The European Electricity Market: Some Trends and Consequences for Investments in the Netherlands

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Abstract

This paper examines the influence of the developing European electricity market on investments in electric power plants in the Netherlands. It is concluded that European influence sets general conditions for investments in new power plants in the Netherlands. Increasing market integration, environmental and emission regulation as well as security of supply concerns each play a role at the policy level. The trend towards mergers and acquisitions as well as concerns about risk abatement through diversification of portfolios both play a role in strategies on an investor level. However, global fossil fuel price developments and autonomous national policies in the near future will remain dominant determinants for decisions about power plant investments in the Netherlands.

Executive Summary

Electricity demand in the Netherlands is rising. Simultaneously, the aging existing generation capacity needs to be gradually replaced. Even if energy efficiency is substantially increased, new investments in power plants in the Netherlands will be necessary in the coming decades, as for elsewhere throughout the European Union.

Investors must take many factors into account when deciding on the type of plant to build, where to build it and when. Dutch government energy policy objectives certainly influence these investment decisions. Further, some of the factors and objectives taken into account by investors in the Dutch market are either determined or influenced by decisions and discussions on a wider European level, which in turn are also to some extent a product of Dutch initiatives and contributions. Global issues such as oil, gas and coal price developments also play a role in investors' decisions.

There are three main 'European' issues that have particular impact on power plant investment in the Dutch electricity market:

1. Investor decisions will be partly contingent on steps made towards further integration of national electricity markets by the harmonising rules for market operations and improving and expanding cross-border electricity connections within the European Union. The relevant power price for investments in Dutch power plants in the future might be set in a North West European regional market instead of in the Dutch national market. Given the current differences in the structure of generation capacity, stronger price integration with surrounding countries might lead to lower prices in the Dutch electricity market. The realisation of new interconnections has encountered delays and the time horizon for effective market integration remains unclear. As a step towards more integration in future, a recent Dutch initiative has increased momentum for stronger integration of the Dutch, Belgian, German, French and Luxemburg electricity markets.

2. The European Union aims to improve environmental performance of the electricity sector. EU targets with respect to the share of renewable energy in primary energy supply are translated into Dutch support schemes. The European CO_2 emission trading scheme probably is the most influential European policy influencing investments in power generation capacity. Although the European Union as a whole appears to be committed to combating climate change, the current lack of progress towards a truly international framework for reducing greenhouse gases leads to considerable uncertainty as to whether or what extent CO_2 emissions from power plants will be financially penalized after 2012. Given the very different CO_2 emission patterns per type of power plant this uncertainty greatly complicates the selection of new power plants.

3. Concerns regarding security of supply of primary energy sources have recently gained considerable attention, also at a European level. Against the backdrop of these discussions, European Union Member States might come up with additional policies in support of specific forms of power generation and restrict others for security of supply reasons. Member States have repeatedly underlined that policies affecting a country's fuel mix are in the sole competence of Member States. Despite initiatives to discuss security of supply on a European level, it is likely that such policies, if any, will remain the purview of national governments for the near future.

European policies currently set the general conditions for investment choices for a power generation plant in the Netherlands. However, global fossil fuel price developments, national regulations, policies and market circumstances as well as how European policies are implemented in the Netherlands in particular will be strong factors influencing new investments in the Netherlands in the years to come.

A fourth European influence, which is not so much linked to policy but rather to investors' behaviour, is the question of which parties plan to invest in power generation capacity. A number of large-scale mergers and acquisitions have taken place in recent years. More are currently under way and are also expected within the European energy markets. Some of the large companies being formed have an explicit strategy to expand their business to markets beyond their original home market. The relatively

small scale of Dutch energy companies and the backdrop of planned ownership unbundling in the Netherlands makes it likely that future new investments in Dutch power generation will be led by foreign companies. This is a continuation of an already ongoing trend and there is no apparent reason to believe that such a development would as such conflict with the options for Dutch Government to set conditions for power plant investments.

Irrespective of size or national origin, basic strategies of key electricity companies all comprise the search for a stable basis in a national home market and a diversified generation portfolio, investments into environmentally friendly production capacity as well as growth via mergers and acquisitions. Regarding the generation portfolio, there is presently an apparent shift away from gas towards coal and nuclear energy. Whether this will result in a substantial shift in the overall primary energy mix in Europe and in individual countries remains to be seen.

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Introduction

In the coming years, in spite of increasing energy efficiency, large investments in new electricity plants in the European Union will be necessary. Two factors are responsible for this: rising electricity demand and a need to replace aging plants. Newly built plants are likely to be in service for several decades, hence decisions taken now will have a long-term impact on the structure of the EU's electricity sector. In a liberalised electricity market, decisions regarding the construction of new power stations are in principle taken by individual investors who decide whether to build a new plant, where, when, which technology to deploy and the primary energy source to be used.

However, such individual decisions also have strategic consequences at both the national and EU levels. The sum of all individual plants determines national and EU emissions, as well as the degree of dependence on primary energy sources to be imported to the Netherlands and the EU. Hence, security of supply for European electricity consumers and the degree of climate change that they will have to confront in the years to come will be in part be determined by the strategies and decisions of individual investors and the construction of a particular electric power station.

National governments, as well as the European Union, therefore set frameworks within which individual investors can make their own decisions. The respective regulations ideally aim at the realisation of secure and environmentally sound electricity supply at reasonable costs to end-users and society. Conversely, investors will need sufficient assurance that the limits set by government regulations allow for profits on their investments. Regulatory frameworks therefore need to offer incentives to investors that support realisation of policy objectives as well as investors' objectives.

In this paper, we examine the extent to which developments in the wider European electricity market influence investments in the Dutch power sector. Such developments need to be taken into account when setting the conditions for new power plants to be constructed in the Netherlands. We consider the current structure of the European power generation portfolio, provide a brief overview of European electricity market policies and assess investor strategies for the power generation sector in more detail.[1]

[1] This paper is part of a research project entitled, "Which new power plant in the Netherlands?". This project examines which type of power plant is likely to be built from the perspective of an investor, and which power plant would be desirable from a national political perspective. An investment model has been constructed for this project in order to examine likely investments from a financial point of view. The project also involves public discussion with investors and policymakers. The project has been financed with the help of SMOM subsidies of the Dutch Ministry of Environment and carried out in cooperation with the environmental consultancy, CE, in Delft and the Bezinningsgroep Energiebeleid. See also www.clingendael.nl/ciep, www.ce.nl and www.bezinningsgroepenergie.nl.

