Global Energy Issues and the United Nations

Challenges for the UN CSD meetings in 2007 and beyond

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List of abbreviations

AFREC	African Energy Commission
b/d	barrels of oil (product) per day (1 barrel = 159 litres)
Bcf	Billion cubic feet
Bcm	Billion cubic metres
BtL	Biomass to Liquids
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
CIEP	Clingendael International Energy Programme
CO_2	Carbon dioxide
CSD	United Nations Commission on Sustainable Development (also: UN-CSD)
CtL	Coal to Liquids
DIS	Deferred Investment Scenario
E4D	Energy for Development conference, organised by the Netherlands in 2004
ECT	Energy Charter Treaty
EDI	Energy Development Index
EIA	Energy Information Administration
ETS	Emissions Trading Scheme
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GtL	Gas to Liquids
HDI	Human Development Indicator
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IEF	International Energy Forum
IEFS	International Energy Forum Secretariat
IBRD	International Bank for Reconstruction and Development
IMF	International Monetary Fund
IOC	International Oil Company
JI	Joint Implementation
JODI	Joint Oil Data Initiative
LNG	Liquefied Natural Gas
Mb	Million barrels
Mb/d	Million barrels per day
MDG	United Nations Millennium Development Goals
MENA	Middle East and North Africa
Mt	Millions of (metric) tonnes
Mtoe	Million tonnes of oil equivalent
NGO	Non-Governmental Organisation
NIMBY	Not In My Back Yard
NOC	National Oil Company
OAPEC	Organization of Arab Petroleum Exporting Countries
OLADE	Latin American Energy Organisation
OECD	Organization for Economic Cooperation and Development
OPEC	Organization of the Petroleum Exporting Countries
PPM	Parts Per Million
PV	Photovoltaic
RS	Reference Scenario
Tcf	Trillion cubic feet
UAE	United Arab Emirates

UK	United Kingdom of Great Britain and Northern Ireland
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UN Energy	United Nations Interdepartmental Agency concerning energy issues
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US	United States of America
USD	United States Dollar
WB	World Bank
WAPS	World Alternative Policy Scenario
WEC	World Energy Council
WEO	World Energy Outlook
WTO	World Trade Organization
WWII	Second World War

1

Introduction

The United Nations Commission on Sustainable Development (UN-CSD) regularly convenes to discuss progress in issues concerning worldwide sustainable development. The CSD works with two-year agenda cycles, focusing each time on specific topics. For the conference cycle in 2006 and 2007, which involves the 14th and 15th sessions of the UN-CSD, the theme of 'Energy' is scheduled, together with 'Industrial Development', 'Air Pollution' and 'Climate Change'.

This report provides some key background information on global energy issues and lessons that can be learnt from energy policy in the Netherlands. It is based on input that CIEP was asked to give to the Dutch government in its preparatory process for UN-CSD 14. The report covers wider material as well, being also relevant for the more decisive process in UN-CSD 15 and future processes. It also takes into account some developments that have occurred since UN-CSD 15. Six issues are treated in separate chapters, covering:

1. Global Energy Issues;
2. Country-specific and Regional Energy Issues;
3. Global and Regional Energy Forums;
4. Energy Sources and Technological Development;
5. Energy Policy in the Netherlands; and
6. Energy Transition Policy in the Netherlands.

In selecting and approaching these issues, a balance was sought between the global, macro dimensions of energy policy and the regional and national, meso ones. The global context of energy policies and the relations with environmental and economic development issues are addressed. In addition, it is recognised that large differences exist at the regional level, especially with regard to energy resources. On the national level, Dutch energy policy developments over the past 30 or so years have seen a number of experiences that we believe might be interesting for other nations as well, especially in the developing world.

Before the issues are discussed in some detail, we summarise our main findings, together with some conclusions and recommendations, in Chapter 2. Global energy issues and their relations to the issues of both climate change and economic development will remain on many international agendas for a long time. Some of the ideas discussed in this paper could be useful to those who are preparing these international agendas, be they of a multilateral, regional or bilateral nature.

2

Main Findings

In Chapters 3 through 8, we discuss the energy issues that we consider relevant to the UN Conferences on Sustainable Development organised in 2006 and 2007, which address the theme of 'global energy'. The chapters were originally written as papers for the Dutch delegations visiting both UN conferences, but are relevant to all professionals interested in global energy issues. Our findings are summarised in this chapter.

2.1. On global energy issues

For an insight into global energy issues, it is important to address not only the perspective of energy-consuming countries (like the countries in the European Union), but also that of energy-producing countries (those countries with large fossil fuel reserves). This leads to the following observations regarding global energy issues:

- In producing countries – apart from the overall energy policy goals of affordable, clean and reliable energy supply – security of demand (whether the reserves can, in the long run, continue to be exported and economic rents be obtained) and proper use of the revenues earned play a role in national policies. Contrary to general belief, high oil prices can be disadvantageous to producing countries. High prices often lead to more income than the economy of a producing country can absorb. Also, the reactions of consuming countries to high oil prices after the past oil crises (diversifying supply and increasing energy efficiency) has resulted in years of economic stagnation and recession in many oil-producing countries. Necessary investments in exploration infrastructure have been postponed, and per capita income dropped throughout the eighties and nineties. Hence, stable, long-term relationships are advantageous to producers as much as to consumers.

- Despite efforts to reduce global dependency on fossil fuels, it is clear that even in optimistic scenarios regarding the transition to a low-carbon energy sector, fossil fuels will continue to play an important role in at least the decades to come. Stable relationships between large energy-producing and -consuming countries are therefore all the more necessary, in order to assure a well-functioning global energy sector that can provide benefits to producers as well as to consumers.

- As energy demand is still predicted to rise in the future, the global liberalisation process of energy markets is accompanied by countries' increasing political interest in gaining access to remaining fossil fuel reserves. Globally, politics come into play more intensely, as access to energy resources is often considered a vital interest of a country. It should also be realised that for markets to function properly, stable regulatory regimes are needed. The latter cannot always be guaranteed in developing countries that are producers of energy. Market liberalisation is therefore not a process that is equally beneficial to all countries worldwide, or that can be exported easily without adaptions to the specific circumstances of each country.

- The present international system is characterised by two orientations. One, represented in particular by the United States as a rule-setter, and the European Union as a rule-follower, concentrates on economic efficiency. The other orientation, represented in particular by China and Russia, focuses on the national interest promotion. In the changing geopolitical landscape, the legitimacy of the

hegemony of the US, along with its message of markets, democracy and freedom, is eroding. To what extent this will affect the geopolitical landscape and therefore the relationships between producing and consuming countries is still uncertain.

- Policies to mitigate climate change will play a role in the future global energy sector. These will have important consequences for fossil fuel producing countries as well as for consuming countries. Presently, two international approaches to reducing carbon emissions are applied: one involving quantitative and binding emission targets, and another focusing in particular on non-binding technology cooperation. It has yet to be seen if one of the two approaches will prevail, or if they will coexist on a global level.

- Another aspect that will affect future energy relations between producing and consuming countries is poverty. A large part of the human population still does not have access to modern energy sources. Providing this access is essential to reducing poverty worldwide, but will increase pressure on remaining reserves and on mitigation of climate change.

- National and international energy politics will have to take into account all of these issues in ensuring a balanced development of the global energy sector in the future. Without doubt, this will present an enormous challenge to governments, multilateral forums and institutions alike.

2.2. On Country-specific and regional issues

It is appropriate to look more specifically at a number of key countries and regions. Key players are the United States, the European Union, Japan, China and Persian Gulf countries. Important rising powers are India and Brazil. Furthermore, net importing developing countries and net exporting developing countries play a role in the global energy sector.

- The *United States* has been the only superpower since the demise of the Soviet Union in 1989. Presently, its main energy policy concern is to reduce its large import dependency, particularly regarding petroleum. Climate change policies so far have been pursued through non-binding international technology agreements.

- The *European Union* is still not a unitary actor on the global stage. Rather, its member states speak with different voices regarding many issues, including energy. These different perspectives of member states hamper formulation of a common energy security strategy. Regarding climate change, however, the EU has succeeded in setting up an EU-wide emissions trading system with binding emissions obligations. The 2007 energy package and the further debate on its implementation provide a new opportunity for the EU to focus and redefine its global policies in this field.

- Due to its traditionally high import dependency, *Japan* has developed far-reaching policies in energy efficiency and supplier- and fuel diversification. Its reliance on the United States regarding strategic geopolitical interests limit Japan's room to manoeuvre regarding energy imports, even more so as Japanese-Russian relations are strained due to territorial conflicts. So far, Japan has played an important role in Asian energy cooperation dialogues, but whether these will be successful depends very much on the roles the other partners in these talks will take.

- *China* is a rising power in economic, political and energy terms. The effects of the rapid economic growth in China are already felt in the global energy market. As economic and welfare growth are predicted to continue, China's need for imported fuels will only increase. The country is inclined to use its political power to secure this need for energy, including establishing good relationships with many developing countries that are energy producers.

- National security is also a cornerstone of *Russian* energy policy. As the world's largest energy-exporting country, it is also the prime energy supplier of the European Union. Stable energy

relationships with the EU are therefore as important to Russia as to the EU, since energy exports are the largest source of foreign currency for the Russian economy. Despite the fact that Russia has signed the Kyoto protocol, due to heavily subsidised domestic energy consumption there are not many incentives for energy efficiency in the Russian economy.

- The largest oil and gas reserves worldwide are concentrated in the *Persian Gulf countries*. Since present production is below their overall share in global reserves, the importance of the Persian Gulf countries for future energy production is only expected to rise. Because oil and gas revenues are by far the most important source of income in the region, there is a direct link between the developments in the global oil price and the social and economic situations of these countries. This makes them potentially politically vulnerable.

- *India* is the fifth largest energy consumer worldwide. With increasing population and welfare, as well as limited domestic reserves, the demand for imported oil and gas is expected to rise in future. Regarding its energy interests, India seems to be somewhat worried about Chinese energy actions and so far has sought cooperation with the United States so as to avoid being solely dependent on China.

- In line with overall developments in South America, *Brazil* is pursuing more pro-active economic and energy policies, now that a new left-wing president has come to power. With its unique ethanol production programme, Brazil is likely to become a more important player, since biomass-based fuels are now acknowledged to be an alternative to oil by the large energy consumers, the United States and the European Union.

- *Net importing developing countries* are struggling to provide their populations with access to modern energy, particularly to electricity networks. In the absence of adequate regulatory regimes, setting up a reliable energy sector in these countries proves to be difficult.

- *Net exporting developing countries* have problems with providing access to energy that are similar to those of importing developing countries. Although export of energy sources provides them with a source of income, usually these revenues are available to only a small elite. The unequal division of income within these countries often is a source of social unrest. This phenomenon has been coined the 'resource curse' of developing countries.

2.3. On global and regional energy forums

There are various multilateral forums in which energy is discussed. However, membership and issues vary widely. There is no overall forum in which all global energy issues are elaborated on in an integral way.

A distinction can be made between five different kinds of multilateral forums: global & universal, specific & universal, global & limited, specific & limited and regional. The global & universal forums discuss overall energy issues and allow for universal membership. An example is the UN-CSD conference. Specific & universal forums also allow for universal membership, but only discuss specific energy issues, such as nuclear energy. The IAEA is an example of an agency in this category. Global & limited forums, such as the G8+5, also discuss energy issues integrally, but have a limited membership. Specific & limited forums like the OPEC or IEA represent particular consumer or producer interests. Regional forums discuss energy issues integrally, but have only a regional scope.

In a separate overview in Chapter 5, the various categories and forums are further identified. On the basis of this analysis, some reflections are made:

- With the possible exception of the G8+5, there is no global platform to discuss energy in its wider context, including climate and development issues. It could be useful to explore the set-up of such a platform, if the UN-CSD framework could facilitate these discussions under appropriate

conditions. However, it might not be efficient to duplicate work done elsewhere, either in specialised universal forums or in non-universal ones.

- If such opportunities are worth pursuing, it would be useful – and perhaps even necessary – to broaden governmental representation to include energy, financial and foreign policy experts.

- As there is no global mechanism for monitoring the discussions on global energy issues in their wider context, it might be useful to consider one, without interfering in the mandates of existing frameworks.

- In exploring options for these mechanisms, one possibility is to provide some overall strategic goals in the form of a 'road map' for addressing wider energy issues. Such a road map could include agendas for work in other organisations than the UN-CSD and a mechanism for intergovernmental review and assessment.

- If such a road map is considered to be worth exploring, it could also be appropriate to consider using the UN-CSD framework as a mechanism for intergovernmental review and assessment. Other alternatives for such a mechanism are also conceivable, within or outside the UN framework.

- Concentrating on more specific UN-CSD tasks in wider energy issues, new tasks could be explored. These might include carrying out specific actions to help individual countries with the formulation and/or implementation of their national policy; or introducing help desk functions for the purpose of giving advice to developing countries about best practice arrangements in the process of building energy policy capacities and related institutional frameworks; or initiating specialised energy policy squads for short term assignments, and short-term energy policy "fire brigades" for times of unforeseen severe energy supply interruptions.

2.4. On technology and sources of energy

Various sources of energy and technology are reviewed. For each energy source, it is discussed as to what extent technological developments contribute to better achieving the energy policy objectives of "security", "reliability" and "affordability" of supply. It is also argued in this paper that a transfer of technologies to developing countries is not a straightforward question. Rather, for each country and specific situation, tailor-made solutions are necessary that respect existing social and cultural situations.

- Regarding *fossil fuels*, further development of carbon capture and storage techniques might contribute to a cleaner use of these energy sources in the future. This holds true in particular for their stationary application in electric power plants and industry. In the transport sector, new end-use technologies in cars are expected to contribute to a reduction in the use of fossil fuels. New and "unconventional" reserves of fossil fuels are increasingly becoming available due to technological developments. For gas and coal, their technological conversion into liquids will play an important role in the future energy sector.

- In *nuclear energy*, a fourth generation of power plants is presently in the research stage, the aim being to design this new generation of nuclear power plants in such a way that the highest standards regarding safety, proliferation, and waste management are met.

- *Biomass* technology developments are expected to lead to the transition from a first generation of "food crop" biomass to a second generation of "wood-based" biomass. This would substantially increase the potential of this renewable energy source. Technological developments are also envisaged to encourage efficiency gains as well as cost reductions in *wind* and *solar energy*

applications. The technology of *hydro* energy is generally considered to be ripe, with no major breakthroughs expected in conventional hydro energy expected. However, tidal and wave hydro energy are potentially interesting technologies that are still in the research stage.

2.5. On lessons from the Netherlands' energy policy

Four interesting areas of Dutch energy policy are examined in more detail: the organisation of gas supply, energy efficiency, public-private deals for development of renewable energy, and an integrated approach to energy policy.

- One of the most outstanding features of the Dutch energy sector is the role played by the large gas field in Slochteren. This field was discovered in the 1950s, and has since then determined the features of the domestic energy sector to such an extent that the Netherlands is often characterised as a "gas country". In the paper, drivers of the quite successful exploitation and development of gas in the Netherlands are explored. It is argued that a combination of geology, geography and policy contribute to this success. After the discovery of the large gas field, a market needed to be developed. For this reason, Dutch households were gradually connected to a nationwide gas network. Part of the reserves were sold abroad. The economic choices made for exploitation (public-private cooperation and coupling gas prices to oil price developments) proved to be very fruitful.

- Energy efficiency in the Netherlands is based on voluntary commitments, the so-called 'covenants'. This system has resulted in relatively high efficiency improvements for many years. It was able to develop in the Netherlands due to a generally consensus-based society, a hierarchically organised business sector and overall harmonious relations between business and government.

- In 2005, two quite exceptional deals were made, furthering the development of renewable as well as non-renewable energy sources in the Netherlands. For many years, exploitation of gas fields in the northern *Waddenzee* (Frisian tidal flats) had been impossible due to perceived environmental dangers. In 2005 an overall agreement was obtained with all parties involved, making gas exploitation possible under severe environmental restrictions. In another agreement signed in 2005, parties settled to allow the Netherlands' only nuclear power plant (near the town of Borssele) to continue operation until 2033. Both deals included the reservation of a large budget for renewable energy development in the Netherlands.

2.6. On lessons from Dutch energy transition policy

In the year 2000, the Netherlands set up an 'energy transition' policy, to stimulate the country's long-term transition to a low-carbon economy. Specific features of this policy are its long-term focus, its institutionalisation of public-private cooperation and the involvement of several ministries via a dedicated interdepartmental project team. Six public-private 'platforms' have been created to stimulate those themes that appear most promising for an energy transition in the Netherlands and that also complement the expertise of Dutch business. These are: "new gas" & clean fossil fuels, green resources & feedstocks, sustainable mobility, efficient energy chains, sustainable electricity, and energy efficiency in buildings.

Tangible results of the energy transition – in terms of improvements in energy efficiency, increased application of renewable energy sources and cleaner use of fossil fuels – have not yet been realised. Nevertheless, it is already possible to formulate some advantages and risks of this policy. Advantages lie particularly in the broad support that can be obtained by involving all relevant stakeholders and in the refusal to pick 'winners' – which in hindsight might be good to stimulate, so as to prevent too high societal costs. Risks are that consensus-building slows down action. Neither is it always clear if business or government has to take the lead when it comes to action. Whereas government based on a philosophy of a 'market-based' approach would like to leave the initiative to business, companies are not always inclined to act if governmental backing is perceived to be insufficient.

2.7. Conclusions and recommendations

In the six chapters to follow, we have tried to address worldwide energy matters from different perspectives: producers-consumers, key individual countries, multilateral forums, technological developments and experiences from the Netherlands. Together with the questions raised at the end of each paper, we hope they provide an integral picture of issues that are of essence in the discussion about a stable future global energy sector.

