European policy-makers must balance what they see as the political impact of a large market share for Russia in Europe against security of supply concerns. On the one hand, a greater gas market share in Europe for Russia, on the back of successful energy diplomacy between European governments and companies, can greatly enhance Europe's gas security of stable and affordable supplies. On the other, from a competition point of view, such a large share in the European gas market for Russia could have adverse political and regulatory ramifications.

The financial and economic crisis of 2008/2009 has shown that sudden demand-side shocks can also create significant oversupplies. In a seller's market scenario, a successful energy policy depends on obtaining competitive supplies from outside Europe, i.e., a focus on external policy of the EU and its member-states. Europe must find a delicate balance between avoiding an overbearing Russian dominance in European gas markets and securing enough gas supply. Encouraging EU-level policies that induce competition could backfire and lead to more coordination between gas-exporting countries. And if gas-exporting countries postpone investments because of growing demand-side risks, by colluding for example, then security of gas supply is jeopardised. Ultimately, creating the lure of greater market share by ensuring long-term security of demand may incline gas-exporting countries to lean towards strategic competition, leading to a regional and interregional gas balance and avoiding undersupply. Consumers and policy-makers should remain mindful of the fact that the crisis and its impact on gas demand may now steer gas-exporting countries toward greater cooperation in the long-term. If it desires to avoid such an outcome, European policy-makers must develop a more successful integrated energy policy.

12.2.2 Future research

Further research with regard to interregional gas market developments is certainly desirable from an academic perspective. While some of the research questions in Chapter 1 cover many aspects of such developments, a great deal can be done in order to more adequately understand the underlying complexities. It also appeared that some problems, that have emerged when addressing research questions, should require further research. Therefore, we have the following recommendations for future research:

1) **Volume-based modifications of the real-option game model:** As mentioned in Section 9.4, the application of the real-option game model to gas infrastructural investments has shown some clear limitations. For example, the model is limited to only two players and the dynamics in the model is restricted to a two-stage game. In addition, both players are fully informed about their dominant strategies and cost information, i.e., there is no

asymmetric information involved. The incumbent makes an investment decision on the basis of information it fully possesses. It is a dynamic game with complete information, relatively simple in game-theoretic terms. The basic structure of Smit and Trigeorgis' [2004] real-option game model, that combines valuation of strategic moves with market structure outcomes, could be expanded to take into account more complexities. Multi-stage games involving more than two players, with incomplete information about each other's cost functions and strategies, and involving more than two sub-games, could be combined with Smit and Trigeorgis' [2004] valuation approach.

2) **Interregional price dimension and shared investments:** Just as in many other industries, gas firms must develop strategies in anticipation of market developments that are dynamic. That firms compete in the first instance on the basis of capacities, or volumes, before way is given to price competition coincides with a widely held view in industrial organisation. Given the research objective, this study focuses primarily on capacity expansions. The stylised and conceptual components of the approach developed in Chapter 8 cannot possibly account for the complexities of the interregional gas market, complexities which pertain largely to price and trade developments. In light of evolution of the different regional gas markets, further research, for example by employing a Bertrand price framework, may offer additional insights, i.e., where both price and volume games are considered. In the context of price competition, further quantitative research is desirable with regard to shared investments between gas-exporting countries in order to mitigate price competition. The strategic impact of shared investments on interregional LNG market is an enticing topic for research on long-run gas market developments (research on price competition is also interesting in light of the current gas demand crunch).

3) **Russia's geopolitical relations with other key gas-exporting countries:** Only Russia's geopolitical interests regarding Iran were briefly covered in Chapter 6. In Chapter 11 it was suggested that diverging interests between gas-exporting countries can impact the likelihood and shape of cooperation between gas-exporting countries. Russia's bilateral relations with other key gas-exporting countries have been left out of the equation in this study. Of course, such relations can greatly impact state-level and project-level horizontal energy diplomacy. They can therefore greatly impact interregional gas market developments in the long run. Geopolitical and economic relations between Russia and various gas-exporting countries and between other gas-exporting countries are elements which merit more in-depth academic investigation.

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This study deals with the boundary solutions to gas supply coordination between gas-exporting countries from a Russian perspective in light of the post-Cold War geopolitical context.

Russia is seeking to redefine its place in an ever-changing international political system. Its vast gas resources, and their profitable development, could serve to strengthen Russia's position in that system while income from gas export earnings could enhance Russia's economic security. For both Russia and its state-controlled Gazprom the stream and possible expansion of income from gas exports are economically vital. Together with Gazprom, Russia must take into account demand uncertainty and competition from other gas-exporting countries in an increasingly interregional and dynamic gas market.

As the industry matures, gas-exporting countries could avoid price competition through (informal) coordination as far as capacity expansions are concerned, for example. The Gas Exporting Countries Forum (GECF) offers Russia a possible platform for such coordination. However, Russia also desires to preserve an independent course for its gas exports strategy. Investments in gas infrastructures potentially act as important instruments for securing and expanding Gazprom's market share in growing markets. In light of demand uncertainties and potential competition, a 'real-option game' model is applied to explain why Gazprom continuously tries to strike a balance between cooperation and competition with other gas-exporters.

Whether-and in what form-gas supply coordination may arise depends on Russia's geopolitical perception of a dominant position in the European gas market, which hinges in part on the post-Cold War geopolitical context in which the great powers vie for a position on the Eurasian continent. The boundary solutions to cooperation between Russia and other gas-exporting countries are therefore also subject to geopolitical forces.

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