2

European Market Structure and Trends

In this section we outline some basic features of the existing European Union electricity sector, its policies and essential features with relevance to electricity sector investments.

2.1. European electricity generation portfolio

Existing power plants, together with their connecting transmission networks, form the physical basis for electricity production in the EU. Regarding the European generation portfolio, three main issues emerge:

1. Installed electricity generation capacity in the EU has risen sharply in recent decades, and is expected to increase further in the decades to come in line with electricity demand. Demand will continue to rise, despite the setting of higher energy efficiency policy targets. Replacement of existing plants underlines the need for new investments in power generation capacity.

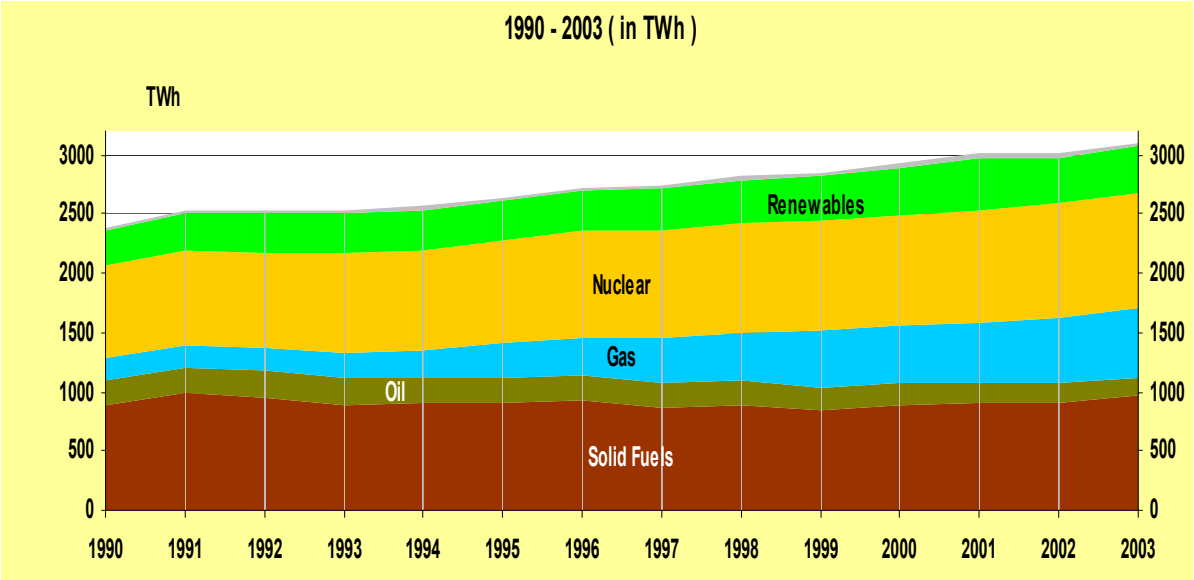
2. Most presently installed capacity is based on fossil fuels. Capacity based on renewable energy sources has the highest growth rates, but its present share is still small and with continuation of existing policies is expected to remain limited in the decades to come.

3. Most EU generation capacity is situated in the five largest EU countries. Generation capacity in the Netherlands only has a small share in total power production. Primary energy sources used for electricity generation strongly vary across countries.

According to Eurelectric, presently installed electricity generation capacity in the EU-25 amounts to 704 GW, of which 56% are conventional fossil fuel plants, 19% hydro-power, 19% nuclear and 6% other renewables (Eurelectric 2006). Installed capacity in the EU-25 increased by 2% from 2003 to 2004, and has doubled from the 1970s on. The category of ‘other renewables’ in relative terms grew most in this period, by 12.5%.

Figure 2.1 shows electricity produced in the EU from 1990 to 2003 by primary energy source. From the figure, it is clear that electricity generation has risen substantially in the last decade, and that the share of gas in electricity generation is increasing.

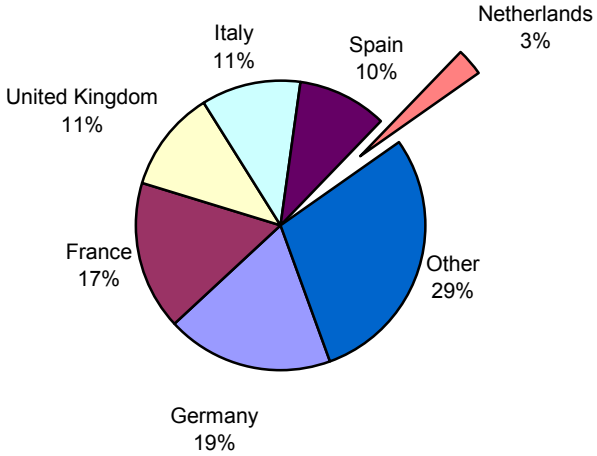
Figure 2.1 Electricity consumption in the EU by primary energy source 1990 – 2003



Source: EU, 2005

In terms of individual countries, most electricity generation capacity is installed in Germany (130 GW), followed by France (117 GW), the United Kingdom (79 GW) and Italy (79 GW). The Netherlands have 20 GW installed in 2004, an increase of 5% compared to the previous year (Figure 2.2).