To summarise, some of the most important conclusions and recommendations that arise from our analysis are:

- Stable long-term relationships are advantageous to energy-producing as well as energy-consuming countries. For this to be achieved, it is important to realise the dependence of many producing countries on revenues from their natural resources of fossil fuels. A world-wide agreement on reduced use of fossil fuels would therefore probably need to include compensation mechanisms for producing countries. Technology transfer might be an option here. However, tailor-made solutions are necessary for this purpose, respecting existing social and cultural situations.

- Liberalisation of energy markets is a process that only works well within stable regulatory regimes. Liberalisation models applied, for instance, in the EU, therefore do not necessarily work well in developing countries. Rather, the creation of regulatory regimes – the precondition for liberalisation in developing countries – should be promoted. Market liberalisation might also conflict with the presently developing geopolitical situation, in which several players try to defend their national energy interests by way of political advances. Liberalisation of the energy sector, as for instance presently undertaken in the European Union, should therefore be carefully balanced with external security of supply politics.

- The structure of the global future energy sector will be strongly influenced by climate change mitigation policies. Presently, there are two global orientations towards these policies: one in which quantitative emission reduction targets and trading of emission permits play an important role, and another that is based on voluntary technology agreements. The former is advocated particularly by the European Union, whereas the latter is promoted by the United States. For a harmonious development towards a low-carbon global energy sector, it deserves attention to examine the extent to which the two approaches can be combined.

- Any stable arrangement for a future global energy sector should take into account all those that are presently deprived of access to modern energy sources. Mechanisms for providing access should be discussed integrally, taking into account the context of climate change, liberalisation, security of supply concerns, and incomes of energy-producing countries. Presently, there is no multilateral forum where such an integral discussion about energy issues takes place. The UN-CSD framework, among others, could be considered as a place for enhancing and/or monitoring the various discussions.

- The experiences in the Dutch energy sector might be interesting to other countries as well. Public-private arrangements in gas exploitation, in voluntary energy efficiency agreements and in stimulating development of renewable energy sources are examples of successful policy practices that could be applied elsewhere. The Dutch way of creating consensus in society about the transition to a low-carbon energy sector might also be interesting for other countries to study. However, it should be remembered that a straightforward transfer of Dutch practices to other countries is not possible.

3

Global energy issues

Energy is one of the key inputs in the economy of every country; for developed countries in maintaining current levels of economic welfare, and for developing countries in pursuing economic take-off. This chapter discusses the most important areas of energy policy from a consumer country's perspective (security of supply, environment, and market/price) and from that of a producer country (emphasising security of demand). It continues by discussing different scenarios of future energy demand. There are, however, many uncertainties in these scenarios. Four themes can be identified that will be of importance in determining the look of the energy future: the role of energy markets and the government, geopolitics, climate change and poverty reduction. All four will be discussed. The chapter ends with a short conclusion.

3.1. Energy policy from a consumer country's perspective: pillars of energy policy

A consumer country's energy policy can be analysed in terms of three main pillars: security of energy supply, market and price efficiency, and the environment. These pillars can be seen as the main goals of a consumer country's energy policy. Each consumer country must find a balance in pursuing all three policy goals at the same time; in other words, pursuing a secure energy supply at reasonable prices that is least harmful to the environment. Figure 3.1 illustrates the tension field that exists between the three pillars.[1]

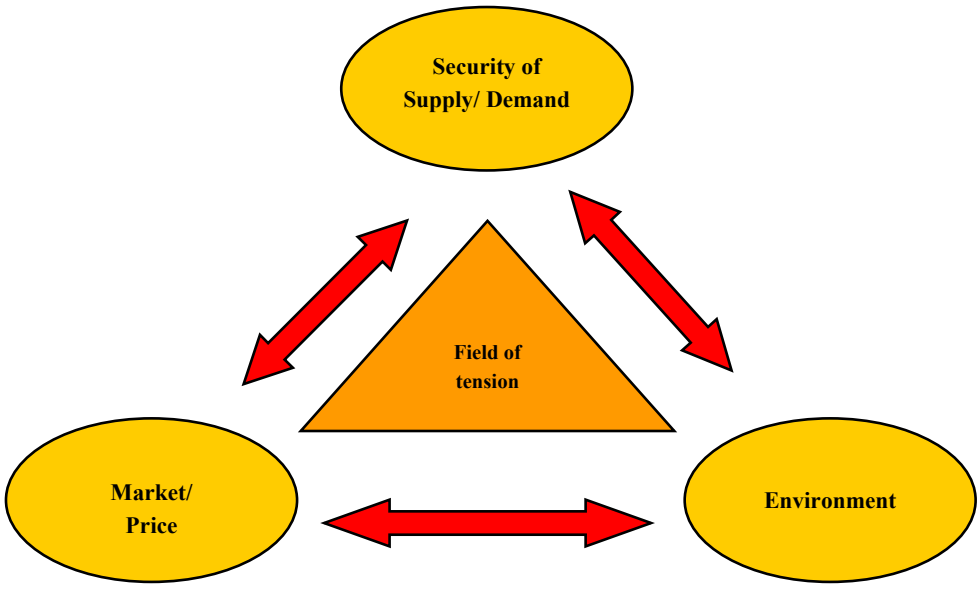

Figure 3.1: The three pillars of a consumer country's energy policy

[1] Energy policy in the Netherlands and other developed countries was initially concerned with one or two of the pillars, and the focus changed over time. In the 1970s, focus was on energy security. In the eighties the attention was on the environment, and during the nineties cost efficiency was central to energy policy. In the past few years, security of supply has become more dominant again. Geopolitical developments and events such as the 2006 Ukraine-Russia gas crisis should, however, not lead to renewed exclusive focus on security of supply.

A continuing debate among energy experts is the effect of high energy prices on economic growth.[2] The two oil crises were both followed by recessions. Large sums of money flowed from oil-importing to oil-exporting countries. Higher energy prices affected all kinds of products, leading to high inflation and high unemployment. As a reaction, oil intensity in the global economy has declined considerably, especially because of policies within OECD countries. For example, the role of oil as a fuel for power generation has become very small. However, direct and indirect links between the oil price and the price of natural gas have led to higher energy prices in general. The International Energy Agency calculated in 2004 that a rise of US$10 in the price of a barrel of crude oil means the loss of roughly 0.5% economic growth in developed countries. Developing economies are relatively more oil-intensive, so predicted loss in economic growth rates are higher; for example, the same price increase equals a loss in India of 3%.[3]

Despite predictions, the global economy has shown growth since the beginning of the rise in oil prices in 2003. The high prices have less effect now than in the seventies. This might be explained by the lower oil intensity of the economy. It must also be noted that the current prices are, in relative terms, not the highest ever. Calculated in dollars of today, the prices at the beginning of the 1980s were over $80, while the recent prices hover between $70 and $75. Although the macroeconomic consequences of higher energy prices are less severe, vulnerable groups in every society around the globe face difficult times due to higher energy bills. Governments of both developing and developed countries have responded with policies to weaken the impact of higher energy prices in the overall spending picture. This is understandable socially and politically speaking; environmentally – for example, in trying to reduce energy consumption – it is another story.

An aspect often forgotten when discussing energy prices is the elaborate tax system most developed countries have on energy consumption. In the years from 1996 to 2000, the G7 earned an estimated total of $1.3 trillion in oil taxes, while the OPEC earned a total of $850 billion in oil revenues during the same period. The struggle between consumer and producer countries has not only been a struggle of control of, and access to, energy resources, but also a struggle for economic rents. The call by Western governments for higher OPEC production during price increases, and angry comments by politicians in the media accusing OPEC countries of being responsible for high prices, therefore constitutes only one side of the story. It should also be noted that if the transition to more sustainable energy sources really takes off, the current energy taxes will need to be replaced, in order to compensate for losses of tax revenues. This could, however, create undesirable signals and effects towards energy conservation.

3.2. Energy policy from a producer country's perspective

The three policy goals described in section 3.1 are also important for countries that are net-exporters of energy. For these countries – usually developing or transition economies for which revenues from the export of fossil fuels represent a large share of the national income – two additional aspects should be taken into account:

- Security of demand, and
- Proper use of the revenues earned.

The first oil crisis was caused by geopolitical tension in which several members of the Organisation of Arab Petroleum Exporting Countries (OAPEC) did not shy away from using oil as a weapon. The second oil crisis had political instability in Iran at its base, and the subsequent war between Iraq and Iran

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[2] See: Bohdi, D.R. and M.A. Toman, *The economics of energy security*, Boston/ Dordrecht/ London, Kluwer Academic Publishers, 1996, pp. 48 and further, and the references therein.

[3] IEA, *Analysis of the Impact of High Oil Prices on the Global Economy*, Paris, OECD/IEA, May 2004, http://www.iea.org/textbase/papers/2004/high_oil_prices.pdf. In 2005 Claude Mandill, Executive Director of the IEA, released a statement that high oil prices hurt the economy, and he quoted President Bush who called it "a foreign tax on the American dream". Mandil, C., *Statement on High Oil Prices*, Paris, OECD/IEA, 29 June 2005, http://www,iea.org/textbase/papers/ 2005/Mandil.pdf.

prolonged the volatility of the oil market. In the short run, the sharp rise of the oil price brought economic growth and welfare to producer countries; in the long run it proved to be disastrous. Western countries responded to the oil crisis by implementing energy-savings policies, reducing the oil dependency of their economies, and, on top of that, reducing oil imports from those countries that were considered to be political liabilities. In general, too great a dependency on any one source was thought to be undesirable from a security of supply point of view. Global oil demand actually decreased from 1981 to roughly 1985. In 2001, the EU's oil demand was still considerably lower than in 1978; 581 million tonnes and 643 million tonnes, respectively. OPEC's share in the EU's crude oil supply decreased during the same time period from roughly 80% to 40%.[4] Consequently, all large oil producers experienced years of economic stagnation and recession. The per capita income dropped throughout the eighties and nineties, a trend further strengthened by high birth rates. The social and political problems arising from this economic downturn are visible today, and only the recent high oil prices have altered the situation to some extent.

As a result, producing countries realised that they need long-term security of demand to be able to provide their population with economic welfare. The recognised mutual dependency of consumer and producer countries is at the heart of the current dialogue between consumers and producers (for example, between organisations such as IEA and OPEC) and, on a multilateral level, in the International Energy Forum.[5] But the relationships are under pressure. The oil market became very tight in 2004 and 2005 as a result of strong demand increases in China and the US. Demand is very near oil production capacity. The principal market situation can be explained economically. Political unrest in numerous producing countries causes, or threatens to cause, small but important disruptions in supply, making the oil market highly volatile and prices high. High prices can fuel political unrest in producer countries, due to increased struggles to divide economic rents within a country and unequal distribution of the revenues earned, possibly leading to violent conflict that also targets the oil industry.

The market can become balanced in the future by either managing demand or managing supply. Ironically, by trying to do both, the current situation can persist for a couple of years. By calling for energy savings from either an energy security perspective or for environmental reasons, the EU and the US cannot guarantee demand for the oil for which investments need to be made now. Since future demand developments from India and China are not transparent and both countries have expressed a desire to become less dependent on imported oil, there is little to no incentive for producing countries to make large investments and increase production. The memories of the pain of the 1980s are still fresh. On top of that, these countries make more money at the moment than they need or can absorb in their own economies. In any case, it takes a few years before energy demand management measures have a real influence on demand and for investments to lead to real production increases, so the only instrument in the oil market for managing demand and supply in the foreseeable future is the pricing mechanism.

3.3. Energy balances

Predicting future energy supply and demand has always been difficult. Many forecasts of the past have proven to be incorrect in retrospect, due to events that cannot be modelled. Generally speaking, higher economic growth, population growth and changes in life styles – more household appliances, more cars and, in developed countries, smaller households – lead to higher energy demand. On the other hand, demand management measures, environmental policy and high prices will slow down the growth in energy demand. Energy supply (production rate) is based on assumptions of fossil fuel resources and assessments of technological developments in non-fossil fuel resources. In its 2006 *World Energy Outlook*, the IEA provided two sets of forecasts for energy supply and demand: a Reference Case (RC) and an Alternative Policy Case (APC). In the Reference Case, no major changes in energy demand and supply patterns and policies of OECD governments are expected, leading to the forecast in Table 3.1. In 2030, roughly 80 percent of demand will still be covered by fossil fuels, as was the case in 2004.

[4] See Willenborg, R., C. Tönjes and W. Perlot, *Europe's oil defences: An analysis of Europe's oil supply vulnerability and its emergency oil stockholding systems*, 2004, Clingendael Energy Paper, www.clingendael.nl/ciep.
[5] See also Chapter 4.

	1980	2004	2015	2030	2004-2030 avg growth	2030 shares
Oil	3107	3940	4750	5575	1.3%	33
Coal	1785	2773	3666	4441	1.8%	26
Gas	1237	2302	3017	3869	2.0%	22
Nuclear	186	714	810	861	0.7%	5
Hydro	148	242	317	408	2.0%	2
Biomass/ waste[6]	765	1176	1375	1645	1.3%	10
Other renewables	33	57	136	296	6.6%	2
Total	**7261**	**11204**	**14071**	**17095**	**1.6%**	**100**

Table 3.1: Global primary energy demand 1980, 2004, 2015 and 2030 (figures in Mtoe).

Source: IEA, *World Energy Outlook, 2006.*

The Alternative Policy Case factors in new policies and measures that governments are currently considering, aimed at enhancing energy security and mitigating climate change. These new policies include efforts to improve energy efficiency in production and use, to increase reliance on non-fossil fuels and to sustain domestic supplies of oil and gas in net energy-importing countries. World energy demand in 2030 will then be about 10% lower; oil imports will start to level off after 2015, and energy-related carbon-dioxide emissions will be some 15% lower in 2030. Fossil fuels will continue to account for around 77% of total energy consumption in 2030.[7] Table 3.2 gives more details.

	Alternative Policy Case 2015	Alternative Policy Case 2030	Differences between RC and APC 2030 (%)
Oil	4534	4955	-11.1
Coal	3431	3512	-20.9
Gas	2877	3370	-12.9
Nuclear	852	1070	24.3
Hydro	321	422	3.2
Biomass/ waste[8]	1374	1703	3.6
Other renewables	148	373	26.1
Total	**13537**	**15405**	**14658**

Table 3.2: Global primary energy demand in 2030 in two different cases (figures in Mtoe).

Source: IEA, *World Energy Outlook, 2006*.

It is possible to discuss the assumptions underlying the various cases, including the changes that occur in relation to previous IEA WEO's. For example, the APC still shows an increase in greenhouse gas emissions, also in OECD countries with Kyoto commitments and countries that have announced ambitious reduction targets for the future.[9] These targets are not met in APC, which leads to the conclusion that from a sustainable development point of view much work still needs to be done.[10] However, the WEO 2006 again reflects the point that there are as yet no economically viable technologies that can globally compete with fossil fuels. Only with further efforts to bring to maturity the available technologies that will either be

[6] Including traditional non-commercial use of biomass.
[7] IEA, *World Energy Outlook 2006*, Paris, OECD/ IEA.
[8] Including traditional non-commercial use of biomass.
[9] The most ambitious target so far is that of France, 75% in 2050. See Perlot, W., *Post-Kyoto and the position of the European Union*, CIEP Briefing Paper number 2, 2005, www.clingendael.nl/ciep.
[10] *State of the Union Address by the President*, January 31, 2006, http://www.whitehouse.gov/stateoftheunion/2006/index.html.

induced by prolonged high prices for fossil fuels or further triggered by government actions, can the importance of other and non-fossil energy sources grow.

The bi-annual energy outlook of the IEA is not the only global energy outlook that governments use. Numerous others exist, ranging from forecasts for individual countries to sophisticated scenario studies by research institutions, think tanks, NGOs and energy industries.[11] They differ in focus, time frames, and policy options – for example, in relation to market efficiency, geopolitics, climate change and energy poverty reduction.

3.4. Market efficiency and energy

Since the early 1990s, the role of market mechanisms in energy policy and development has been the dominant ideology in many policy arenas. Energy deregulation in the US, energy liberalisation in the EU, market forces and the private sector in transition economies, market conditions for energy investments from international financial institutions in the developing world – they all were different melodies and harmonies of the same basic song: to use market-based mechanisms wherever possible to pursue energy policy objectives and to limit government interventions. This process is still going on in many developed and developing countries, although there are signs that countries are becoming less willing to accept the market paradigm.[12] The roles of energy prices and different energy market mechanisms as drivers for achieving economic efficiencies and consumer benefits are essential elements in most government energy policies, and therefore in international energy discussions and negotiations. However, market mechanisms are of little consideration for governments when vital interests are thought to be at stake, which might be a more important part of international negotiations.

Market based instruments can be used for a combination of objectives; for example, in the EU's Emission Trading Scheme (ETS) the environmental objective of reducing CO_2 emissions is reached in an economic efficient manner. Similarly, the Clean Development Mechanism and Joint Implementation under the Kyoto Protocol are also market-linked mechanisms to combat climate change. Other examples are tradable green and white certificates promoting the use of renewable energy sources and energy conservation, and comparable schemes for promoting green consumer preferences. Examples can also be found in the energy and development policy debates, where incentive-based mechanisms are used for energy investments in production, distribution and consumption. However, for markets to function properly and to deliver the benefits for consumers, stable regulatory regimes with transparent, reliable and trustworthy public decision-making procedures are seen as necessary conditions.

Many discussions concerning energy and development seem to carry the assumption that the energy sector in developing countries should be market based, liberalised and preferably privatised. This is similar for other utility sectors, such as water. Especially when the IMF or the World Bank are involved, the pressure to open up the energy sector to private parties increases. Without denying the importance of market efficiency in developing countries, it should be noted that there are not many countries in the world with a fully open and liberalised energy market, and that the energy sector in industrialised countries was developed in many cases with a strong government presence since it was considered a public interest. On top of that, developing countries lack the institutions to regulate the liberalised market, and their citizens are hardly capable of buying energy at commercial tariffs. Sometimes it seems that developing countries need to do all at once everything that has been a process of decades in industrialised countries. The call for liberalised and open energy markets also extends to producing countries, while again most industrialised countries with energy endowments are only partially open, and national interests play an important role in their policies as well.