Figure 2.2 Shares of electricity generation capacity in the EU

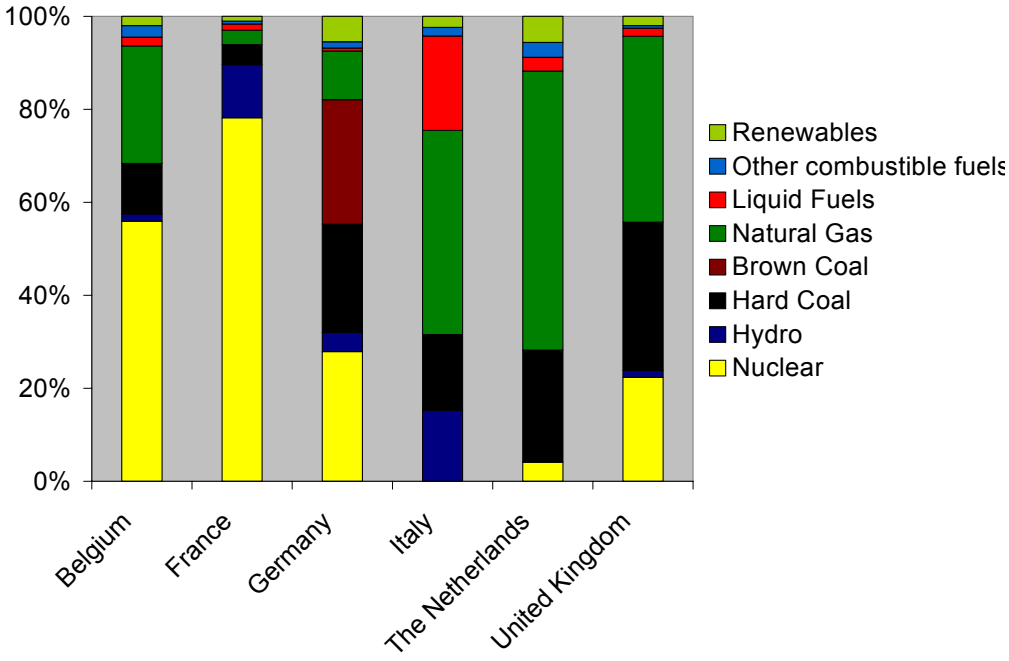


Source: Eurelectric, 2006

The kind of installed generation capacity differs strongly per country (Figure 2.3). The fuel shares in the various countries to a large extent are determined by the availability of domestic fuels. The availability of coal and especially lignite (brown coal) in Germany and the presence of natural gas in

the Netherlands has resulted in a national level preference for these fuels, whereas France, lacking in fossil fuels, beginning in the 1970s embarked on a massive nuclear energy programme. The latter case was also politically influenced by the oil shocks during that period. Differences in generation portfolios has resulted in significant variations in electricity generation cost structures across these countries. Especially during times of generation capacity surplus, such differences result in different prices for different markets.

Figure 2.3: Electricity generation by primary fuel in selected EU Member States, 2003



Source: IEA, Electricity Information 2005.

For the future, it is expected that there will be a need for large investments in new electricity generation capacity. Two factors are driving this need: economic growth and anticipated substantial increases in electricity demand across the European Union. Moreover, aging power plants need to be replaced in the decades to come. Estimates regarding the amount of investments needed differ (table 2.1). According to estimates, a replacement demand of 250 – 300 GW and a new capacity demand of 250 – 300 GW up to 2030 seem likely.

Table 2.1 Estimated need for new generation capacity in the EU up to 2030

(GW)	Replacement	New Capacity	Total
Eurelectric	255	265	520
IEA	290	317	607

2.2. European Electricity Market Policies

Investors in power generation operate within frameworks set by governments. Whereas the European Union is establishing overarching legislation for its Member States, for many energy-related policy areas the Member States maintain considerable scope for country-specific measures.

Energy policies in general aim for the provision of secure and environmentally sound energy at prices that allow economies to grow and which are affordable to small customers. While European initiatives during the 1990s focused on achieving liberalised internal energy markets and emission reduction measures, more recent attention has been directed toward security of supply issues.

In this section, we provide an overview of current policies implemented at European level and issues currently under discussion that could shape future EU policies.

2.2.1. Liberalisation and the Internal Electricity Market (IEM)

European energy policies of the last decade were clearly focused on the pursuit of economic efficiency via introduction of competition in the EU electricity and gas sectors. The recent Green Paper (CEC 2006) maintains the strong commitment of the European Commission to further proceed along the path to fully competitive markets. Relevant issues concern provisions for new power generation capacity, consumer choice, unbundling and transmission capacity. Furthermore, recent assessments afford a view on how the Commission sees the current state of the liberalisation process.

Provisions for new power generation capacity

The currently applicable general framework for the liberalisation process of EU electricity markets is set by directive 2003/54/EC (second electricity directive or 'acceleration directive'). With regards to new power plant construction, the electricity directive states that Member States must adopt an authorisation procedure, laying out the criteria to be met to obtain authorisation for the construction of new generation capacity. Member States are obliged to monitor the supply/demand balance in their national electricity markets. Should this monitoring process indicate that market parties do not provide sufficient new generation capacity under the authorisation procedure, Member States may organise tenders for new generation capacity. Since the framework does not establish in detail which criteria have to be set, these differ substantially across Member States. National criteria provide the detailed framework within which investors must operate.

Consumer choice

A key feature of the liberalisation process outlined by the European Commission is the establishment of competition via introduction of consumer choice. By 2007, all consumers in the EU must be able to choose their electricity supplier. This increases the risk for investors in power generation, as cost increases can no longer be automatically passed onto captive customers.[2]

Unbundling

To facilitate non-discriminatory network access for all electricity suppliers, the second electricity directive requires vertically integrated electricity companies to legally separate transportation activities from other activities (legal unbundling). Transmission of electricity, as a monopoly business, remains subject to regulation. The regulatory authorities determine tariffs for electricity transport. The unbundling requirement reduces the scope for integrated electricity companies to cross-subsidize generation activities from the regulated, stable revenues of transportation activities.

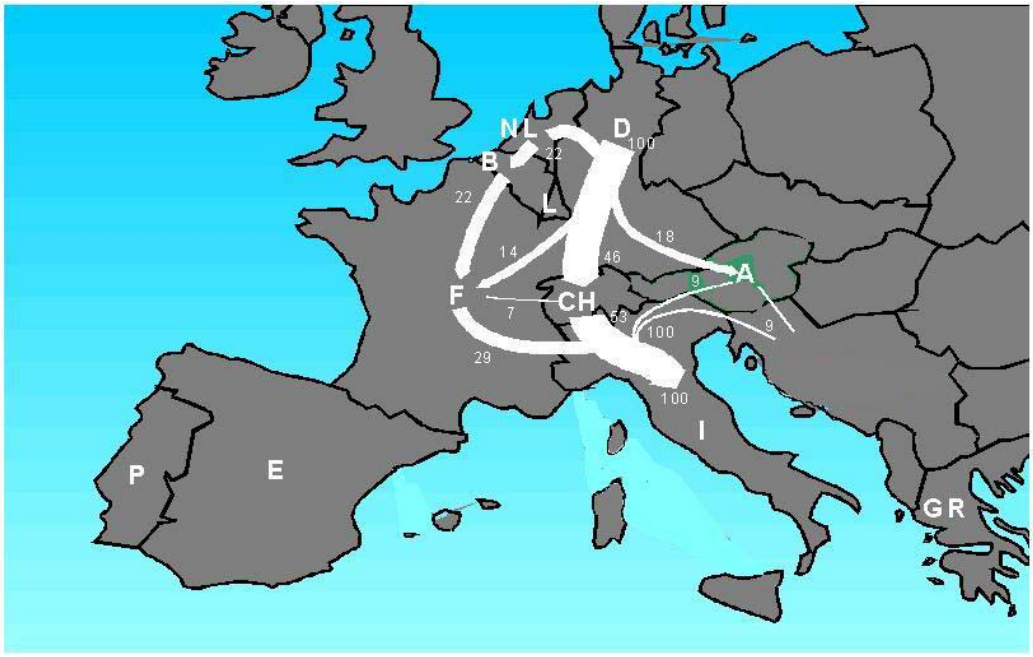
The Netherlands, in particular, is undergoing a process to implement ownership unbundling, meaning that parties who hold shares in networks would no longer be allowed to also hold shares in generation and trade companies. Such a measure, aimed at better ensuring fair non-discriminatory network access, might further reduce the credit rating of owners of electricity supply and generation companies in the Netherlands and also raise financing costs.

[2] This holds, in principle, also if the output of a power plant is contracted long-term to an electricity supply company. If the respective electricity supply company is not competitive and loses customers, its financial difficulties will affect the power plant owner.

Transmission capacity

Transmission capacity plays a crucial role in the development of a European electricity market. Regulation of transmission is complex, since physical flows of electricity are not equal to contractual flows (Figure 2.4). Two main challenges exist, which are further complicated by the liberalisation process: These are first, how to deal with congestion, i.e. how to allocate transmission capacity between countries if market parties would like to make more use of the networks than technical capacities allow for; and second, how to compensate the various transmission system operators (TSOs) for hosting international transit flows. Following Regulation 1228/2003 EC, new guidelines for resolving these issues are being developed.

Figure 2.4: Flow pattern for a single electricity sale transaction (simulation results).



Source: Pérez-Arriaga, 2003.

Apart from the efficient use of existing interconnection capacity, the overall level of interconnection capacity also affects the degree of integration between various national markets. The aim of the European Commission is to substantially expand cross-border transmission capacity. The 2002 Barcelona Council Meeting set a target that every European Union Member State should have import interconnector capacity equalling or exceeding 10% of installed production capacity. The target has been set rather arbitrarily and does not say very much about existing transmission congestion between Member States as an obstacle to international trade (Table 2.2). Some countries with high levels of interconnection capacity suffer from regular congestion on those lines, while other countries with relatively little interconnection with neighbouring countries suffer less congestion on those lines. Moreover, congestion might be reduced if power plant investment in the importing country reduced the need for imports, with additional investment in interconnector capacity ultimately becoming uneconomical.

The Netherlands will be increasingly connected with neighbouring markets. Adaptations to German networks will complement investments made earlier in the Netherlands and raise interconnection capacity (see also Section 4). A new 700 MW DC link (NorNed), construction of which began in 2005, will directly link the Netherlands with Norway by 2008 and a similar connection to Great Britain (BritNed) is currently being studied.

Table 2.2: Electricity imports and import capacities of selected EU Member States[3]

	Imports in relation to energy supplied (2003)	Import capacity in relation to installed generation capacity (2004)
The Netherlands	19%	17%
Belgium	17%	25%
Germany	8%	16%
France	1%	14%
Italy	16%	6%
Spain	4%	6%
Austria	29%	24%

Sources: IEA Electricity Information 2005; DG Comp Sector Inquiry

Competition and liberalisation: The European Commission's assessments

The European Commission, DG Transport and Energy, regularly monitors the transposition of the electricity directive into national law and assesses progress made towards the achievement of an Internal Electricity Market with effective competition. It publishes its findings in accordance with the requirements of the electricity and gas directives on an annual basis, following up on the so-called benchmarking reports issued in previous years.[4]

In a separate process, the DG Competition in 2005 launched a sector inquiry into the EU energy sector. Based upon an analysis of European gas and electricity markets, which includes the responses of stakeholders, the inquiry examines "whether current indications of market malfunctioning result from breaches of competition law" and attempts "to address the barriers currently impeding the development of a fully functioning open and competitive EU-wide energy market by 1 July 2007."[5]

Both reports state that there are key concerns regarding progress made towards a European electricity market. These include:

- *Market integration*
  Electricity markets in most cases remain national in scope. Foreign generators and suppliers have little influence on market structures other than in their home market, unless they acquire existing companies abroad. Identified hurdles by the Commission include shortages in existing interconnection capacity, the long-term occupation of this capacity dating from the pre-liberalisation era, current cross-border regimes providing insufficient incentives for new investments in interconnection capacity, and large differences in market design between Member States.

[3] Imports: gross imports. Import capacity: average hourly NTC.

[4] The most recent report is, Commission of the European Communities (CEC) (DG TREN), 2005, Report on progress in creating the internal gas and electricity market. Communication from the Commission to the Council and the European Parliament. COM(2005) 568 final. 15 November and CEC, 2005, Technical annex to the report on progress in creating the internal gas and electricity market. Commission Staff Working Document. 15 November.

[5] European Commission, DG Competition (DG Comp), 2006, Energy sector inquiry. Draft preliminary report. 16 February. p. 2. The legal basis for such an inquiry into an economic sector is Article 17 of EU Regulation No. 1/2003.