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[11] For example the Global Energy Scenario's of Shell, latest edition published in 2005 and scenarios by the World Energy Council (WEC), a new edition forthcoming 2007.

[12] For example in energy-producing countries such as Venezuela and Russia, but also in China and perhaps even in the EU, considering the current developments in electricity markets. See also Hoogeveen, F. and W. Perlot (Eds.), *Tomorrow's Mores: The International System, Geopolitical Changes and Energy*, 2005, Clingendael Energy Study, www.clingendael.nl/ciep.

3.5. Geopolitics and energy[13]

For many years after the fall of the Berlin Wall, there was a general belief in developed countries that the world would integrate into a global economy based on market principles. However, the expected *strong* globalisation made way for *weak* globalisation in a relatively short time span. This general trend is particularly visible in energy markets. The grounds for this interpretation of national interest based, or *weak*, globalisation is that the countries adhering to this type of globalisation have little trust in the hegemonic power, the US. This became more apparent after 2001 when the US, for national security reasons, began to more closely define the political, legal and social requirements for integration, i.e., the rule set or mores of the international system. Before this date, the US had been less clear about the mores and relied on the logic of the market as the main tool to achieve full integration. The new interpretation of the rule set by the US after 2001, and particularly after the intervention in Iraq in 2003, has motivated some emerging consumer countries, such as China and India, and producer countries towards a more state-oriented approach to globalisation in which national interests are the main purpose behind their international activities. The legitimacy of the hegemony of the US and its message of markets, democracy and freedom, is eroding.

The awareness that traditional proponents of the market-based system have difficulty themselves in adhering to the economic principles that they propagate, adds to the suspicions towards the market-based system. The difficult WTO negotiations serve as a good example. On the other hand, when thought opportune, states with a formerly planned economy do adopt economic standards and integrate parts of their market into the international economy. The problems are worsened by difficult and strained relations between important actors, adding to misunderstandings and misinterpretation of actions, – e.g., between US-China, China-Japan, EU-Russia and US-EU member states – as well as ongoing security concerns about, for example, Israel-Palestine, North Korea, Taiwan and Iran.

Currently, the world is still characterised by two orientations to the international system, one focused more on economic efficiency as the leading principle of governance, and the other focused more on the effectiveness of national interests promotion. Today's changing international relations will lead to an unknown and unpredictable geopolitical landscape. Because energy itself is subject to geopolitical manoeuvring, it is obvious that these changing relations will have an impact on international energy markets and international energy relations.

3.6. Climate change and energy

There are many environmental concerns connected to the production and consumption of energy. Three levels can be distinguished: local, regional and global. Local concerns are about local air pollution, such as caused by the burning of coal (an example of a regional concern was acid rain in the 1980s). Globally, the greatest concern at the moment is global warming. In this section of the chapter, the focus is on global warming. It is important to note, however, that solutions for environmental concerns on one level do not necessarily solve, and might even create, problems on other levels. Windmills reduce greenhouse gas (GHG) emissions, but are problematic for local bird life. Hydropower plants also reduce GHG emissions, but have a major impact on local, and possibly regional, ecosystems.

Since the Industrial Revolution, the level of CO_2 in the Earth's atmosphere has increased from 280 parts per million (ppm) to 375 ppm today.[14] The period from 1970 to 2000 accounted for 60 percent of this increase. The average global temperature rose by 0.6 degrees Celsius. Based on the aforementioned reference scenario for energy demand, the IEA anticipates another 70 percent increase in CO_2 emissions during the period 2000-2030. In 2025, developing countries are expected to surpass developed countries as the biggest contributors of new CO_2 into the atmosphere. In 1997, within the framework of the Kyoto

[13] See for a full description of geopolitical developments, possible futures and consequences for energy policy in general and energy security in particular Hoogeveen, F. and W. Perlot (Eds.), *Tomorrow's Mores: The International System, Geopolitical Changes and Energy*, 2005, Clingendael Energy Study, www.clingendael.nl/ciep.

[14] See for more information Perlot, W., *Post-Kyoto and the position of the EU*, 2005, CIEP Briefing paper no. 2, www.clingendael.nl/ciep.

Protocol, industrialised countries and the transition economies (the so-called Annex 1 countries) agreed on a 5.2 percent reduction of their greenhouse gas emissions as compared to 1990 levels by 2012. The US and Australia decided not to ratify the Protocol. The Bush Administration considered the absence of any obligations to limit emissions by large developing countries, such as China, unfair.

The EU has asserted that it wants to limit the rise in temperature to two degrees Celsius in comparison to pre-industrial levels. Based on current climate models, this implies that the average amount of CO_2 emissions in this century needs to stabilise at around 550 ppm. Such an overall target is not yet global policy and shall be part of future negotiations concerning post-Kyoto. The real challenge will be to find consensus between the major actors – the US, the EU, China, Russia, India, Japan and Canada – on both their commitments to reduce emissions and the principles upon which these commitments will be premised. At the moment there are two approaches: the Kyoto approach, which puts a cap on emissions and reduction targets in a certain timeframe; and the approach of the US, which aims at energy innovations but without any binding commitments.[15] Many other countries might find a non-obligatory treaty without growth restrictions, without clear reduction targets and with the promise of new technologies far more attractive than the strict, complex and mandatory policies connected to the Kyoto-protocol. But the attractiveness of such an agreement, its non-binding character, is also reason to doubt whether such a technology approach will be effective enough to reduce greenhouse gas emissions. On the other hand, the introduction of market-based mechanisms under the Kyoto-protocol (the EU's ETS, CDM, and JI) presents economic incentives in support of new technologies.

Despite the fact that global warming is increasingly being recognised as one of the most important problems of the future, and that the possible consequences, such as shifting of climate zones and flooding of low countries, might even lead to geopolitical shifts in power, the dependency on international cooperation, national interests and differences between countries in economic and political set-up make the chances for "Winning the battle against global climate change" dependent on global geopolitical developments and effective energy policies.[16]

3.7. Poverty and energy[17]

One of the Millennium Goals adopted by the United Nations is the eradication of extreme poverty and hunger. One of two targets to measure progress in achieving this goal is to halve the number of people living on $1 a day by 2015. Reaching this target is very difficult without improving access to electricity for poor people, because "the strong link between income and access to electricity (…) implies an enormous increase in electrification rates in very poor countries".[18] In the period until 2015, electricity should become available to at least 500 million people, which will cost roughly 200 billion USD.[19] On top of that, modern cooking and heating fuels will need to replace traditional biomass consumption and be made available to at least 700 million people by 2015 in order to reach the $1 target.[20] Availability of energy is helpful in reaching other Millennium Goals as well.[21]

In the World Energy Outlook of 2004, the International Energy Agency presented for the first time an Energy Development Index (EDI). It is based on three factors: per capita consumption of commercial energy, national share of commercial energy in total worldwide energy consumption, and the share of the

[15] This approach is the basis for the Asia-Pacific Partnership on Clean Development and Climate in which the US, China, India, Japan, South-Korea and Australia participate.
[16] "Winning the battle against global climate change" is the title of the communication of the European Commission to the European Parliament on post-Kyoto policies published in February 2005.
[17] See also Chapter 3 in Annex C of Hoogeveen, F. and W. Perlot (Eds.), *Tomorrow's Mores: The International System, Geopolitical Changes and Energy*, 2005, Clingendael Energy Study, www.clingendael.nl/ciep.
[18] IEA, *World Energy Outlook 2004*, Paris, OECD/ IEA. p. 350.
[19] Ibid.
[20] Ibid.
[21] UNDP, UNDESA, WEC, *World Energy Assessment - Overview: 2004 Update*, New York/ USA, http://www.undp.org/enery.

population with access to electricity.[22] This EDI is compared with the Human Development Index (HDI) of the UNDP. This comparison clearly shows the correlation between low levels of EDI and low levels of HDI. Especially in the poorest countries, increase in EDI and HDI go hand in hand until a certain level of HDI is reached and increased energy consumption no longer leads to strong increases in HDI.

It is currently estimated that 1.6 billion people do not have access to electricity. Electrification rates have increased slightly over the past decades, but improvements have been largely offset by population growth. Between now and 2030 about two billion people are expected to gain access to electricity. However, due to population growth, the number of people without electricity will still be 1.4 billion.[23] Most of these people live in southern Asia and sub-Saharan Africa. China has been very successful in decreasing energy poverty. As a side effect, the amount of greenhouse gases emitted by Chinese coal-fired power plants has increased sharply. Although no one will dispute the right of poor people to energy, the case of China clearly shows the problematic implications: increased pollution levels and increased demand for fossil fuels, adding to increasing impacts on global energy supply security. Higher electrification rates lead to higher economic growth, higher household income, higher energy consumption, higher energy supply volatilities and higher emission levels. Combining the priorities of the international community to address global warming and to reduce energy poverty with the global energy policy dilemmas is a very difficult challenge.

3.8. Conclusion

Energy policy is returning again to many political agendas and is getting more and more public attention. Increasing mobility and the growing dependence on electricity-driven machinery in almost every part of global society increases the need for reliable energy supplies. The re-emerging awareness of the dependence on fossil fuels from a limited group of foreign, at times politically unstable, sources; the promotion of renewable energy sources; reducing energy poverty to enable reaching the Millennium Development goals; the contribution of the energy sector to the greenhouse effect; and the introduction of consumer choice in electricity and gas markets are all topics that require further attention. These topics cannot be tackled one by one, as they are increasingly interlinked and are strongly influencing and determining the effectiveness of policy instruments and approaches. Additionally, there are heightened geopolitical tensions, a problematic legitimacy of the US hegemonic power, resurfacing nationalistic and protectionist tendencies in developed countries, and a disturbed balance between energy-consuming and producing countries. Strategic interests at national and regional levels are at stake when energy is concerned. Progress in international negotiations, whether on sustainable development, climate change or investments in producing countries, will most likely only be possible when these interests are recognised, accepted and taken into account. There seems to be no doubt that this will create an enormous challenge to governments and their negotiating tactics, to the multilateral forums and institutions and – most of all – to politicians involved in internal and external decision-making processes.

It might therefore be very relevant to consider if and to what extent the present institutional frameworks for discussing energy issues would sufficiently cover all three pillars of energy policy and what roles each of these three pillars (affordability, supply security and environment) have in and for developing countries. In addition, one should reflect on the extent to which supply security should play a larger role in the relationships between energy-exporting developing countries and energy-importing developed countries. Further questions are whether energy poverty reduction goals must include reducing GHG emissions and other sustainable development goals; and what the role should be, if any, of universal organisations such as the UN in these reflections and assessments.

[22] IEA, *World Energy Outlook 2004*, Paris, OECD/IEA, pp. 339-346.
[23] Ibid., p. 348.

4

Country-specific and regional energy issues

As described in the previous paper, tight supply and demand balances in world and regional energy markets have made energy issues part of various political agendas, including those dealing with foreign policy and security issues. Geopolitical aspects will become more and more important in international energy relations and will have large impacts on national and regional policy making. The international context for energy policy issues is therefore dynamic and uncertain. There are, at present, strong interactions between the main actors in the international system and international energy markets, causing geopolitical relations to shape and reshape time and again, redefining the balance of power over and over.[24]

This chapter therefore contains descriptions of the largest energy-consuming countries and a couple of producer countries. Net importing developing countries, with a focus on sub-Saharan Africa, and net exporting developing countries are discussed in general terms. In the descriptions of consumer countries, the three goals of energy policy are discussed, including viewpoints on geopolitics and climate change. In the section on net importing developing countries, reliability is emphasised; while in the section on net exporting developing countries, emphasis is on spending oil and gas revenues. The descriptions show that countries have different geopolitical outlooks, that they differ in the emphasis on the pillars of energy policy, and that they value risks to energy supply and environmental risks differently.

4.1. The United States

The United States has been the world's only super power since the demise of the Soviet Union in 1989. As the largest economy, the US is the largest energy consumer. The US is also the largest producer, with production and reserves of all three fossil fuels and the largest amount of electricity generated by nuclear power plants. The energy consumption per capita is relatively high in comparison to other OECD countries, but the energy intensity of the US economy is similar to that of other developed countries.

The US imports roughly two thirds of the oil it consumes and ten percent of its natural gas. The reserves to production outlook for oil and natural gas within the US is around ten years, and the US will rely more and more on imports for these fuels in the future. Energy security is considered to be a matter of national security and as such has featured on the foreign policy agenda for decades. The US tries to secure supplies on the international energy markets and stimulates the integration of producer countries into the global economy, with mixed results. The current Bush administration has added a call for democratisation and good governance. The combination with a religious revival in America, from which Bush gets a lot of support in exchange for more conservative Christian policies, makes the ideological double demand (economise, democratise) suspicious and hard to digest for many countries across the world, not only in energy-producing countries.[25]

The US consumes roughly a quarter of the daily production of oil, for a large part caused by the number of cars, the size of the cars and the size of their engines. The past years have shown an increase in the sales of hybrid cars, although overall market share remains small. President Bush in his State of the Union

[24] See also Chapter 4: Changing geopolitical relations and the impact on the international energy market, in: Hoogeveen, F. and Perlot, W., *Tomorrow's Mores, The International System, Geopolitical Changes and Energy*, CIEP Study, December 2005, pp. 43-72.
[25] Ibid., p. 67.

Addresses 2006 and 2007 announced further funding for research into and support for hybrid cars, ethanol, hydrogen, nuclear energy, wind and solar power and zero-emission coal-fired power plants (the reserves to production ratio for coal is two hundred and forty-five years in the US).[26] Investing in these alternative energy sources comes primarily from energy security concerns, and to some extent from environmental concerns. Funding for clean energy technologies and cooperating in their development is at the heart of the Asia-Pacific Partnership on Clean Development and Climate.[27]

In general, on a federal level, the US seeks solutions to energy and environmental problems through economic and markets instruments – the energy sector in the US is being liberalised – and technological breakthroughs, although the US has very strict environmental laws in certain areas. The Kyoto-protocol can be considered government-driven, despite the market-based principles within the Kyoto-protocol, which, in addition to the concerns for the American economic position vis-à-vis competitors such as China, explains the non-participation of the US. The US is the largest emitter of CO_2 in the world. Its per capita emissions are also very high. Effective policies to limit these emissions are very important, but the US is not likely to accept binding targets in a successor of the Kyoto-protocol. It is important to note that there are large differences between the federal government and those states that are very progressive and keen to implement policies and measures against global warming, including a trading scheme for CO_2 emissions.

Despite the political ambitions that were formulated in the two recent State of the Union messages, the fact remains that the US is addicted to oil and energy. Policy answers in the sense of a full and straightforward National Energy Policy have not emerged to date. The US would be able, if it would be willing, to develop a "man-in-the-moon" type of approach. It has the technical and economic potential to do so, but the political leadership seems to be lacking. That is a pity for the US, for its allies and partners and for the world at large.[28]

4.2. The European Union

The European Union, as a group of countries, is the only actor globally that can rival the US on economic terms, although economic growth rates have been lagging behind those of the US for years. In comparison to the US, the EU is a dwarf, politically and militarily speaking. Despite the enormous progress in the integration process, it is not possible to see the EU as a unitary actor on the global stage.[29] From an energy perspective, this is particularly important in terms of energy security. The watered down attempts to become the most competitive economy of the world are not preparing the EU for a global world in which economic competition is important in determining energy flows, while at the same time the lack of real progress in political and military cooperation limits the EU in its possibilities to prepare for a world in which energy flows are, for a large part, the result of political competition.

The expected growth for energy demand in the EU is low in comparison to that of other countries and regions. The EU as a group is the largest energy consumer after the US. The EU depends for roughly 65% on imported oil and around 55% on imported gas. To decrease oil dependence on OPEC, and following the fall of the communist regime in Moscow, oil imports from Russia have increased considerably. Russia is also the largest supplier of natural gas to the EU. The differences between the member states in energy mix, import dependency and the most important suppliers are considerable. The asymmetrical risks that result from these differences hamper the EU in formulating a common energy policy.

The EU has embarked on an ambitious liberalisation process in its energy sector, not only by allowing for more market principles in energy markets, but also by trying to link up the different markets to become

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[26] *State of the Union Address by the President*, January 31 2006, http://www.whitehouse.gov/stateoftheunion/2006/index.html. More information on energy sources and technology can be found in Chapter 5.

[27] See Chapter 2.

[28] See also Jacques de Jong and Stephan Slingerland, *Een beetje verslaafd bestaat niet*, in Internationale Spectator, April 2006.

[29] See Hoogeveen, F. and W. Perlot, *Tomorrow's Mores; The International System, Geopolitical Changes and Energy*, 2006, CIEP Energy Study, p. 73-89, www.clingendael.nl/ciep.

one. Considering the differences between the member states in approach and technological possibilities, the development of regional markets, especially in electricity, is for now more likely.[30] The effects of liberalisation, exact market design, regulation issues and coordination between the member states have not completely crystallised.

The EU has ratified the Kyoto-protocol and has been one of the strongest supporters of an international climate regime. The ratification process of Kyoto has been difficult. Real negotiations about the successor of Kyoto have not yet begun, but a new agreement with binding targets is not likely, since both the US and China are opposed. The EU has said that the average temperature increase should be limited to two degrees Celsius in comparison to pre-industrial levels. Several member states have announced severe reduction targets towards 2050, whereas other states are reluctant to commit themselves at this moment while the potential of future negotiations remains unclear. The EU has an extensive programme to promote the development of new energy technologies, as do the member states themselves. Research is conducted on renewable energies, clean coal technologies and nuclear energy. There is a non-regulatory guideline of 21% of renewable electricity production by 2010 and a percentage of 5.75% of biofuels in the transport sector by 2010, the latter also triggered by agricultural considerations. In a Green Paper published in 2005 by the European Commission, the objective of 20% energy savings by 2020 is mentioned. There are differences between member states in focal points for energy research and in promotion of certain technologies, and there seems to be little coordination.