- *Market concentration*
  Owing to the overall structure of the generation park and the properties of the generation portfolio controlled by individual generators, the Commission found that in some national markets, generators theoretically could raise prices by abusing their market power. However, no concrete cases of abuse of market power have been found so far.

- *Vertical foreclosure*
  According to the investigations, market participants strongly doubt that current unbundling provisions are sufficiently effective to ensure non-discriminatory access to electricity networks. They claim that system operators that are part of an integrated electricity undertaking discriminate in favour of their affiliated companies. It is also noted that as of November 2005, Greece, Luxembourg, Portugal and Spain had not implemented the Electricity Directive into national law, despite the deadline for implementation being 1 July 2004. The Commission also expressed concerns about integration of generation and supply in some companies, as this would reduce liquidity in wholesale markets and raise barriers to entry for new competitors in the retail market.

- *Transparency and price formation*
  Market participants have also complained about a lack of transparent information in European electricity markets relating to the availability of interconnector capacity, generation, balancing and reserve power, and load behaviour. There is limited trust that market prices reflect actual competitive levels.

Outlook

Both Commission reports hint that further structural unbundling measures might be necessary to achieve the objectives of a truly competitive Internal Market for electricity. DG TREN will proceed with country specific assessments of progress towards the creation of a truly liberalised electricity market and devise further policy proposals in 2007.

Measures considered are:

- requirements for various parties to publish more information, according to criteria set by the Commission;

- structural (ownership) unbundling; and

- forced divesture of generation assets to mitigate market power concerns.

However, it is highly doubtful whether Member States will subscribe to such measures. Ownership unbundling and forced divesture touch upon property rights and are difficult to enforce, especially if private investors are involved.

Implementation of ownership unbundling could alter the conditions for investment in new power generation capacity. Network operations are usually subject to relatively low market risk and provide for rather stable and predictable income flows. Owners of energy networks thus have a principal advantage with respect to credit rating as compared to energy companies without networks, the latter on average being exposed to higher market risks from generation and trade activities. Investors who are allowed to own energy networks in the domestic market or abroad might thus face lower financing costs than investors required to divest their networks.

Although this consideration is certainly valid, it should not be overstated. Network activities face considerable regulatory pressure, with revenues being predictable but probably declining. Moreover, the scope for financing advantages could be limited.

Among EU Member States, full ownership unbundling of all electricity and gas networks is supported in particular by the Netherlands, although there it has encountered forceful opposition by many stakeholders (cf. Tönjes, 2005). Belgium has implemented a long-term strategy prescribing that all distribution networks must be owned by local authorities by 2018.[6]

Progress towards a European electricity market might evolve through the development of regional markets. Groups of Member States might decide to implement further harmonisation of their market designs to facilitate international trade and more efficient electricity provision. Additional harmonisation might occur with respect to the degree of market opening, determination of transmission tariffs, rules for bilateral trading, as well as congestion management methodologies.[7] Regional markets offer the benefit of fewer countries being involved in the harmonisation efforts resulting in agreements being reached more efficiently. Various mini-fora have been established to discuss such issues on a more regional basis.[8] Regional markets emerging thus far include the Nordic Countries, the United Kingdom and Ireland, Italy, the Iberian Peninsula and a North-West European market including the Benelux countries, Germany and France.

The Belgian, Dutch and French power exchanges are in a process to establish 'market coupling' of the three national spot electricity markets which will lead to a more efficient allocation of interconnection capacity. Similarly, the NorthPool market and the Dutch spot market might be coupled when the NorNed cable is completed. Moreover, the Dutch Ministry of Economic Affairs initiated the establishment of a Pentalateral Energy Forum, in which the governments, regulators and TSOs of the Netherlands, Germany, France, Belgium and Luxemburg are working together to achieve a regional model for assigning and improving interconnection capacity between these countries. Several working groups have been formed in which the parties involved work towards further cooperation aimed at more efficient use of interconnection capacity and better monitoring of security of supply in generation and transmission at a regional level. The forum aims for implementation of a regionally coordinated system of interconnection capacity allocation within 2007.[9]

Although the European Commission states that year-ahead prices between countries in the North West European Market still show significant differences, other analysis suggests that at least day-ahead prices between the various market places have started to converge.[10] In light of these developments one could surmise that an integrated North West European electricity market is slowly emerging. However, it remains difficult to assess to what extent electricity prices are set at a supranational rather than national level.

2.2.2. Environment

Several environmentally motivated European directives, targets and regulations have influence on the construction and operation of new power plants. In particular, these are directed at lowering non-greenhouse gas emissions, CO_2, stimulating the use of renewable energy sources, and stimulating cogeneration of heat and power.

Renewable energy sources

EU environmental policies specifically stimulate the introduction of renewable energy sources within Member States. Such policies date as early as the 1996 "Energy for the Future: Renewable Sources of

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[6] Gómez-Acebo & Pombo Abogados, S.L. and Charles Russell LLP, 2005, Unbundling of electricity and gas transmission and distribution system operators. Report for the European Commission. 1 December.

[7] European Commission, 2004, Medium term vision for the internal electricity market. DG Energy and Transport strategy paper. March. p.6

[8] Compare http://ec.europa.eu/energy/electricity/florence/mini_fora_en.htm.

[9] Ministry of Economic Affairs, 2006, 'Voortgang totstandkoming Noordwest-Europese elektriciteitsmarkt.' Letter to Parliament, 19 June.

[10] European Commission, DG Competition (DG Comp), 2006, Energy sector inquiry. Draft preliminary report. 16 February. Roland Berger Strategy Consultants, 2005, Regional supranational Energy markets in the European Union. Presentation to CIEP Electricity Market Seminar 'Regional Electricity Markets in the European Union.' 19 April.