More recently, the EU Commission has proposed a rather extensive and integrated package for a new European Energy Policy.[31] In this package, a number of energy policy areas and targets are combined in a consistent set of policies. On climate change and sustainability, a “triple 20 in 2020” approach is proposed, i.e., 20% less carbon emissions in 2020 as compared to 1990 levels, a 20% renewable energy share in the energy balance in 2020, and a 20% more energy efficient economy in 2020. The package also contains a number of further-reaching proposals on the internal electricity and gas markets, including the expansion of interconnections, the beefing-up of regulatory powers, and the idea of further unbundling of the transmission networks. With respect to supply security, a number of internal measures are taken, but more interestingly is the idea of applying a single voice doctrine for the EU in its energy relations with its external energy suppliers.

4.3. China

China is rising, economically speaking, but also in political and military terms. Whether justified or not, China is perceived by many developing countries as the alternative to Western countries and the West’s combined development approach.[32] This perception gives China greater political leverage than it would have if looking solely at the statistics and at the actual situation in the country. The rapid rise of the Chinese economy is cornering a lot of resource markets. The effects of this demand increase are felt in other economies, for example through high oil prices. In Western media and by politicians, China is often discussed as the 'awakening giant' and the 'dragon' that threaten Western welfare both directly and indirectly.[33]

China is the second largest consumer of oil and the third largest importer. Domestic production is still considerable, but cannot prevent China from becoming more import dependent. Consumption of natural gas is low, but expected to increase. This increase will partly come from imports. China is by far the largest consumer and producer of coal and is keen on using coal in its transportation sector to decrease oil dependency. The successful electrification of the country comes from hundreds of coal-fired power plants

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[30] De Jong, J., *The 'Regional Approach' in Establishing the Internal EU Electricity Market*, 2005, Clingendael Energy Paper, www.clingendael.nl/ciep.

[31] An Energy Policy for Europe, Communication by the Commission, 10.01.2007, COM (2007)1 final.

[32] Leonard, M., *How China is wooing the world*, The Guardian, 11 September 2004.

[33] A few examples: Luft, G., "US, China are on collision course over oil", LA Times, February 2 2004; "China's global hunt for oil", BBC News, 9 March 2005; "China stroopt de wereld af naar olie" Trouw, Saturday 5 March 2005; Klare, M.T., "Het gevaar van oorlog om olie", NRC-Handelsblad , Saturday 26 March 2005.

built in the past twenty years, although reliability is a problem. China has only a few nuclear power plants, but wants to build several more, including a state-of-the-art pebble bed reactor. China is also trying to develop renewables to offset import dependency and reduce pollution, but these developments are negligible in relative terms – except for hydropower, for which China has the biggest potential worldwide and ranks third in installed capacity. Overall, China is the second-largest consumer of energy and consumption of all fuels is expected to increase. Although the energy consumption per capita is low, energy intensity is high. Energy efficiency is therefore important.

China needs to continue its fast economic growth to spread welfare to the more remote parts of the country. There are many social and political tensions that could lead to small crisis situations within the country. The Chinese strategy seems to be to increase economic growth to deal with its diverse and complex social dilemmas. Energy is vital in that strategy. China is mainly concerned with security of supply. Costs aspects and environmental concern are of lesser importance, although there are reform plans for the electricity sector, and cleaning energy consumption is gaining ground on the policy agenda due to the extreme air pollution in large cities. Solving global climate change is considered important, but China does not want to be obliged to reduce emissions, partly because it feels that the moral responsibility for climate change lies with the industrialised countries, and because they are concerned that such obligations will hamper future economic growth.

Security of supply is China's first concern. It is active in a growing number of producer countries to ensure the flow of oil – and, in the future, natural gas – to the country. Just like Western countries and Japan in the past, the current Chinese approach might lead to a situation in which far too much money is paid to secure supplies, and the options chosen are not the most efficient. It seems that China is leaping at every chance it gets. And those chances are most often in areas in which Western companies do not want to, or can not, invest (Sudan, Iran), in countries of which the governments think they can use the Chinese presence to their own strategic benefit (Venezuela, Iran), or by paying/offering more then Western companies are willing to pay. China is an attractive partner for many developing countries, because it is less politically involved, making no demands about democratic reforms or human rights.

4.4. Japan

Since the seventies, the energy policy of Japan has been dominated by energy efficiency, supplier diversification, and diversification of fuel. Japan has one of the lowest energy per GDP ratios of developed countries, with its total energy consumption being four times lower than that of the US while the economy is only 2.5 times smaller. The energy efficiency policies have been highly successful, but due to the lack of energy resources within Japan it remains very import-dependent. Japan is the fourth largest energy consumer in the world, the third largest oil consumer, seventh in consumption of natural gas and fourth in consumption of coal. More than 10% of the total energy consumed comes from nuclear energy; Japan is third in installed capacity of nuclear power. The number of nuclear power plants is expected to rise for energy security reasons and to reduce CO_2 emissions. For this reason, Japan is also keen to develop renewable resources. Fifty percent of all energy consumed in Japan comes from oil.

Energy demand in Japan is expected to decline a little over the coming decades, due to economic stagnation and Kyoto commitments. This might easily change, however, if economic growth picks up, as we have seen since 2002. Japan has a Kyoto reduction commitment of 6%, and there is doubt as to whether Japan will reach this target.

The reliance on the US to secure strategic interests, and the rise of China and India, are limiting the policy options for Japan. Russia is seen as a key country in allowing Japan to become less dependent on the Middle-East, but the relationship between Russia and Japan is strained due to territory disputes, which are also the reason that no peace agreement between Russia and Japan has been signed since World War II. Since the middle of the nineties there have been numerous attempts to establish an organisational framework to reduce the likelihood of struggle for energy resources among Asian nations to the east of Pakistan. These attempts have focused on promoting Asian energy cooperation projects. Japanese

organisations have played a significant role in initiating dialogues on projects such as the Northeast Asian Energy Cooperation Project. Whether these institutions will be successful depends on the geopolitical direction of the different countries and of the US.

4.5. India

India considers itself a weak power but is on the rise. It has an ambivalent attitude towards globalisation and economic integration, but is now reaping the first benefits. Since it considers itself to be a weak power, India wants to create a multi-polar world and avoid becoming too closely tied to only one power. However, India is worried about China and feels more secure with a strong America nearby. Reports on energy cooperation between China and India are significant, but at the same time should be viewed with a certain amount of scepticism.

India is the fifth largest energy consumer. Security of energy supply is India's focus at the moment. It has a very high energy intensity, roughly 3 times more energy per unit GDP than the US. It is the fifth largest oil consumer and the third largest coal consumer. More then half of all energy consumed comes from coal, which is mostly produced domestically. Domestic oil and natural gas production is low, although the expectation is that more intense exploration will lead to new finds. Dependency on imports will stay well above 70%. The domestic energy sector is opening up, leading to more foreign companies being active in India. India is keen to use renewable technologies and hydropower to limit security of supply problems. It recently signed a disputed agreement with the US regarding nuclear energy. Considering the large coal reserves, there is also interest in coal to liquids for the transport sector. A lot can still be achieved through energy efficiency.

Environmental issues and costs concerns are of less importance to India then security of supply. Attention is going to gaining access to resources and to providing the growing economy with the necessary fuels. There is concern, however, about the heavy pollution in the large Indian cities, which are some of the most polluted in the world. Global warming is also a concern, but growing welfare for its large population has priority.

4.6. Brazil

Brazil is rising in economic importance and has, as a regional power, a considerable influence in Latin America. Brazil has recently become more aware of its interests and is more actively pursuing them, as has become clear in, for example, WTO negotiations. The current president of Brazil has a left political signature and has a cooperative dialogue with Venezuela, including energy issues, which has become strained recently with the developments in Bolivia and Venezuela hurting Brazilian interests. Brazil has oil and natural gas reserves, and their resource base has increased in recent years by finds offshore. Due to national interests of supply security and rural development, Brazil has invested heavily in biofuels. The development of the sector is now such that ethanol produced in Brazil can economically compete with oil on the world market. There are concerns about the sustainability of ethanol production in Brazil in relation to the rainforest, especially if ethanol production would increase considerably because of demand increases by Western countries. The promotion of climate-neutral technologies in Western countries is of interest to Brazil because of its competitive advantages in biofuel production. Expected rapid economic growth will be paired with a rapid increase in energy consumption. Energy consumption per capita is low, but energy intensity is relatively high.

4.7. Net importing developing countries

Getting a well-functioning energy sector off the ground in a developing country requires tackling a number of classical development issues, in addition to a number of energy concerns. Large funds are needed to invest in power plants and infrastructure. Development aid is not enough to supply the funds needed. The willingness of companies to invest is low. Regulatory frameworks and the rule of law in general are largely lacking in most developing countries. Creating a market for electricity – i.e., customers who can afford to pay electricity bills – is problematic. Unpaid invoices and illegal tapping of electricity are major problems in developing countries. The promotion of good governance and the implementation

of market forces as called for at the Energy for Development Conference, organised by the Netherlands in Noordwijk in December 2004, is easier said then done.[34] These last two issues have been on the development agenda for years.

In the case of developing countries, one aspect needs to be emphasised. This aspect is availability. Above all, an energy sector has to be reliable. End users normally expect that whatever the time of day, lights can go on, machines have electricity to work and cars can be filled up whenever needed. Trust in the energy system is very important to consumers. An unreliable energy sector with frequent black-outs or unavailability of gasoline will block development efforts to promote small businesses, especially if these need energy for their production efforts. Few companies are willing to make large capital investments if there are doubts about security of delivery.[35] Development projects cannot focus only on the electrification of countries; they need to make sure that the energy system will function securely, soundly, and at reasonable prices for a long time. This poses questions about the type of technology that is going to be used, high capital investment, the choice between proven technology or new innovations, maintenance intensity of the technology used (also taking into account local weather suitability), and fuel choice. The extra challenge is to do this in an environmentally sound way, with concern for both the local footprint and global concerns such as greenhouse gas emissions.[36]

Energy consumption in Africa is much lower than in the rest of the world. About 3% of commercial energy in 2004 was consumed in Africa, including northern Africa. Africa has 9.4% of world oil reserves, of which 7.7% is located in northern Africa and Nigeria. African natural gas reserves, not including those in northern Africa and Nigeria, are 0.7% of the global proven reserves. About 5.5% of global proven reserves of coal are almost completely located in South-Africa and Zimbabwe.[37] The number of people living without modern energy is highest in southern Asia, but relatively speaking, energy poverty is most severe in sub-Saharan Africa. For example, the estimated number of people without electricity in sub-Saharan Africa was 526 million in 2002, or 81%. The *World Energy Outlook 2004* of the IEA plotted access to sustainable water resources and percentage of people without electricity. Of the 21 countries where less than 30% of the population has access to electricity, 17 are located in sub-Saharan Africa.[38] Similarly, of the twenty countries with the lowest Energy Development Index, 17 are located in sub-Saharan Africa, with Ethiopia having the lowest EDI.[39] Although the EDI level of Africa is expected to increase until 2030, in the scenario presented by the IEA, the EDI will be roughly 0.4, up from 0.28 in 2002. For comparison, the average EDI of the OECD countries in 1971 is estimated to be 0.75.[40] The outlook for modern heating equipment and cooking is similar: "The proportion of the population using traditional fuels [for cooking and heating] remains highest in sub-Saharan Africa".[41]

4.8. Net exporting developing countries

In general, developing countries with large endowments of energy resources have performed worse in past decades in economic development and in the improvement of living conditions for their populations than other developing countries. This has been referred to as the ‘resource curse’, but resources are not the cause; it is better to call it a ‘governance curse’, as the problems many developing countries face are

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[24] Kok, M.T.J. et al, *Energy for development 2004; conference paper*, December 2004 and *Energy for development 2004 conference; chair's conclusions*, Noordwijk/ Netherlands, 14 December 2004. http://www.energyfordevelopment.org.

[35] A distinction can be made between *security of supply*, which stands for the availability of primary energy sources such as oil, natural gas and coal in a specific country, and *security of delivery*, which stands for the availability to consumers of the end-products, such as electricity, in the energy value chain. Without security of supply there cannot be security of delivery. Without natural gas for a gas-fired power plant there will be no electricity. It is, however, very possible to have plenty of oil and natural gas while there is no security of delivery, for example because of unreliable networks, but also caused by natural disasters or heat waves. The availability of energy is not just a matter of managing oil, gas and coal flows; it is also about the national energy infrastructure. Energy security starts at home.

[36] See also Chapter 5 on energy sources and technological developments.

[37] BP, *Statistical Review of World Energy*, 2005.

[38] IEA, *World Energy Outlook 2004*, Paris, Figure 10.5: Electricity and Improved Water Access, page 341.

[39] Ibid., pp. 344-345.

[40] Ibid., pp. 346-347

[41] Ibid., p. 347.

magnified by the size of the oil and gas revenues and by the active political involvement of consuming countries.

Governments of producing countries face the challenge of spending the revenues better than they have in the past. Too much investment in non-tradable goods such as infrastructure can lead to 'Dutch disease'. Revenues can better be used for government-induced programmes to promote other economic industries, allowing the countries to become less dependent on energy revenues, but these programmes so far have a mixed track record. Spending also needs to be limited, since commitments made during times of high revenues are difficult to withdraw later on. At the same time, careful spending will surely lead to high political pressure to spend more. Spending of high natural resource revenues might lead to social unrest within a country if the money is perceived to benefit only small sections of the population, or only people belonging to a certain group.

An advisory organ on how to design the energy sector and manage the revenues based on best practices from around the globe could benefit producer countries considerably. Public-private partnerships, as implemented in the natural gas sector in the Netherlands, might be one of those best practices. At the moment, a research and advice project is running, among others with CIEP, that is financed by the Dutch Ministry of Foreign Affairs. The goal of this project is to determine whether the Dutch model can be helpful for the Bolivian government. International law regarding code of conduct for companies operating in producing countries is a necessity, limiting the possibilities that foreign companies become part of, or even disturb processes of, good governance.[42] Producer countries are concerned that climate change can hurt their economies and ask for compensation.

4.9. Russia

Strategic thinking and national security are the cornerstones of Russian (external) policy. This foreign policy could be illustrated with a quote of Primakov, former Minister of Foreign Affairs, who said that Russia does not have "permanent friends, but permanent interests".[43] Russia is the country with the world's largest hydrocarbon reserves. It holds the largest gas reserves, the seventh largest oil reserves and is second in coal reserves. Russia is also the world's largest energy exporting country and is the principle energy supplier for the European Union. Although many commentators link Russia's strategic manoeuvring to its energy endowments, for large markets such as the EU the risks regarding Russia pertain rather to Russia's ability to uphold its production capacity, rather than to a deliberate supply cut with a political motive. Russian reserves might be abundant, but the investment climate is suboptimal, and it is uncertain as to whether investments will be made in a timely manner.[44]

Russian energy policy aims at upgrading production capacity of oil energy industries (oil and gas).[45] Russia needs energy not only to satisfy the needs of its domestic economy, but because the export revenues are by far the largest contributor to the government's budget. It is estimated that oil and gas constitute 25% of the country's GDP.[46] Energy is also Russia's largest export product; oil and gas account for over half of export earnings and currently guarantee the country a healthy account surplus.

Energy is important to domestic industry and the population. The government has set requirements for the oil and gas industry to supply the domestic economy with energy at sharply reduced prices (effectively a subsidy); the population and industry enjoy the benefits of cheap oil and gas. However, the policy of supplying cheap energy to end-users certainly does not give any incentive to reduce the consumption of

[42] Most international oil companies have codes of conduct and also subscribe to the process called "Voluntary Principles" initiated by the US and the UK. There are, however, many more companies involved in the extraction of energy, and the question is whether voluntary principles are sufficient.
[43] Trenin, D. and Lo, B., "The landscape of Russian foreign policy decision-making", Carnegie Endowment for International Peace, 2005.
[44] Janssen, E., *Can Russian oil growth be sustained*, The Hague, CIEP Briefing Paper number 4, 2005.
[45] Russian government, Energy strategy for the period to 2020.
[46] EIA, Country analysis brief: Russia.

energy (fossil fuels) in Russia. Russia has one of the most energy-intensive economies in the world and emits a lot of CO_2 per unit of GDP produced. Given the fact that Russia has ratified the Kyoto-protocol, and seeing that Russia will have difficulty maintaining its current course – let alone increasing production capacity – it becomes clear that energy savings and improving energy efficiency are of paramount importance.

4.10. Persian Gulf countries

The Persian Gulf countries have the largest endowments of oil and natural gas in the world; almost 70% of proven oil reserves and almost 40% of natural gas reserves. Since current production shares are much lower, it is expected that, in the long term, consumer countries will become more dependent on the Persian Gulf. Consumer countries are very reluctant to accept this dependency, due to social and political instability in certain countries and defiance of the international rule set by Iran. The relations between the Persian Gulf countries and most consumer countries have become more strained recently, due to political, cultural and religious differences, but also by the high oil price. Talks of energy savings and investments in alternatives by governments of consumer countries are a threat to security of demand for the Persian Gulf, and fierce opposition to climate change policies can be expected. Just as in other net exporting countries, spending the revenues in a sustainable manner and attempts to reduce dependency on energy revenues have been difficult, making the social situation volatile. Energy consumption per capita is high, as well as the energy intensity of the economy and related CO_2 emissions. Energy savings are important.

Country	Oil	Gas	Coal	Nuclear	Other	Total energy consumption
Australia	38	22	51	-	2	113
Brazil	82	14	11	3	83	193
Canada	96	83	31	16	35	261
China	266	29	835	10	269	1409
EU	688	406	311	221	104	1730
India	113	27	191	4	218	553
Japan	249	69	112	52	35	517
Russia	125	354	109	33	19	640
Saudi Arabia	75	54	-	-	2	131
South Korea	104	23	50	27	1	205
US	912	581	563	182	43	2281
World	3761	2420	2778	624	1413	10579

Table 4.1: Energy consumption by fuel in million tonnes oil equivalent[47]

[47] All data in Table 4.1 come from BP, *Statistical review of world energy 2005*, http://www.bp.com, except *Total energy consumption* which comes from IEA, *Key World Energy Statistics 2005*, 2005. Energy statistics are difficult to compare due to differences in definitions and calculations. The category "Other" consists of the category "Hydro" from BP and the difference between total energy consumed in 2003 according to BP and IEA. The latter reports a higher consumption than the former. The difference is probably caused by other commercial renewable and waste energy production and the treatment of marine bunkers. The category "Other" stands for commercially consumed energy that does not come from oil, natural gas, coal and nuclear and consists for roughly 50% of hydropower.

Country	Oil reserves 1000 mmb's	Oil production Mb/d's	Gas reserves Tcm	Gas prod. Bcm/y	Coal reserves Mt	Coal Prod. Mt
Algeria	11.8	1.9	4.6	82.0	-	-
Australia	4.0	0.5	2.5	35.2	78,500	364.5
Brazil	11.2	1.5	0.3	11.1	10,113	4,4
Canada	16.8	3.1	1.6	182.8	6,578	66,0
China	17.1	3.5	2.2	40.8	114,500	1956.0
EU	7.7[48]	0.3[49]	2.8	216.0	45,000[50]	596.0[51]
India	5.6	0.8	0.9	29.4	92,445	403.0
Iran	132.5	4.0	28.0	85.5	-	-
Japan	-	-	-	-	359	1,3
Kazachstan	39.6	1.3	3.0	18.5	31,279	68.8
Norway	9.7	3.2	2.4	78.5	-	-
Russia	72.3	9.3	48.0	589.1	157,010	280.0
Saudi Arabia	262.7	10.6	6.8	64.0	-	-
South Korea	-	-	-	-	80	3.2
US	29.2	7.3	5.3	543	246,643	1,008.3
World	1,188.6	80.2	179.5	2,691	909,064	5,538

Table 4.2: Global reserves and production[52]

[48] Estimation based on BP, *Statistical review of world energy 2005*. There is no data on several EU Member States; estimation is based on the data from the Member States that is provided, plus a percentage from other European countries.
[49] See note 47. UK produces roughly two million barrels per day.
[50] See note 47. Germany and Poland account for 6739 and 14000, respectively.
[51] See note 47. Germany and Poland account for 208 and 161, respectively.
[52] All data in Table 5 come from BP, *Statistical review of world energy 2005*, http://www.bp.com and are given in the most common denominator. The table includes the top 8 of largest energy consumers, the EU and a number of countries with large energy endowments. Figures are rounded off to one tenth. The categories *Anthracite and bituminous* and *Sub-bituminous and Lignite* have been combined under the heading "Coal".

Country	Energy consumption (toe/ capita)	Energy consumption (toe/ 000 2000$)	CO_2 emissions (t CO_2/ capita)	CO_2 /GDP
Australia	5.63	0.26	17.35	0.81
Brazil	1.09	0.31	1.71	0.49
Canada	8.24	0.34	17.49	0.72
China	1.09	1.02	2.89	2.70
EU	3.90	0.20	8.50	0.45
India	0.52	1.02	0.99	1.93
Japan	4.05	0.11	9.41	0.25
Russia	4.46	2.09	10.64	4.98
Saudi Arabia	5.81	0.64	13.6	1.51
South Korea	4.28	0.35	9.36	0.77
US	7.84	0.22	19.68	0.55
World	1.69	0.32	3.99	0.75

Table 4.3: Other energy data [53]

4.11. Conclusion

Regions and countries have partly overlapping interests, but also conflicting ones. Regional and national differences in terms of energy supply and demand exist. Even when energy supply structures are largely similar, the consequences, economic reasoning and perceptions of risk will vary per country. This is also true for the level of importance given to environmental considerations and the political involvement in energy policy. Cultural and socio-economic differences between countries and regions and within regions are largely behind this variety of risk perception and could lead to diverse political reactions.[54]

Discussions on energy issues and their related wider policy impacts and inter-linkages will have to take due account of these differences in the process to be able to find common ground for future action. This could lead to different and sometimes tailor-made approaches, with specific commitments and instrumentation. In all cases, however, common understanding and analysis of the issues to be solved, based on mutual recognition of regional and national interests, are necessary starting points for finding acceptable and effective solutions. This will also put a heavy burden on institutional frameworks and the mechanics of the negotiation process. It could be worthwhile to explore and analyse in more detail the regional and national specifics when seeking mutually beneficial solutions.[55]

[53] All data in Table 6 come from IEA, *Key World Energy Statistics 2005*, Selected energy indicators for 2003, pp. 48-57. The total energy consumption figure is the same as Total Primary Energy Supply (TPES) from the IEA. Same selection of countries as inTable 4. Data is rounded off to one hundredth.

[54] See also Chapter 2: Analysing the international system, geopolitical changes and energy, in: Hoogeveen, F. and Perlot, W., *Tomorrow's Mores, The International System, Geopolitical Changes and Energy*, CIEP Study, December 2005, pp. 17-26.

[55] Challenging examples for such more detailed analyses could be "Brazil and biofuels", "India and nuclear energy" and "South-Africa and coal".

5

Global and regional energy forums

5.1. Introduction

Energy policy issues are becoming increasingly interlinked with other global policy considerations. Energy and the environment, energy and climate, energy and development, energy and poverty, and energy and sustainability are just some of these inter-linkages. Energy and security, notably sustainable supply security for energy services, has recently 'climbed the charts' as well, adding to the overall and integrated context of energy issues. Energy policy can therefore only be tackled in a global approach that recognises the three pillars of energy policy and their interactions (Figure 5.1).

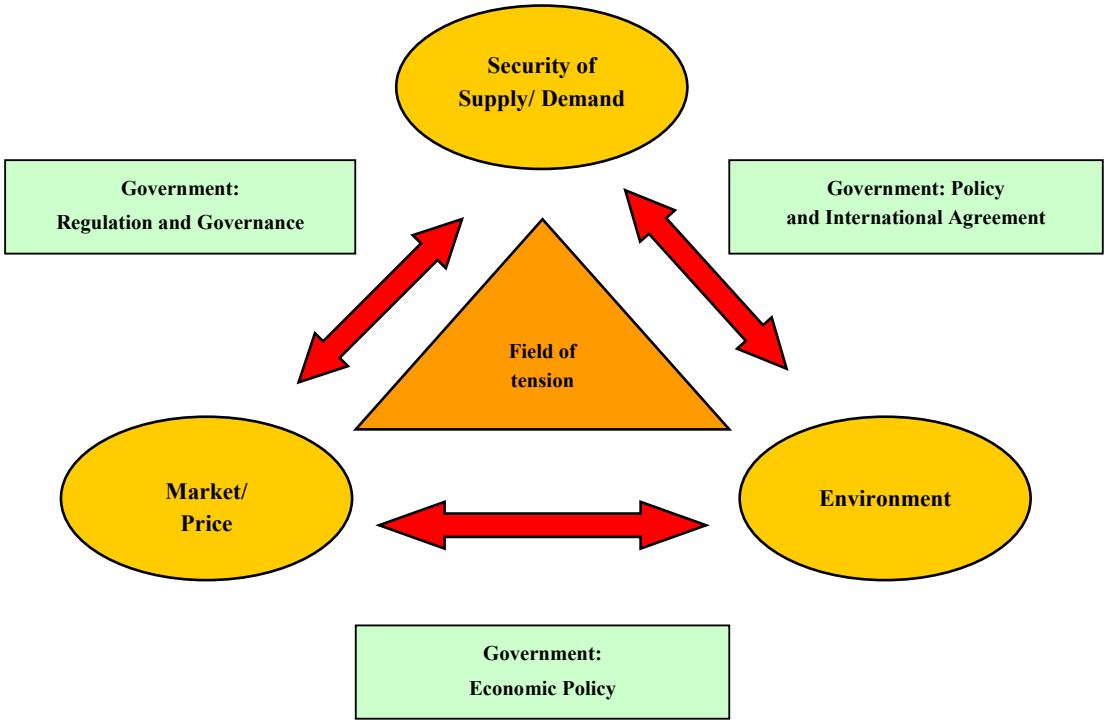

Figure 5.1: Field of tension between the three pillars of energy policy and related policy areas

International energy agendas usually deal with a number of transition issues. Transition towards sustainable development is generally considered to be the main driving force behind these agendas, but the transition process towards "more market and less government" is still ongoing and very much alive in many policy circles. In the past one or two years, the somewhat neglected issue of energy supply security has been back on the agenda. The concern of how to secure access for the energy-poor is also prominent in the minds of policymakers and politicians. Energy issues are therefore more and more becoming global

issues, bringing with them an increasing need for global discussions. There is, however, no appropriate global framework, nor road map for organising these discussions.

In preparing discussions for the CSD-14/15 and beyond, it is therefore useful to analyse the wheres and whens of global energy discussions and to see what this could mean for the CSD agenda and its follow-up. In this analysis, the following five categories will be defined, making a distinction between global versus specific *issues* and universal versus limited *memberships*: global and universal; specific and universal; global but limited; specific and limited; regional. Table 5.1 summarises these categories and the various discussion forums. In addition, specific attention will be given to the position of the EU.

5.2. Global and universal

Global and universal discussions on energy could take place in the existing organisations that have energy issues in their statute. A distinction could be made between the government organisations and the (only) NGO in this context, the World Energy Council (WEC). The WEC is a global multi-energy organisation with memberships from over 90 countries, including most of the largest energy-producing and energy-consuming ones. Members are recruited worldwide, and come from all segments of the industry and from governments. The main foci of the WEC are studies and status reports on energy technology, with the in 2007 upcoming *WEC Scenario Study 2050* being a main product. Global discussions between governments are furthermore organised in the UN framework. Some twenty UN organisations include energy in their mandates, but none is specified in this issue. In order to address the issues of energy efficiency and efficacy in the UN context, the UN-Energy bureau has been set up as an inter-agency coordination mechanism. It should be noted, however, that whenever the UN discusses energy issues, the focus is very much on sustainable and economic development, with the Millennium Development goals and the Johannesburg Plan of Implementation as the main products. Energy policy and its three integrated pillars are discussed neither as such, nor in their relationship with economic and sustainable development and climate change issues.

5.3. Specific and universal

The next group of bodies are those that have universal membership but a specific mandate. This mandate is either energy-source specific or deals with solely one of the energy policy pillars. Energy source specifics are handled in, for example, the UN's IAEA, the International Atomic Energy Agency. The IAEA is an independent science and technology-based organisation that serves as the global focal point for nuclear cooperation in the planning for and use of nuclear science and technology for various peaceful purposes, including the generation of electricity. It facilitates the transfer of such technology and knowledge, and develops nuclear safety standards. It verifies through its inspection system that States comply with their commitments – under the Non-Proliferation Treaty and other non-proliferation agreements – to use nuclear material and facilities only for peaceful purposes. Single-pillar organisations within the UN context are the UNFCCC and the one-time E4D conference.

5.4. Global but limited

In the group "global but limited" the G8+5 process is the main force behind discussions. At the Gleneagles summit in July 2005, the G8 adopted an important "plan of action for climate change, clean energy and sustainable development". In this plan the G8 countries, together with 5 leading emerging countries (China, India, Brazil, South Africa and Mexico), agreed on some 38 commitments and guidelines, dealing with all energy issues in a global and integrated way. A new paradigm for international cooperation was called for, taking into account the new development scenario resulting from climate change and an increasingly tense world energy context. The IEA was asked to analyse a number of relevant issues in more detail, bringing people and knowledge together. It is now catalysing innovation and creativity and identifying pathways to a better energy future. The program includes alternative energy scenarios and strategies; energy efficiency in buildings, appliances, transport and industry; cleaner fossil fuels and carbon capture and storage; renewable energy; and enhanced international cooperation. The IEA

reported back to the St. Petersburg G8 summit in July 2007. During that summit, a Saint Petersburg Plan of Action concerning global energy security was agreed upon, further building on the Gleneagles process.

Based on and inspired by Gleneagles, the "Gleneagles energy-climate process dialoguewas launched, for which energy and environment ministers of about 20 countries from 5 continents have been meeting since 2005. This dialogue should lay down the basis for the favourable conditions that are necessary to advance effective multilateral climate regimes in the global energy context. It is unclear, however, if and how this dialogue is effective. An interesting additional development is the parliamentarian process of the G8+5 countries. This so-called 'Legislators Forum' includes a number of key parliamentarians from the G8 group and is actively trying to influence their respective governments and political leaderships. They called very strongly on them in their February 2007 Washington Statement in which they underlined the importance of action to increase climate security as well as energy security and also urged them to lay down "the key elements of a post-2012 framework" and start "global negotiations by the end of 2007".The whole G8+5 process could be further fostered during the July 2007 Summit under the German G8 presidency.

5.5. Specific and limited

Discussions on energy specific issues with limited participations are taking place in organisations such as the IEF, the IEA and OPEC. The focus of the International Energy Agency, with its 26 members, started in 1974 with oil supply and crisis management, but has developed in a wider energy policy agenda. The IEA could be considered as the main intergovernmental energy think tank of OECD countries, and has resulted in, among other things, the G8+5 request to do extensive analytical groundwork for its climate change, clean energy and sustainable development. The Organisation of Petroleum Exporting Countries has been coordinating the oil production policies for its 13 members since 1961, with the aim of achieving a reasonable rate of return on its investments. This policy is also designed to ensure that oil consumers continue to receive stable supplies of oil. Increasing needs felt by IEA and OPEC members led to the establishment of the International Energy Forum in the early 1990s. The IEF acts as a forum to organise and foster producer-consumer dialogues, where at present some 60 countries participate. Since 2002 the IEF has continued its institutional development, and has established an IEF Secretariat. Activities focus primarily on oil markets, with the Joint Oil Data Initiative (JODI) being its first major accomplishment.

5.6. Regional

Regional organisations dealing with energy chain/s are either the regional organisations of the UN itself, or organisations that serve solely regional issues. The regional UN Economic Commissions have wider economic policy mandates, including energy issues. Their relevance for global energy discussions is, however, limited. Regional energy organisations that have specific competences, expertise and relevance are the Energy Charter Treaty (ECT), the Latin American Energy Organisation (OLADE) and the emerging African Energy Commission (AFREC). Similar initiatives for the Asian region are being discussed. The focus of the ECT is on energy trade, transit and investments between Western Europe and Eurasia and, with its 51 members, has the potential to govern the wider legal basis for energy trade and investment in the area. OLADE is its region's technical and political cooperation mechanism for energy development. AFREC has a comparable mandate for the African region.

5.7. The European Union

The EU, with its 27 member states, is developing and considering a common energy policy as a wider framework for its various energy activities. These range from legal frameworks for its internal energy market to policies and legislation on specific issues, such as renewable energy and energy conservation, and global agreements on issues such as climate change. Apart from legalities about the EU remit, there are still many policy and political differences about the vision, content and direction of a common EU energy policy. Specific events in 2005, 2006 and 2007, however, have given new momentum to the EU energy agenda, with new challenges for the EU to act as such in its external relations and in multilateral

forums. If these challenges are met, the EU platform would become more important for the international energy policy discussions for its member states.

Issue Category	Forum	Issues	Membership
Global & Universal	UN-CSD World Energy Council (NGO)	Climate Change Energy Efficiency Renewable Energy Access to Energy Supply Security	All countries
Specific & Universal	IAEA UNFCCC	Nuclear Energy Climate Change	Countries with nuclear energy Kyoto parties
Global & Limited	G-8 + 5	Climate Change Energy Efficiency Renewable Energy Access to Energy Supply Security	Main Global Powers
Specific & Limited	IEF IEA OPEC	Producer -Consumer dialogue Crisis Management & General Energy Policy Oil	Producers & Consumers OECD Countries Oil Producing Countries
Regional	ECT OLADE AFREC EU	Development Overall Energy Policy	Europe & Asia South-America Africa Europe

Table 5.1: Energy Issues and discussion forums

5.8. Conclusion

In looking at global energy agendas in the UN and elsewhere, where there are various ambitions to address the energy issue in relation to climate change and issues of global and sustainable development, the following reflections might be worth considering:

- With the possible exception of the G8+5, there is no global platform to discuss energy in its wider context, including climate and development issues. It could be appropriate to explore the set-up of such a platform, if the UN-CSD framework could facilitate these discussions under appropriate conditions. However, it might not be appropriate to duplicate work done elsewhere, either in specialised universal forums or in non-universal ones.

- If such opportunities are worth pursuing, it would be useful – and perhaps even necessary – to broaden governmental representation to include energy, financial and foreign policy experts.

- As there is no global mechanism for monitoring the discussions on global energy issues in their wider context, it might be useful to consider one, without interfering in the mandates of existing frameworks.

- In exploring options for these mechanisms, one possibility is to provide some overall strategic goals in the form of a 'road map' for addressing wider energy issues. Such a road map could include agendas for work in other organisations and a mechanism for intergovernmental review and assessment.

- If such a road map is considered to be worth exploring, it could also be appropriate to consider using the UN-CSD framework as a mechanism for intergovernmental review and assessment. Other alternatives for such a mechanism are also conceivable, within or outside the UN framework.

- Concentrating on more specific UN-CSD tasks in wider energy issues, new tasks could be explored. These might include carrying out specific actions to help individual countries with the formulation and/or implementation of their national policy; or introducing help desk functions for the purpose of giving advice to developing countries about best practice arrangements in the process of building energy policy capacities and related institutional frameworks; or initiating specialised energy policy squads for short term assignments, and short-term energy policy "fire brigades" for times of unforeseen severe energy supply interruptions.

6

Energy sources and technological development

In this chapter, energy technology developments and their impact on the energy sector, markets and policy will be briefly discussed. First, some comments are made on the importance of innovations currently shaping the energy debate, and on the role of technology in finding solutions to some of the challenges the world is facing. Secondly, an overview is given of different energy sources and innovations in relation to the most important policy aspects. Thirdly, some considerations are given about energy technology transfer to enhance the energy situation in developing countries; as well as the different projects of international organisations, followed by some remarks on the Dutch projects to relieve energy poverty. Although innovations are crucial for facing especially the environmental challenges ahead, implementation should be considered within the general goals of energy policy, and classic lessons from transfer of technology to developing countries should not be forgotten.