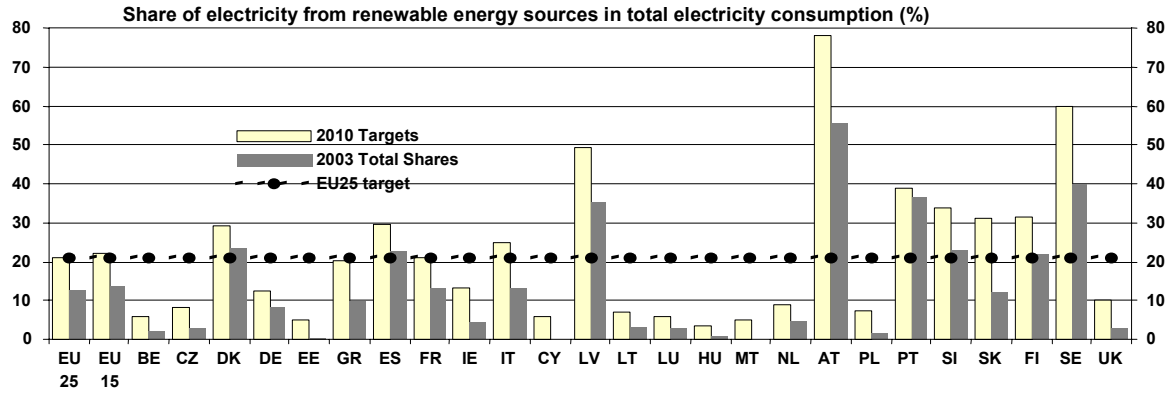
Energy" Green Paper. Present targets for renewables in the electricity sector are set out in directive 2001/77/EC, according to which the share of renewables in electricity consumption must increase from 14 to 22% in the EU-15 states and to 21% in the EU-25 states by 2010. Figure 2.5 shows the targets for 2010 and actual implementation in 2003 for individual Member States.

The figure shows that targets and achievements thus far greatly vary per Member State. Recent evaluations suggest that the overall achievement will lag behind targets. It is expected that continuation of existing policies will result in a share for EU-15 of 18 to 19% by 2010. An action plan for biomass, including measures directed at the use of biomass for electricity generation, heating and as a transport fuel, will boost further development.

Generation capacity investments are contingent on the national support schemes for renewables that are implemented. In the Netherlands, as a result of subsidies, installed renewable energy capacity has risen substantially in recent years. Also, various fossil fuel power plants are now co-firing biomass as a result of these incentives.

National support schemes for renewable energies influence investor decisions for conventional power plants in two ways. First, the total amount of generation capacity could be altered as renewable energies are pushed into the market. Second, the kind of conventional power plants required might change as intermittent renewable energy sources, such as wind, may require more flexible and less capital-intensive capacity in the remaining conventional generation portfolio.

Figure 2.5: EU renewable electricity targets and achievements per Member State



Source: DG TREN, 2005

Cogeneration

Cogeneration of heat and power is a highly efficient means of power generation, as the heat generated is also used, for example, for domestic heating or industrial use. Much higher efficiencies can be achieved in this manner than for conventional power plants. Several European directives therefore mention stimulation of cogeneration as a useful environmental instrument for the electricity sector. Most recently, the 2006 energy efficiency directive (2006/32/EC), aiming at a 9% efficiency improvement in Member States within a nine year timeframe, names cogeneration as one of the possible measures to achieve this target. The 2004 directive "on the promotion of cogeneration based on a useful heat demand in the internal energy market" requires that Member States, in 2006, report on potentials, hurdles and stimulation measures in their countries. From 2007, they must report on progress in stimulation. However, there are few other concrete European measures to stimulate cogeneration, which is otherwise left up to national authorities to implement stimulation measures. The Netherlands have a high percentage of cogeneration capacity installed. Due to present market circumstances, however, high growth rates similar to those in the past are not foreseen.

Conventional emissions

Burning fossil fuels leads to several conventional, or non-greenhouse gas emissions, such as nitrogen oxides (NO_x), sulphur dioxide (SO_2), volatile organic compounds and particulate matter (PM_{10}). These emissions are harmful to human health and the environment. They can be technically controlled, however, at a cost.

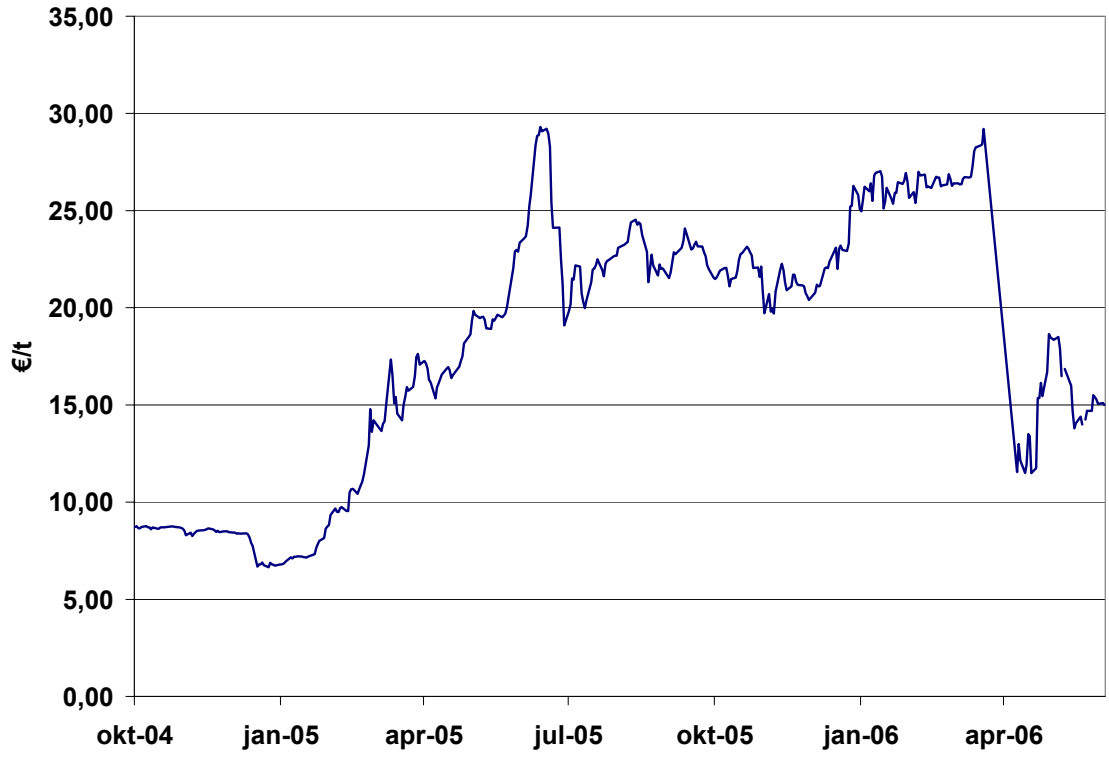
In the context of the European Clean Air for Europe programme (CAFÉ), national emission ceilings have been set for these substances. These standards alter the relative economics of various fuel choices. Natural gas for instance emits much less NO_x and SO_x than coal, which makes meeting emissions standards much easier and thus cheaper. Due to the provisions of the national emission ceilings, in some cases, investors may decide to replace older plants with newer and more efficient ones, as costs of making these plants comply with the emission ceilings begin to exceed those of building new ones.