6.1. Energy technology and energy policy

Innovations in both energy technology and its applications propelled the start of the fossil fuel age, first with coal as the leading fuel, and later oil. Energy technology was, is and will be a crucial component throughout the whole energy value chain. The history of this energy chain is full of technology breakthroughs, but is also loaded with lessons for managing realism and expectations. Figure 6.1 gives some global indications for this process over the past and the future, indicating market share developments of primary energy sources and of various energy infrastructures.

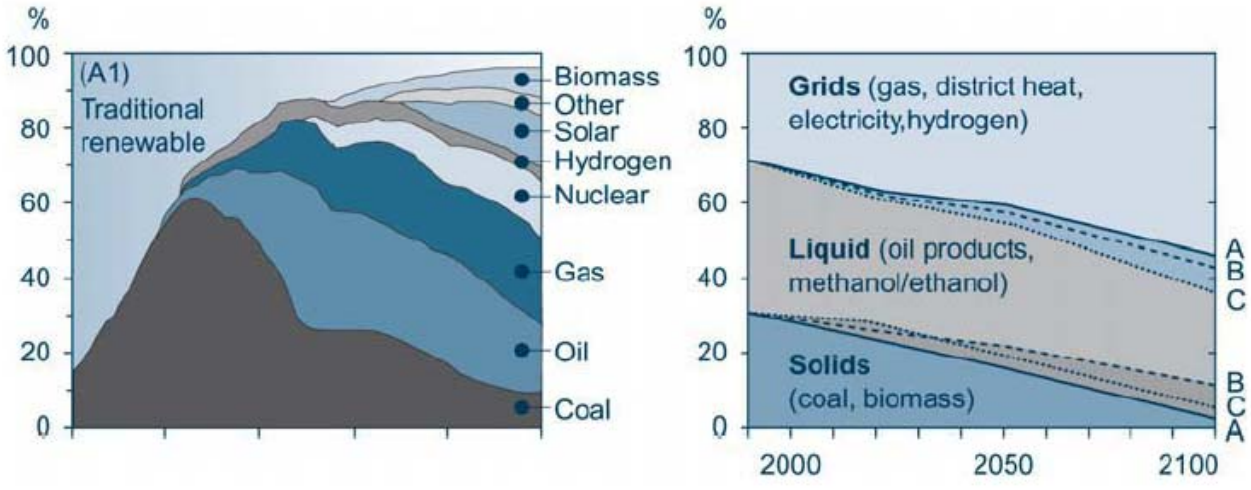

Figure 6.1: Worldwide developments of energy sources, consumption shares and infrastructures over the 1850-2010 time frame

Source: *Energy End-Use Technologies*, WEC, July 2004

Maintaining present levels of energy production and energy supply requires technological developments. Front-end technologies, aiming at exploring and exploiting energy resources in an environmentally friendly and economically justified way, have to be developed and applied. The same is true for the back end in the chain, with all sorts of enabling technology developments for efficient and clean energy use.

Although the importance of innovation is generally acknowledged, the role of governments remains hotly debated. This role is, to a certain extent, determined by the political colour of the government in office, but also runs deeper, being rooted in the general economic set-up that is linked to cultural and societal differences. These differences come to the fore in the differences in approaches to tackling global warming, with the Kyoto Protocol and its emission caps on the one hand, and the energy technology approach used by the Asia Pacific Partnership on the other. Forthcoming negotiations on climate change will not only have to find bridges between these two approaches; it is also necessary to make realistic assessments of the technological options.

6.2. Energy sources and technological developments

Historically, the world at large has relied on non-commercial energy sources, mostly biomass such as wood and dung. For many developing countries, this is still the case. Although in some publications non-commercial energy use is grouped under renewable energy and biomass, the use can hardly be called renewable or sustainable. For one, it is quite hazardous to the health of users. Local environmental degradation caused by non-commercial energy consumption can be considerable, ranging from air pollution to large-scale wood cutting. The availability of other energy sources to replace non-commercial energy will limit these local environmental problems, bring benefits to consumers in the form of heat, power, light, etc., and has additional indirect effects such as new time allocation away from energy provision and more flexibility in time allocation over night and day.

In principal it is possible to define three groups of commercial energy sources: fossil fuels (oil, natural gas, and coal), nuclear energy, and renewable energy (solar, wind, biomass, hydro). Each has its own characteristics and, to a large extent, their own value chain. Within each energy source, technological developments are underway. Each still holds potential for cleaner and more efficient use; especially renewable energy sources are still underdeveloped. The developments within nuclear and renewables largely depend on long-term support of governments in the form of subsidies and/or regulation for providing the correct market incentives. Considering the large amounts of coal throughout the world, the cleaner production and use of coal deserves attention as well. In separate boxes following section 6.3, we give some short and general – but certainly not complete – overviews of technological developments of major energy sources in relation to the three goals of energy policy: security of supply, market/price and environment.

6.3. Reducing energy poverty and technology transfer

Since the introduction of the Millennium Development Goals, energy has become more important in development issues, and the number of energy projects by international organisations and bilateral aid has increased considerably. Projects generally are oriented to renewable energies, sustainable transportation, energy efficiency and enabling activities, and include technology transfer. International organisations either prove financing (e.g., GEF, IBRD), execution (e.g., UNDP) or a legal framework for projects (e.g., UNFCCC).[56] Despite the increased focus, reducing energy poverty is not part of an integrated energy

[56] Electricity sector activities include off-grid- and grid-based activities and aim at substitution of existing primary energy sources and equipment, or at providing new access to electricity. Typical examples are off-grid and grid-based renewables projects (e.g., biomass, wind, solar, geothermal) and rural electrification projects. Transport sector projects are mostly directed at improving public transport, whereas energy efficiency projects generally aim at the industry or housing sectors. Projects vary from rather sophisticated efficiency improvements in industry (e.g., cogeneration, cleaner production) to improving basic access to energy,

policy of a consuming country. It is a development objective handled within departments for development aid. The potential benefits of combining the different objectives are considerable. Helping China and India to avoid to great reliance on oil and natural gas in favour of renewable or nuclear energy could lower prices because both markets would become less strained, it would enhance security of supply and contribute to the overall goal of a more sustainable world. Implementing the environmental objectives of industrialised countries (such as Kyoto commitments under CDM and JI) in developing countries can have a bigger impact on combating climate change for the same amount of money as measures in developed countries. In other words, the billions of euros spend on cleaning the energy mix within, for example, the EU, might be better spent in cleaning the energy mix in, especially, larger developing countries; or in energy efficiency projects in Russia, which would also contribute to security of supply by making more resources available for export.

Dutch development activities regarding energy focus on providing 10 million people by 2015 with sustainable (i.e., affordable and reliable) access to energy in their homes, small businesses, health clinics, and schools. Nuclear energy is excluded from the options, but projects do include fossil fuels. For that purpose, in cooperation with private organisations, several energy technology transfer projects are being financed, now leading to around 5.3 million new people having access to modern energy.[57] Fossil fuels are often excluded from projects, or not even considered. This might be logical from a sustainable development perspective, but fossil fuel energy has a long track record, and its technology is reliable and cheap. For all projects, all energy sources and the entire energy value chain should be taken into account to try and find the best solution for specific problems.

Projects also include technology transfer, which is not value free.[58] It leads to social change that can have a profound impact on societies, which is sometimes even the desired effect. For example, a more flexible time schedule can change traditional organising practices and social and institutional set-ups, making other developments possible. The outcome is, however, not always positive. Experiences from previous infrastructural projects, such as for clean drinking water, has led in certain circumstances to shifting labour divisions that have worsened the circumstances for women.[59] Such gender-related side effects are also possible in energy related projects, for example when wood collection is a job done by women. It is important to not forget the lessons from previous technology transfers, now that availability of modern energy technology has become such a seminal issue of international development aid.

Other lessons include a possible reluctance of people to become less self-sufficient or to become dependent on institutional structures that do not match with traditional organising practices based on, for example, family ties.[60] The reverse effect can also occur. If there are too many local development projects

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such as providing efficient stoves for cooking. Many projects are also directed at enabling activities, like education, stimulation of good governance, or help with administration and formulating action plans.

[57] Presentation Ton van der Zon (Ministry of Foreign Affairs), Clingendael, December 2005.

[58] In the eighties, working from sociological disciplines such as sociology of scientific knowledge, and ultimately based on social constructivisism, publications by scientists such as Bruno Latour and Wiebe Dijker showed how technology has different meanings for different groups with different consequences. These insights have become less theoretical in experiences in development aid and agricultural processes, most obviously in analyses published on the Green Revolution in, for example, India.

[59] Jiggins, J., Gender issues in agricultural technology development, in: Altieri, M.A. and Hecht, S.B., Agroecology and small farm development, Boston, 1990, p. 45-51.

[60] Institutions, whether organisations or not, have three pillars, regulative, normative and cognitive. In development aid, the focus lies on the implementation of the regulative dimension, which does not correspond well sometimes with existing normative and cognitive pillars. The result is not necessarily failure, but is certainly different than expected. In development literature, these mismatches have also been referred to as a lack of social capital, which is seen as a general problem for market development and good governance. See Scott, W.R., *Institutions and organisations*, Sage, London, 1995. pp. 33-62 and Hospes, O., *Secrets of institutional transformation of member-based financial self-help organizations in post-colonial Africa*, paper presented at the conference "Financial institutions in the political economy: cases from pre-colonial, colonial and post-colonial Africa", Rosendal, Norway, 1998. Solutions can be sought in grass-roots organisations and NGOs, although their role in energy development is at the moment underdeveloped. Publications by, for example, Uphoff, might offer possible starting points for future research – for example, Uphoff, N., Grassroots organizations and NGOs in rural development: opportunities with diminishing states and

coupled with a focus on empowerment of poor people – for example, using decentralised energy technologies such as windmills and solar power – governments of developing countries might fear a loss of control and legitimacy.

With technology comes a set of institutions and a regulatory framework under which optimal performance can be reached. The situation in developing countries might be unsuitable for this built-in set of conditions, although a superficial analysis of a specific energy source and technology might suggest otherwise.[61] The design context of technologies is a well-established fact in development literature. However, relevant analyses and research in energy technology are lacking. It is advisable to conduct energy development projects in multidisciplinary teams in which development experts and energy engineers work closely together. Again, it is very important to not repeat mistakes of the past and ignore lessons learned. Perhaps the so-called integrated water management project can offer a road map on how to proceed with energy projects.

It is unrealistic to expect to implement only expensive, state of the art technologies.[62] The high initial capital costs might be covered by development aid, but the higher maintenance costs and expertise required might become a strain later in the project. Projects should also become commercially viable at some point. Clean technologies are at a disadvantage in developing countries, just as they are in developed countries, since externalities such as environmental costs are not included in current pricing mechanisms.[63] It is much cheaper and easier to import second-hand cars and trucks or small power generators from industrialised countries, where they have been replaced by cleaner and more efficient units. By allowing these second-hand products to be exported to developing countries, industrialised countries contribute directly to local air pollution in developing countries, while at the same time they implement development policies to increase the access by poor people to – preferably sustainable – energy.

In the case of donor investments in energy systems, long-term support must be part of the plan. Otherwise, if systems later become unreliable, access to modern energy might prove to be only a temporary improvement, leading perhaps to an increased Energy Development Index but no improvement on the Human Development Index. Government and donor commitments will always be crucial. Long-standing relationships should be part of the transfer process, as building, operating and applying new technological devices requires stability and developed expertise. As for pricing, the role of government subsidies is important, but they could prohibit the introduction of efficient pricing mechanisms.

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expanding markets, in: De Janvry, A. et al (eds), *State, market and civil organizations; new theories, new practices and their implications for rural development*, MacMillian, Basingstoke, 1995, pp. 168-201.

[61] For example, nuclear power installations can supply large growing cities in developing countries with electricity. Nuclear energy is a well-established branch within the energy sector, the safety of the reactors has improved considerably, nuclear energy is very clean, and security of supply is not an issue. However, the regulation framework that ensures the safety of plants, waste storage and the spread of nuclear technology to third parties as implemented by developed countries will be difficult to implement in most developing countries. It is justified to question whether nuclear energy technology can feasibly be part of development aid. Nuclear energy is excluded from the plans of the Dutch government to reduce energy poverty.

[62] There are also the questions of whether the private sector is willing to share innovative technology that has not yet earned itself back for the company, and of how sharing of new innovations to developing countries is linked to the Lisbon strategy of the EU.

[63] See for example Bhattacharyya, S.C., Viewpoint: Renewable energies and the poor: niche or nexus? in: *Energy Policy*, 34 (2006), pp. 659-663.

Oil

Security of supply

At current production rates, there is enough oil for roughly 40 years. Oil is traded on a world market, which in recent years has become tight. Although oil is available globally, it is a politicised commodity. Both producer and consumer countries have used a wide range of tools - economic, political and military - to secure supplies. Most of these tools are not available to developing countries, such as strategic stock holding as an oil crisis response system.

Market/Price

Technology for oil exploration, production, transport and processing is highly developed. Oil is used as an energy source largely in the transport sector, in which technologies are readily available. The production and use of oil is therefore relatively cheap. The price of oil is volatile, however, due to a combination of economic and political factors, which potentially hampers economic growth, although the world economy has so far shown considerable robustness.

Environment

Oil production has a significant impact on the local environment, although the effects can be limited by using modern technologies. Governments in producing countries should be assisted if necessary in setting up a sound regulative system to limit ecological problems. Pollution can also occur during transport and at refineries. Again, modern technology limits the risks considerably. By burning oil products, a variety of polluting side products are released. Some emissions are under control with new technology. Limiting GHG emissions from transport is difficult; limiting oil consumption in this sector is still the best solution. Infrastructure and transport vehicles in developing countries are relatively polluting and fuel inefficient due to old technology.

Technological developments

The production of crude oil is continuously being improved and becoming cleaner, although the amount of investments and regulatory frameworks in producing countries largely determine whether the available technology is put to use. Developments have made the production of deep-sea oil more economically viable, as well as the production of unconventional oil. The latter is produced in an open mining process, increasing the local environmental impact. It is also highly energy intensive. Refinery processes are improved under pressure from environmental regulations, both of the process itself and of the end product. This leads to constraints in the oil supply chain, since the new capacity of crude oil is often heavy crude, which needs longer and more difficult refinery processes. In the transport sector, fuel cells and hybrid cars are considered to be the most important technologies in the short run to limit the environmental impact of oil products, although filters for diesel truck engines are also necessary.

Natural gas (1)

Security of supply

There are enough natural gas reserves to last at least 60 years. Natural gas is traded mostly regionally through pipelines. Liquefied Natural Gas (LNG) is becoming more important, making the gas market more global. Considering the low costs of pipelines and LNG projects and, especially with pipelines, the link of mutual dependency between producer and consumer, natural gas is considered a less risky fuel in terms of security of supply. Still, too great a dependency on only one supplier is considered undesirable.

Market/Price

Natural gas prices in many countries are coupled directly or indirectly to oil, making the prices for gas also volatile. Natural gas transport infrastructure is capital intensive, making natural gas a limited option for development, perhaps with the exception of countries with natural gas endowments.

Natural gas (2)

Environment

Natural gas is sometimes produced as a side product of oil refining. In the past this gas was flared, causing very high GHG emissions. Leaks of natural gas from pipelines are a source of pollution. The use of gas is relatively clean in comparison to the other fossil fuels, which makes it attractive for power generation in countries with Kyoto commitments.

Technological developments

Possibilities for producing natural gas in difficult circumstances such as deep sea environments will increase. Experiments and attempts to produce unconventional gas will continue, although large-scale implementation is still far off. Natural gas is used increasingly in the power sector. Cleaning of burning natural gas is important, by methods such as CO_2 capture and storage. Also interesting is Gas to Liquids (GtL), which can be used in the transport sector and burns cleaner and more efficiently then most oil products.

Coal

Security of supply

Coal resources are abundant (there are at least some 160 years left of today's consumption) and widely spread. Most coal consumption is near to coal mining. The world coal market is relatively small (< 15% of all coal produced ends up on the world market). Major coal exporters are relatively diverse and stable. Security of supply is hardly an issue for coal, although strong demand growth in China and problems in Chinese production has somewhat cornered the market in recent years.

Market/ Price

Coal is a bulk product, but is relatively easy to transport. Coal prices are relatively stable and were always below oil and gas prices. Placing a price on CO_2 emissions, especially in the EU, could change coal's competitive position in power generation. Technology will be the main driver for coal's future in the energy mix.

Environment

Coal production has various environmental impacts, especially in open mining. Burning coal causes considerable environmental damage and CO_2 emissions. All pollution can be technically managed, scrubbed or captured, recycled and/or stored. These technologies are currently under further development, especially to improve cost effectiveness.

Technological developments

Emissions from coal combustion and management of coal waste are largely covered by mature and well developed technologies. Combustion nonetheless has wide technological potentials, both for gasification and for liquefication, for example burning gas-from-coal for power generation together with CCS (carbon capture and storage) or CtL (coal-to-liquid) in transport. Both technologies could boost the role of coal in the energy mix. In addition, the burning of coal in combination with biomass could strengthen the role of renewable energy, whereas underground coal gasification would introduce environmentally-friendly techniques to the front end of the coal cycle.

Uranium

Security of supply

Uranium resources are considerable and largely unexplored. Price is a main driver for exploration. Present reserves would cover today's consumption for some 250 years. The uranium resource base can be further expanded by new and future explorations, including in the deep sea. Other fissile material fuel cycles are possible as well (thorium). Nuclear waste from dismantled nuclear weapons is also used as a source for nuclear energy. Various recycling modes of used fuels add further to uranium's reserves to production ratio. However, some of the fuel cycle steps require sophisticated and sensitive technologies that are only available in a limited number of countries. Due to proliferation concerns, this is not likely to change. Ideas have been put forward to form a nuclear fuel bank under multilateral control, but in the current international political climate are not likely to come about in the near future.

Market/ Price

The uranium market is well developed, and uranium prices are relatively low, due to stable, limited demand. Uranium's economic perspective largely stems from its low share in the cost of power generation as compared to other fuels. However, nuclear energy is very capital-intensive, adding to its economic risk. Once a power reactor is built and operated, economic risks are relatively low. It is unclear whether or how the costs at the back end in waste management and of decommissioning are, or can be, fully internalised in the price of nuclear power.

Environment

Uranium fuel cycles have (severe) environmental impacts, especially at the back end. Final disposal of high-level waste only exists on paper. In addition, radiation and safety issues are also a concern, not so much in normal operation, but due to risks of accidents. A new generation of reactors are, however, strongly diminishing risks of accidents.

Technological developments

Technological developments are taking place throughout the nuclear value chain. Inherently safe and more cost-efficient reactor types are on the boards, developed in large international projects such as the US-initiated G4 project (4^{th} generation of reactor types). There is also potential in improving fuel cycles, and especially in recycling, actinide partitioning and mutation (burning), diminishing the amounts of high-level waste for long-term final disposal. Both the developments in reactors and in fuel cycle add to the improved management of proliferation.

Wind Energy (1)

Security of supply

Wind energy is used mainly for power generation, although in developing countries it is also used for other applications, e.g., pumping water. Wind energy is problematic for electricity generation due to its reliability, which necessitates additional, more conventional, capacity. Coastal regions and offshore areas offer good wind conditions, leading to a concentration of wind power generating units there. In principle, this puts bigger demands on transmission networks, as excess electricity produced in the wind region has to be transported to the markets; and in times of little wind, electricity needs to be brought to the 'wind region'.

Market/ Price

Wind electricity generation technology has seen impressive technological advances in the last 15 to 20 years. Capacities per generation unit (windmill) have risen by a factor exceeding 20, and generation cost per unit of electricity is nowadays only about twice as high as for electricity generated from fossil fuels. Costs are higher when the improvements on transmission networks, etc. are calculated in.

Wind Energy (2)

Environment

Parks with the most modern wind turbines need huge amounts of space. The number of suitable locations is limited in densely populated areas. Planning for wind mills is increasingly experiencing NIMBY-effect resistance in developed countries, since windmills are considered to be ugly and noisy. In addition, local environmental NGOs are concerned about bird life.

Technological developments

The expectation is that windmills will continue to improve, making the generation per mill higher and reducing costs. Several countries are considering and planning building windmill parks at sea, which is in itself an impressive engineering scheme.

Solar

Security of supply

Solar energy contributes to security of supply, although its reliability depends on the amount of sunlight available. Considering that many developing countries are tropical, solar energy might be interesting. There are currently three technologies that convert solar energy in electricity or warmth for human use. Solar cells are easy to handle and require virtually no maintenance. Solar cells already play an important role for small applications in sunny regions that are not connected to an electricity grid. Solar thermal technologies for electricity generation use sunlight indirectly, by using it to heat a medium like water (transforming it into steam) or air, which then is used to run a generator. Solar thermal technologies for heat production make use of sunlight for water- and space heating. So-called collectors can be installed, for example, on the roofs of houses, where the sunlight is 'collected' and transferred to the buildings' heating and warm water systems.

Market/ Price

Solar cells make use of photovoltaic (PV) technology, which transforms sunlight directly into electricity. Significant technological advances have been made in recent years, yet generation cost for electricity from solar cells currently range from 30 to 65 USD cents per kWh, depending on the location. (IEA 2001a: 356). This is not competitive with electricity generation costs from large-scale fossil fuel power plants, which are in the order of around 3 to 5 cents/kWh. Significant future cost reductions might bring generation costs down to levels which are comparable to household consumer electricity prices. Solar thermal technologies for electricity generation are likely to remain rather expensive in comparison to fossil fuel power generation. Since they need to be applied on a relatively large scale and require more maintenance, the application of these technologies on a household level is far less likely than for photovoltaic technology. How economic the use of solar thermal technologies for heat production is, depends on the price of substitute fuels for space- and water heating. Due to relatively high oil prices, this technology is competitive. However, the high up-front investment costs and the uncertainty about the development of fuel (oil, gas) prices appear to withhold consumers from installing this technology on a larger scale.

Environment

Solar energy is clean. The biggest concerns are with large-scale applications, since these have possible negative consequences for the local environment.

Technological developments

Efficiency gains will make large-scale implementation more likely and can bring the costs down. Increasing economic competitiveness should be a priority.

Biomass

Security of supply

Bioenergy is used in various forms. Traditional biomass, such as wood and dried manure, is a very important source of energy in many developing countries. More modern ways of using bioenergy have emerged over the past decades. Various applications are now possible, among them the cultivation of special energy crops intended to be burnt for warmth and electricity generation, the cultivation of crops and oil seeds, from which motor fuels can be derived, and the derivation of 'biogas' from manure, which can be used in a way similar to that of natural gas. 'Biogas' can also be produced by the gasification of biomass. Biofuels for the transport sector can decrease oil dependency and increase security of supply. However, many countries will probably have to import biofuels, due to a lack of sufficient agricultural land or suitable climate for biofuel crops. Crops such as sugar cane are also used in food product, for which demand has been rising again. The price increase has made it more attractive to sell sugar cane for sugar than for biofuels, causing a potential security of supply problem.

Market/ Price

Economically speaking, the use of biomass is not yet competitive in comparison to oil, although efficiency has improved and costs have decreased, especially in Brazil. It must not be forgotten, though, that this has come from major subsidies by the government, which are not reflected in the price. In Europe it is estimated that using biomass in power generation is cheaper than using biofuels for transport.

Environment

If special energy crops are grown, this production can compete with food production for arable land, tending to make food crops more expensive and to decrease food production. Large scale production can also lead to mono-cropping, leading to a decrease of biodiversity, and to the burning of rain forests. A certification system might limit these problems. Traditional biomass is not sustainable and not clean.

Technological developments

Improvements in efficiency, as well as cost reduction, can still be expected. Most intersting are perhaps the so-called 2nd generation fuels, which are more efficient and do not need bio-energy crops. Technology for GtL and CtL can also be used for liquefying biomass and for syngas installations, making the use of coal possible for the same power generation facility.

Hydro

Security of Supply

Hydropower is a secure source of energy. There is still considerable scope for increasing hydroelectricity generation, particularly in developing countries.

Market/Price

It is very often an economically competitive alternative to fossil fuel fired power generation. Virtually every country in the world generates at least some hydroelectricity, but the potential differs greatly per country.

Environment

Hydropower is very clean energy. However, large hydropower projects require substantial dams that can have a strong local environmental impact, disturbing ecosystems and altering the region's water household. Projects might entail the replacement of inhabitants, causing social unrest. Thus, hydropower projects regularly face local opposition. The smaller a project, the more limited the negative effects are in general; however, costs per unit of electricity are usually higher.

Technological developments

Improvements continue to be made, but no major breakthroughs are expected in conventional hydropower. Experiments continue in tidal and wave power, although large-scale applications are still problematic for a variety of reasons.

Other technological developments

Other developments that could be mentioned are ones in the context of energy efficiency. Technological improvements, both in small-scale systems and in larger energy applications are still very promising. Lightning, for instance, has large efficiency potentials in both public sectors and building environments. In addition, energy carriers such as hydrogen also have interesting potentials for the medium and longer terms. Nuclear fusion however is still a very long term option, in both its technological and economic maturity. In the case of developing countries, it might be more interesting to focus on energy demand technologies.

6.4. Conclusion

Innovation is key in meeting future energy demand in a clean and sustainable manner. Achieving innovation should be considered within the three goals of energy policy and wider policy objectives so as to avoid failures. Especially renewable energy technologies require government support in the form of subsidies or regulation, to create the right market incentives to enhance their possibilities. Renewable energy will quickly become competitive when externalities such as environmental degradation or security of supply measures for fossil fuels become part of the pricing mechanism. This has to be done globally; otherwise it will be harmful to the international competitive position of a country, which in turn will hurt general economic policy.

Energy poverty reduction projects should not be determined too lightly. Lessons learned from decades of experience with development should be central to the new projects, especially considering energy technology. Otherwise these projects will only lead to expensive mistakes without any lasting benefits for poor people. Countries, organisations and companies have to realise that energy development projects are complex, long-running projects that require commitment and support.

Developed countries should examine potential overlaps between their development policies, energy policies, foreign policies and energy transition policies in more detail to make their policies more effective. This also means looking for possible contradictions, such as the export of old and polluting cars, buses and trucks to developing countries.

Focusing on ongoing UN-CSD discussions and elsewhere, it might be appropriate to consider some of the following approaches:

- Define the energy technologies that can be usefully transferred between developed and developing countries, including a more precise notion of the role of market forces in that context. Consider also environmental concerns and institutional set-ups in developing countries when making technology choices. This might lead to the exclusion of certain technologies from bilateral and multilateral development aid frameworks.

- Consider the expansion of multilateral frameworks in this area, such as opening up IEA Implementing Agreements on new energy technologies for non-IEA countries, or broadening the role of the UN Foundation in energy technology transfers.

7

Energy policy in the Netherlands

In this paper, some key characteristics of Dutch energy policy are described. Three elements are discussed in more detail, as they might be of interest in the CSD preparatory process.

7.1. Brief outline of Dutch energy policy

Dutch energy policy is based on three pillars: supply security, affordability and environment. Instruments focus on supply sources as well as on demand. Main primary energy sources used are oil, in particular for transport, and gas. Coal, nuclear and other energy sources play a smaller role (Figure 7.1). Demand has increased from about 60 Mtoe in the 1970s to 75 Mtoe now, and is expected to continuously rise further until 2020.

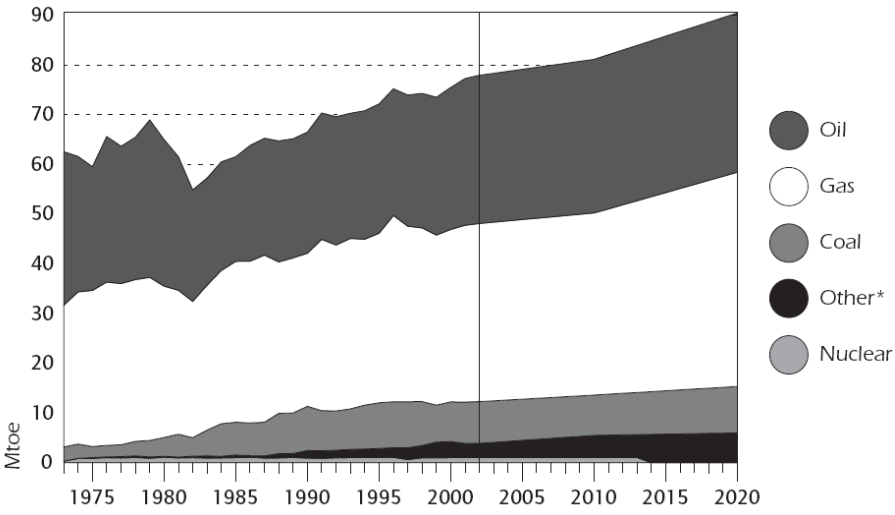

Figure 7.1: Total primary energy supply in the Netherlands, 1973-2020

Key characteristics of Dutch energy policy are:

- An integrated energy policy, focusing on the triangle markets, supply security and climate;
- International cooperation on theEU level;
- Securing vital Dutch energy interests on a national level; and
- A long-term approach aimed at transition towards a clean & lean energy sector.

The long-term "energy transition approach" is discussed in Chapter 8. The importance of international cooperation and an integrated policy approach to energy focusing on three pillars is also discussed in more detail elsewhere in this paper (e.g., in the Introduction). Apart from that, it has also to be realised – although this is much more implicit in official policy papers – that Dutch energy policy also pursues specific national policy interests, related to, e.g., the specific position of natural gas in the Netherlands, the Port of Rotterdam and its oil refineries and, to a lesser extent, the importance of industrial activities.[64]

However, rather than aiming to give an overall picture of Dutch energy policy, this chapter will focus on three specific case studies that might be of interest for wider energy policy dialogues in the UN or elsewhere. These are:

- The institutional arrangements for gas exploitation and supply,
- The organisation of energy efficiency, and
- The 2005/2006 agreements made by government and private parties combining issues with respect to gas and nuclear energy with the development of renewables.

The first case study gives an example of how developing countries can profitably exploit their own natural resources (securing vital national interests and/or supply security). The second case study explores how a country, given a certain degree of organisation of its energy sector, can stimulate energy-efficient development (with attention given to environment and affordability). The final case study examines a sophisticated type of market regulation.

7.2. Organisation of gas exploitation and supply

The Netherlands is often characterised as a 'gas country'. Since the discovery of a large natural gas well in the northern part of the Netherlands in the 1950s, this energy source has been a crucial factor in Dutch energy policy. Not only were virtually all households in the Netherlands connected to the gas network constructed from the 1960s on, but also the income from natural gas exports financed much of the social security and many other government purposes in the Dutch economy. A strong public-private partnership and the unique geologic characteristics of the large Groningen field, along with a number of smaller offshore and onshore fields, were large contributing factors to the success story of Dutch gas policy.

The assured income from natural gas in the Netherlands was not only a blessing. Well known is the term "Dutch disease", reflecting a situation of recession in the 1980s caused by high government spending in the 1970s. This spending was financed by the income from natural gas exports, but was without structural backing in the economy. Nevertheless, the organisational construction of gas exploitation and supply in the Netherlands is generally seen as a success, providing more benefits than drawbacks.

Analysing the organisation of Dutch gas exploitation and supply in a nutshell, its history can be divided into three periods. In the first period, roughly from the discovery of the Groningen gas field in 1959 to the first oil crisis in 1973-74, the Dutch gas exploitation system was established in a time of conceived abundance of natural resources.[65] Profits and ownership of natural gas exploitation were distributed between private parties and government in an ingenious 50/50 way, with an income split on a gliding scale increasingly in favour of the Dutch government. Other fundamental principles of gas policy established in that time were the foundation of an integrated infrastructure organised as the Dutch *Gasunie*, and the coupling of gas prices to those of oil. Precondition for this organisational construction was the

[64] Mention should be made of large industrial energy users (chemical, steel and aluminum industries) and the uranium enrichment facility of Urenco in Almelo.
[65] Reference should be made to the CIEP-publication "Natural gas in the Netherlands", by Correljé, vd Linde and Westerwoudt.

establishment of a de facto monopoly in supply, in practice preventing consumers from buying gas elsewhere at cheaper prices.

In the second period, until the late 1980s, 'Dutch disease' and the perception of scarcity led to a fundamental revision of natural gas policy. The search for small fields was actively stimulated by government, and the role of the Groningen field could be transformed to that of a swing producer. This approach, which still is followed today, was coined the "small fields policy".

The third period, starting in the late 1980s and lasting until now, is characterised by the transition towards a liberalised European gas market. The market is opened to suppliers other than Gasunie, and trading and transport activities of this company are unbundled. Also, policy is now gradually preparing for times in which the Groningen gas field will be exhausted and the Netherlands will be looking for alternatives to natural gas. Connecting pipelines to Norway and the United Kingdom, and the strategic position of Rotterdam harbour as a potential import hub for LNG, will make the Netherlands a future European "gas roundabout". Also, the future use of the natural gas infrastructure for supplying hydrogen and the possibilities of biogas are actively examined.

Factors behind this rather successful development are manifold. Any analysis has to take into account a combination of geological, geographical, economic and policy factors responsible for the development. Some of the most important are:

- Geology: One exceptionally large field and many small fields.
- Policy: Public Private Partnership chosen as a way to exploit natural gas resources in an optimal way, with exploitation investments by private parties and income divided in a harmonious way between private parties and government, creating a win-win situation.
- Geography: Large potential for gas consumption in neighbouring countries (in particular Germany). Future: position between other producers and consumers, distribution capacity for LNG (Rotterdam harbour).
- Policy: Priority given to exploration of the small fields in order to maintain the large field as a swing producer in the Dutch and European market for as long as possible.
- Policy/Economics: Coupling gas prices to market value (in practice: oil prices), leading to market-based income for private companies and government.

To summarise our lessons on this policy issue, the following issues relate the key benefits and drawbacks. State income increased substantially, initially being spent on social security, but later on strategic investments in education and infrastructure. There was wide availability of a relatively clean energy source, bringing not only employment in the gas industry, but also attracting energy-intensive industries with additional employment opportunities. On the other hand, we also saw the impact of a relatively "easy" income in the smoothening of budget procedures and spending disciplines. Additionally, abundant gas supplies delayed structural energy policy choices for many years, and gas-oil price linkages added further oil market volatilities to the Dutch energy process, especially in electricity with its 60% gas-based power generation.

7.3. Energy efficiency in the Netherlands

The organisation of energy efficiency in the Netherlands is based on voluntary commitments.[66] However, this does not mean that there are no obligations for organisations to meet the targets they have set. In fact, the system is a balanced combination of carrot-and-stick methods, in which subsidies and technical services provided by government serve as a carrot for multiple-year agreements with business, and regulation via permits and energy levies as a stick.

There are four periods in energy efficiency policy in the Netherlands that can be discerned: the period between the two oil crises from 1974-1979, the 1980s until the 1989 new Electricity Act, the early 1990s until the 1998 Electricity Act, and the "liberalised" period from that year on.

The early days of energy efficiency policy were characterised by fragmented actions, in particular based on household energy conservation and transport. Promoting public awareness played a key role in policies. After the second oil crisis with its rising oil prices, quantitative energy efficiency targets were set: 2% of energy efficiency improvement per year was the goal to be obtained. More efforts were put into industrial energy efficiency, and larger governmental budgets became available, including subsidies for investments by business in energy efficiency. From 1985 on, however, interest in energy efficiency decreased as a result of lower oil prices. Budgets for energy efficiency were reduced.