CO_2 Emission trading

Probably the most influential environmental measure for power plant investment taken at the European level has been the CO_2 emissions trading scheme. The European Union as a whole is one of the most committed parties working to limit greenhouse gas emissions. The European Emission Trading Scheme (ETS) began in January 2005, requiring a large part of CO_2-emitting activities to hold tradable permits covering their emissions.

Emission permit costs can have a significant impact on the use of various fossil fuels in power generation. Different emission characteristics of fossil fuels affect the variable cost component of power plants to different extents, making for instance gas, due to its lower emissions, relatively cheaper than coal. Permit prices make all fossil fuel generation more expensive. Electricity prices will rise and trigger further electricity savings, whereas investments in even more efficient generation plants will become more attractive. Thus, the price for these emission permits should play a significant role in the planning of new power plants; the higher the price, the more CO_2-efficiency is supported. However, there are significant short and long-term uncertainties with respect to CO_2-emission price developments which makes it very difficult to assess investments for long-life installations such as power plants.

Figure 2.6: CO_2-emission permit price 2004 – 2006, index

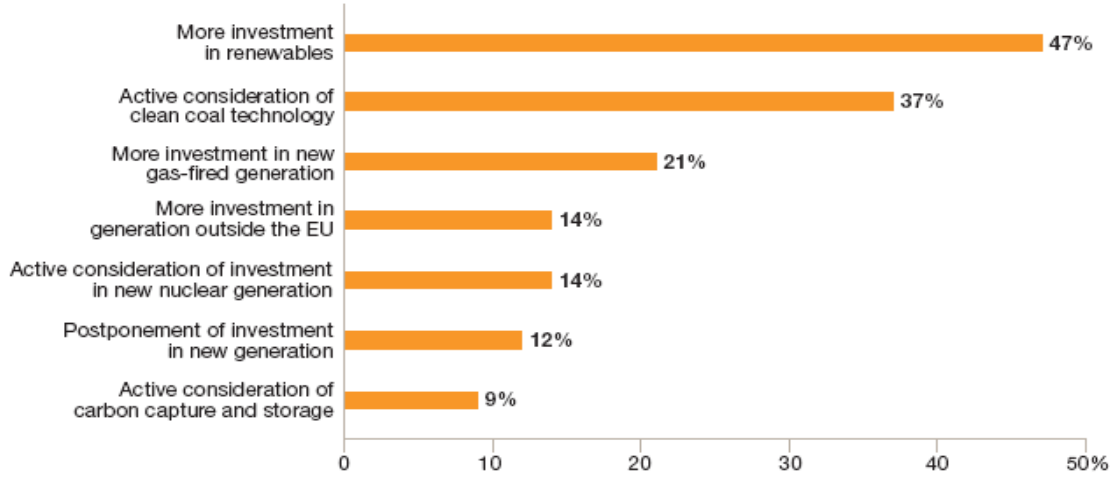


Source: European Energy Exchange (EEX).

The price of emission permits depends on the cap national governments set for the issuing of these permits, fixed in the so-called national allocation plans (NAPs). The first allocation period (2005-2007) has always been considered as a 'learning and practicing period'. Still, economic consequences have been significant. Emission permits for the first allocation round were expected to be relatively generous and at the beginning of the emission trading scheme, the price range of 5 to 10 €/t was regularly quoted as likely. To everyone's surprise, however, prices for emission permits in practice increased to almost 30 €/t (Figure 2.6). Uncertainty around the final shape of several national allocation plans was initially thought to have contributed to these rather high prices. Nevertheless, the publication of an increasing number of allocation plans did not bring permit prices down significantly either.

Increasingly, CO_2 prices have started to influence and drive-up power prices in European electricity markets, as envisaged by the designers of the system. During April/May 2006 CO_2 prices dropped within a few days from close from 30 €/t to around 10 €/t when it became clear that actual emissions in 2005 were lower than the average 2005-2007 allocation of emission rights, suggesting a surplus of emission permits. The strong volatility in CO_2 prices also has demonstrated that transparency in the CO_2 market is still poor and that the CO_2 market is still in its infancy. Nevertheless, the scheme is already significantly influencing the decisions of electricity companies in Europe, as shown in Figure 2.7. In particular, the scheme has led to more investments in renewables and active consideration of clean coal technology, according to European electricity company executives.

Figure 2.7: Effects of the ETS according to interviewed senior executives of European electricity companies



Source: PriceWaterhouseCoopers, 2006a.

Outlook

The future of the CO_2 emission trading scheme is subject to a wide range of uncertainties. Although many individual governments within the European Union state that climate change is one of the most important contemporary threats to society, concerns that climate change mitigation measures will unduly disadvantage the EU's economic competitiveness at a global level have remained during recent years. Decision on the post-2012 provisions of the emission trading system will be of crucial importance to the environmental ambitions of the EU, as well as for investments in power generation capacity.

The recent "no" to the European charter by the Netherlands and France have engendered the need for a period of reconciliation within the Commission. Completely new environmental provisions from a European perspective thus are at present unlikely.[11] Rather, the Commission seems focused on the achievement of present targets, e.g. for renewables. It is thus dependent on the national-level provisions of the Member States. Investors in power plants considering capacity based on renewable energy sources therefore should take into account the development of national support schemes rather than focus too much on the European policy level.