The 1990s were a crucial period for energy efficiency policy in the Netherlands. The 1989 Electricity Act reorganised the electricity sector by unbundling generation from distribution companies. Due to the specific regulations, an interest of distribution companies for investing in new cogeneration plants arose. A 'dash for cogeneration' was the result, leading to substantial efficiency improvements in the electricity sector. Increasing political awareness of environmental issues (notably the greenhouse effect) added to wide public and industrial acceptance of energy conservation policies. The distribution companies signed a ten-year agreement for stimulation of energy efficiency with government, financed by permitted add-ons to energy prices. A large part of the energy efficiency targets obtained came from the cogeneration plants constructed. Also, multi-year agreements or covenants were signed by government with almost all industrial and business sectors, represented by their respective umbrella organisations. In the late 1990s, more than 90% of industry participated in these agreements. The principal motivation for stimulating energy efficiency changed from exhaustion of reserves to climate change.

With the start of liberalisation of the electricity sector in 1998, however, interest in energy efficiency declined. Principal concern of the power companies became to obtain a good market position. Ways of reducing prices dominated the debate, and energy efficiency played only a minor role in attracting new customers. Nevertheless, one more important energy efficiency covenant was signed: in the "Benchmarking covenant", large industry agreed to work on belonging to the top of worlds' most energy-efficient companies by 2012. Since 2005, interest in energy efficiency has once more been on the rise. Climate change and limited successes of renewable energy sources so far, as well as the fear of oil import dependency from unstable political regimes seem to be key driving factors this time. "White certificates", tradable energy efficiency certificates, are the present buzz words. However, introduction of the white certificate system is still pending.

Overall, energy efficiency policy in the Netherlands developed rather successfully, with large support from business and industry. However, a drawback of this system is that there are limits as to the level of voluntary energy efficiency efforts to be obtained: deals between government and industry require compromises. Analysing the history of energy efficiency in the Netherlands, several factors seem important for the developments. In particular, the system of energy efficiency covenants found its origin in

[66] The term "energy efficiency" is generally used to express a reduction of the energy use per unit of GDP. "Energy conservation" generally means an absolute reduction of energy consumption. In the Netherlands, despite significant successes in increasing energy efficiency, energy use in absolute terms is still increasing and expected to increase further.

a consensus-based and well-structured society. Business in the Netherlands is hierarchically organised in sector organisations, making contacts of government with umbrella organisations of business sectors relatively easy. There is a generally harmonious relationship of business with government, resulting in mutual trust as a basis for long-term agreements. The success of cogeneration in the 1990s is due in large part to the specific regulations surrounding the unbundling of generation and distribution during that time.

Again, summarising key benefits and drawbacks of this policy issue, we would note that there was, on the one hand, broad-based support by business and industry of energy efficiency efforts, whereas on the other hand the required compromises between government and industry did set limits as to the level of ambitions.

7.4. Public-private deals for development of renewable energy

In 2005, two unusual deals were made between government and private parties about issues in energy supply that had been a source of conflict for many years in the Netherlands.

It has been known for a long time in the Netherlands that in the *Waddenzee*, a shallow part of the North Sea close to the Groningen gas field, also substantial gas reserves are available. So far, however, exploitation of these reserves has not been possible because of fears that the valuable ecosystem of the Waddenzee, a breeding and resting place of many types of European birds and home to many types of fishes, would be disturbed. Exploitation therefore met with fierce resistance, particularly by environmental organisations involved in conserving the Waddenzee ecosystem. This led to a stalemate of more than 20 years.

In 2005, largely due to the process of bringing together all involved parties, a breakthrough was obtained. An integral agreement was signed, involving not only gas-winning and environmental organisations, but also fisheries. It was agreed that gas winning would be allowed under strict environmental conditions with close monitoring of effects, that fishery of particular kinds of shells would be stopped with financial compensation paid to fishermen, and that a substantial part of state revenues from gas exploitation would be used for nature conservation as well as the sustainable economic development of the region, including the development of tourism.

A similar win-win deal was obtained in the field of nuclear energy. Closing of the Netherlands' only remaining nuclear power plant had been in discussion for many years. In 1994, political decisions were made for closing down the power plant in 2004. Legality of these decisions was questioned in court cases, resulting in the conclusion that there was no juridical basis for closing down the power plant. It was then politically agreed to allow the plant 40 years of operation and to terminate operation in 2013. However, it again became apparent that a firm legal basis for this decision did not exist and that implementation of its shut-down was considered to be impossible without agreement of the owners. Changing political views about the role of nuclear energy in the electric power mix has subsequently led government to explore a deal with the owners. Chaired by a neutral party, negotiations between government and owners led to an agreement signed in 2005, allowing the power plant to continue operation until 2033 if a large part of the revenues from electricity generation obtained by the owners in this way would be reserved for investments in renewable energy, to be initiated by the electric power companies owning the nuclear power plant.

Several key elements are common to both deals:

- A breakthrough past the "traditional" patterns under which the previous conflict evolved;
- An integral approach involving all parties;
- A neutral mediator, trusted by all parties; and

- Combining economic and environmental interests through distribution of funds.

7.5. Conclusions

What can be learned from these case studies of Dutch policy for the wider energy dialogues within and outside the UN system? In the first place, studying the Dutch gas model in more detail can be worthwhile for developing countries wishing to exploit their natural resources in a successful way.[67] Specific geological, geographical and economic situations should be taken into account by governments when they wish to optimally exploit their natural resources. An agreement between private and public parties can be beneficial to both parties, provided that there is a good balance between obligations and profits for both of them. Keeping an open eye for changing external circumstances that might make organisational changes in the national exploitation structure necessary is a third lesson that can be learned. Dutch government could provide the necessary institutional knowledge as a form of development aid to those countries wishing to gain more information on this issue.

The second case study shows that energy efficiency models on a voluntary basis with agreements such as the Dutch covenants can work in societies in which business is well organised and in which there is a general understanding between government and business. Through a constant dialogue between these parties, a harmonious achievement of energy efficiency targets can be achieved. However, it is also clear in this model that there are compromises needed between government and business which, depending on the outcome of the negotiations, might set limits to the level of energy efficiency to be achieved. On the other hand, a clear advantage of this 'harmonic' model is the support by the business community, which reduces the need for government to intervene with 'control and command' policies.

The two 2005 governmental deals with private parties, finally, show that a breakthrough in long-lasting environmental conflicts in society can be obtained, provided that all parties have some benefit in the arrangements made. Care should be taken to involve all parties concerned, and unusual thinking patterns should be actively stimulated.

[67] Bolivia is already examining the merits of the Dutch gas model.

8

Energy transition policy in the Netherlands

The Netherlands' Energy Transition Policy approach is a new and very promising approach to energy innovation policy. As such, it could serve as an example of best practice in the CSD conference. However, there are also some potential risks that have to be taken into account when considering whether to apply this approach. This chapter gives an outline of Dutch energy transition policy and analyses its promises and pitfalls in an international context.

8.1. Characteristics of Dutch energy transition policy

Dutch "Energy Transition Policy" is a new approach to energy innovation in an industrialised country. Its goal is to achieve long-term sustainability and competitiveness in the energy economy. Its main characteristics are:

- A long-term focus;
- Building support in society through explicit public-private cooperation and partnerships;
- Focus on the process, no pre-defined technology paths, and objectives towards a sustainable energy supply system; and
- Inter-ministerial, project-based governmental organisation.

Shortly before the year 2000, it was concluded by Dutch policymakers that the traditional overall approach to energy innovation in the Netherlands had not rendered sufficient results. In particular, government-led, closely predefined technology development paths had not resulted in a breakthrough in cost-effective new energy technologies. New, promising initiatives by market parties were lacking; or had limited successes in, and few prospects for, becoming cost-effective in a market situation.

Therefore, a new overall policy approach was sought, in which a focus was placed on how to build a sustainable energy sector in a competitive market situation. The approach was coined "Energy Transition Policy". Work on this approach started with a report in the year 2000 by the Ministry of Economic Affairs, responsible for energy policy in the Netherlands, looking into prospects for the Dutch energy sector in the year 2050. With this report, a long-term time horizon was set for energy transition policy, looking ahead fifty years and trying to identify relevant trends for the energy sector in this time frame.

As a next step in 2001, the Ministry[68] introduced "the South-bound voyage" as a metaphor for Dutch energy transition policy. The metaphor gave a picture as to what the energy transition policy wanted to stand for: an approach that had its "final destination" and "travel companions" clear, but the "means of transport" and "directions to be taken" were left open. "South" in this metaphor stood for the destination: a sustainable and competitive energy supply system. Most innovative of this report, however, was the network approach applied by government, identifying market parties, including business and

[68] Ministerie van Economische Zaken, De reis naar het zuiden, 2001.

environmental NGOs, as "travel companions". These travel companions were subsequently invited not only to participate in the process, but even to take the lead in identifying cost-effective ways towards a sustainable energy economy.

From the year 2001 to 2004, the transition process was led by four Ministries separately. As described in the fourth National Environmental Policy Plan,[69] fundamental transitions in agriculture, transport, energy and biodiversity were the aims. In 2005, these separate paths were combined, and an inter-ministerial organisation was set up between the six relevant Ministries: Economic Affairs, Environment, Agriculture, Traffic, Foreign Affairs and Finance. Task of this project-based organisation was to coordinate themes relevant to the energy transition policy and, in particular, to bring together all governmental expertise necessary to further cross-cutting issues relevant to energy transition. The organisation was also meant to be "initiator and driving force of the energy transition, responsible for the dialogue between government and society, and caretaker of the internal coherence of the programme".[70]

Having worked out the themes in an initial phase in the years 2002 and 2003, subsidies were introduced: the Support of Transition Coalitions (*Subsidieregeling Ondersteuning Transitie-coalities*, or OTC) and the 'Single Opportunities' Investment Scheme (*Unieke Kansen Regeling*, or UKR), so as to invite market parties to come up with project proposals that fitted into these themes.[71] Also in 2005, a "frontrunners desk" was opened within government, to provide one particular address to which innovating businesses could direct themselves for governmental support. Most fundamental innovation in the transition process, however, was that in order to specify in more detail the "roads to be taken towards the South", a limited number of public-private platforms were started by the Ministry, which were mostly led by market parties.

Names and topics of the selected energy transition themes changed over the years, due to the discussions with stakeholders. In 2002, energy transition policy started with four main themes: International Biomass, Modernisation of Energy Chains, A Sustainable Rijnmond (Port of Rotterdam) Area, and New Gas. From 2005 onwards, the following *transition themes* have been identified:

- New Gas & Clean Fossil,
- Green resources & Feed stocks,
- Sustainable Mobility (vehicles and fuels),
- Efficient Energy Chains,
- Sustainable Electricity, and
- Energy efficiency in the Building Environment.

For each of the themes, a specific "Steering Platform" has been created in which all relevant market parties and government agencies participate. In addition, in 2005 a high-level "Task Force" with CEOs from large businesses, banks, research and NGOs was created. The Task Force assessed the various transaction themes and translated them into a more global Transaction Plan of Action in a report issued in May 2006.[72] The report developed a number of ambitious targets, such as 50% fewer CO_2 emissions in 2050, the promotion of economic growth and the enhancement of Dutch activities in the field of energy, annual and cumulative energy efficiency targets of 1.5-2%, and a continuing process towards the

[69] Ministerie van VROM, Nationaal Milieubeleidsplan 4, 2001.
[70] Ministerie van Economische Zaken, Interdepartementale Programmadirectie Energietransitie, werkplan 2005-2006.
[71] OTC € 4.5 million, leading to more than hundred viable transition ideas and coalitions, UKR two annual tenders, involving in 2005 in total € 22.5 million and in 2006 € 30 million.
[72] Meer met Energie; Task Force Energietransitie

development of a sustainable Dutch energy economy. The Dutch government, in its reaction, invited the Task Force to make more practical and instrumental recommendations for the implementation of the Transaction Plan. In an Interim Report, issued in December 2006, the Task Force gave a first outline of the necessary institutional and budgetary set-ups for the required implementation.

The Task Force heavily stressed the need for a coherent and consistent set of instruments providing for multi-annual stability and reliability for stakeholders and industry. In addition, it was argued that the policy of energy transition would require an increased level of European cooperation and participation by other interested member states.[73] As for financial means, a yearly budget has been proposed, running from B€ 1 in 2007 to B€ 2 in 2011. In addition, a joint public-private Participation Fund should be established for financial participation in new innovative sustainable energy projects. Further established should be a new but small and independent body for managing and directing the energy transition programme and advising the government on the relevant policies. Political support is indispensable for the whole process, as is a medium-term directed acceleration programme that should include clean fossil and nuclear options. In February 2007, a new Dutch government entered office with clean and sustainable energy as a major pillar of its political itinerary.

8.2. Advantages and risks

The Energy Transition Policy can only be judged on its results in achieving energy innovation. Being now only a few years after its start, it is too early for a final judgement. Nevertheless, some advantages and risks of this approach can already be formulated. Advantages of the energy transition approach are profound and lie particularly in:

- Broad support for energy innovation plans made through public-private policymaking, involving business and NGOs from the beginning;
- Integration of all existing and new policies relevant to energy innovation via a dedicated, inter-departmental organisation;
- An aim of consistency of policies through a long-term horizon; and
- A focus on the innovation process rather than on specific technologies.

However, lessons learned from practical experience with the approach chosen in the Netherlands also bring to light some risks that have to be taken into account by any parties wishing to adopt a similar approach. Some of the main risks are, for instance, the question of who should take the lead, in other words, the possibility of "much talking, but limited action". Another risk is the detachment from short-term, practical policy, and the lack of clear criteria for success. The limited integration with foreign policy is another risk. These risks are discussed in somewhat more detail below.

Who is taking the lead

Initial aim of the Energy Transition Policy was to have market parties take the lead in formulating promising energy innovation paths. Therefore, market parties were explicitly invited to chair the project groups having to identify these routes. From their discussions, however, it became clear that, without government explicitly stimulating innovation, rather few initiatives would be able to survive under market conditions. Hence, the rather traditional approach of giving subsidies was chosen to support innovative projects. Over the years, in policy papers, government also showed more and more willingness to take the lead. Illustrative is that, whereas in initial communication documents the role of government was seen as

[73] CIEP issued a study on Coalitions for Energy Innovation in Europe (December 2006), which was commissioned by the inter-ministerial organization for Energy Transition.

merely supportive, later policy documents assume a leading role of government in seeking coalitions for energy transition in society.[74] Therefore, even in an open, multi-actor and societal-based approach of energy innovation, it is clear that government takes the lead in formulating at least the basic preconditions for the process and for its support.

Consensus-building slows down action

From the initial start in the year 2000, it took five years to formulate basic routes for energy innovation. Practical results in terms of actual energy innovation and innovative concepts are so far limited, despite the fact that many projects are 'on their way'. Some innovation routes had to be reformulated, staffing of the project groups changed and some initial ideas failed. Therefore, the Energy Transition Policy has been criticised for resulting in "much talking, but limited action". Although this is perhaps too easy a criticism, as involving many parties with different backgrounds obviously implies a carefully implemented dialogue, it should be realised by any country wishing to adopt a similar multi-actor approach for energy innovation that this is a long-term process. Also, changes on the way have to be taken into account explicitly, as failures have to be accepted as an integral part of this learning-by-doing approach.

Detachment from short-term, practical policy

Energy Transition Policy in the Netherlands is guided by an interdepartmental project group within government. Apart from the work done by this project group, overall energy policy is carried out by others within government. Although much effort is put into the integration of the various policy initiatives taken, in practice, short-term measures sometimes seem to conflict with long-term aims. For example, sudden changes in modalities of subsidies, which were applied in the years 2000-2005,[75] do not contribute to long-term investor stability. Rather, governments in any country wishing to stimulate an energy transition should aim to formulate policies that are, as far as possible, robust for a period of 20 years or longer, and preferably as little as possible dependent on changes in governments or economic developments.

No clear criteria for success

Focusing on the process complicates the formulation of criteria for success. Even if a good process is initialised and maintained, the final achievements of energy innovation and reduction of energy consumption and emissions have to be delivered. The Dutch interdepartmental Energy Transition Policy project organisation so far has, for example, formulated process goals only in terms of number of projects to be started, platforms to be running, etc. A "hard" criterion for emissions reduction or energy conservation to be obtained through the initiative is still lacking.

Limited integration with foreign policy

The Dutch interdepartmental project organisation for Energy Transition Policy coordinates the activities of six Ministries engaging in energy matters: Economic Affairs, Environment, Agriculture, Traffic, Finance and Foreign Affairs. Energy Transition activities have, however, hardly been integrated into those of Foreign Affairs. In particular, in the field of development cooperation, where the government has committed funds to provide 10 million people with access to modern energy services, opportunities exist

[74] Compare e.g. the formulation in a 2002 policy document of Energy Transition as "a project of companies, organisations and consumers, supported by the Ministry and embedded in international developments" [Nieuwsbrief Energietransitie Nr 1, 26 September 2002, with a formulation in 2005: "Government has to actively seek support in society for Energy Transition, and has to initiate coalitions with several actors in society for that purpose" [Werkplan Interdepartementale Programmadirectie Energietransitie 2005-2006, November 2005].

[75] E.g., allocation principles for subsidies for wind energy at sea were suddenly changed, and subsidies for investments in energy-efficient equipment stopped.

to stimulate energy transition activities in developing countries, but these integration options have not yet been fully explored.

8.3. Conclusions

Other countries might profit from the lessons learned by applying the "transition approach" adopted in the Netherlands. It could be worthwhile for them to adopt strategic approaches to energy innovation similar to the one explored in the Netherlands. Such approaches could be successful in countries where government is well-organised and trusted by market parties and society as a whole. It also can be beneficial when there is already a tradition of dialogue between society and government, with representative bodies for various stakeholders. Government should also be able to set its own success criteria for such a dialogue and have the means to monitor achievement of these criteria. It should be kept in mind, however, that although the Dutch energy transition approach has advantages, it also bears some risks. A successful and broad societal process of energy innovation requires active and efficient stakeholder participation. Only then can a real "energy transition" take place.

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