2.2.3. Security of Supply

From the beginning of the new millennium, European policymakers have become increasingly aware of the EU's rising dependence on imported primary energy. At the same time, concerns about the political stability of the main energy supply regions have not been mitigated or even underlined. It appears that the general expectation of the early 1990s – that markets would be the main coordinating mechanisms for the increasingly interconnected global economy and strongly shape international relations – has been met only to some extent. Political influence and non-economic drivers have reappeared in international energy relations. Against the backdrop of such developments, it is not encouraging for European politicians that in relative terms the EU is expected to lose economic power vis-à-vis emerging economies.[12]

[11] Interview Luc Werring, European Commission, DG TREN, 2006 (for this project).

[12] For an assessment of the changes in the international political system and the possible consequences for global energy trade relations see Perlot and Hoogeveen (eds), 2006.

Such shifts in perception on the future of international energy markets are also reflected in the European Commission's recent Green Paper and in the Austrian Presidency conclusions of the European Council meeting of 23-24 March 2006.[13] Both documents pay attention to long-term security of supply with respect to external supply sources and plead for a common external policy approach, for instance by strengthening dialogue between producer and transit countries. The Green Paper also notes that decisions taken in one country may affect other countries' energy systems, in particular in crisis situations. It therefore calls for a better assessment of such effects by implementing a regular review of supply security at a European level. The European Council's conclusions, which can be understood as a first reaction by EU Member States on the Green Paper, stress the need to better diversify the fuel mix, also with respect to supply origins. It is also stated explicitly that the fuel mix is subject to decisions at Member State level.

Whereas for most EU countries the fuel mix is currently left to the market, some countries such as France and Spain already have legislation in place, which directly intervenes in fuel choices for power generation. The French government issued a decree specifying the desired levels of various types of generation plant within French jurisdiction. If investment plans for new generation capacity do not fit into this planning, the French government has some scope to withhold authorisations for the capacity proposed. Vice-versa, in the case of investment plans lagging behind the schedule set out in the decree, the government can start a tendering procedure for procurement of the desired type of capacity.[14] Similarly, Spanish legislation imposes a cap of 60% on the share of gas imports from any single country, thus also influencing the fuel choice of power plant investors.[15]

Outlook

Thus far, Member States have been reluctant to let security of supply be managed at the European level. It has been reconfirmed by the European Council that measures aimed at directly influencing fuel mix are the sole domain of Member State policies. Nevertheless, the topic is receiving increased attention at both European and national levels. Increased European influence does not seem likely for the near term, but cannot be ruled out for the future.

2.3. European Investors: the playing field

This section has outlined the playing field in which European investors in power generation capacity operate. Developments at a European level influence to some extent investment decisions in Dutch power generation capacity while national developments and policies have a stronger impact on investment. European influence can be observed in three key policy areas, although to different degrees:

First, in recent years much importance has been accorded by the European Commission to the introduction of competition in the European electricity sector and the promotion of international trade in electricity. Considerable progress has been made, but markets are not yet completely integrated and substantial obstacles to effective competition remain. Obstacles identified by the Commission include a lack of interconnection capacity between countries and possibilities for exertion of market power by large incumbent electricity companies. This is partly a result of limited unbundling and bottlenecks in interconnection capacity between countries. EU regulations and initiatives by individual groups of Member States at a regional level have already resulted in some degree of harmonisation of EU electricity prices, thus affecting investment conditions for new power plants in the future. It is not clear whether or when the various national electricity markets will begin to behave as integrated markets, with comparable price levels, although developments in such a direction are taking place. Market regulation at the national level, bearing in mind gradually increasing integration in future, will remain important in the years to come.

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[13] CEC, 2006, A European strategy for sustainable, competitive and secure energy. Green paper. COM(2006) 105 final. 8 March. Council of the European Union, 2006, Brussels European Council 23/24 March 2006. Presidency conclusions. Document No. 7775/06. 24 March.

[14] IEA, 2004, Energy policies of IEA countries. France 2004 review. p.41.

[15] IEA, 2005, Energy policies of IEA countries. Spain 2005 review. p.88.

Second, the foremost environmentally motivated legislation at a European level is the CO_2 emission trading scheme. Since its establishment in 2005, it already appears to have substantially influenced decisions on electricity generation capacity in the EU. Other environmental regulations at the EU level include targets for renewable energy sources, cogeneration legislation and a directive on large power plant emissions. The sum of these regulations alter the economics of investment in power generation towards power plants with higher efficiency, lower carbon intensity and fewer emissions. Many uncertainties remain as to the post-2012 emission trading provisions, as well as regarding other environmental legislation. For renewables, at the European level, implementation of current targets presently appears to prevail over the setting new goals.

Third, external security of supply has recently been accorded increased attention at the European level. However, proposals for more coordination by the European Commission thus far have been met with strong resistance by the Member States. Security of supply, including in particular the primary energy mix for electricity generation, is therefore likely to remain a national competence for the near future. This gives rise to the question of whether and to what extent national governments motivated by securing external security of supply would like to intervene in fuel choices made by investors.

3

European Investors and their Strategies

In this section, we consider European investors and their strategies. We begin with a discussion of general factors influencing investments in power plants and mergers and discuss their functioning in practice within Europe. We also examine the strategies of some selected European electricity companies in more detail.

3.1. Factors influencing investments in new plants

Investors in power generation must consider a wide range of factors and weigh views on various uncertain future developments. Some factors will influence the decision of whether to invest at all, whereas others will determine the choice of power plant. We name a few:

- investment costs of various types of power plants, depending on technology and size of the installation to be constructed;
- supply and demand balance in the relevant market and electricity price developments;
- size and geographic scope of the relevant market as well as the load segment within which the new plant should (primarily) operate;
- view on fuel price developments, including costs for emissions, such as CO_2;
- existing generation portfolio of an undertaking;
- time horizon for the investment;
- view on the relevant regulatory developments; and
- availability of suitable locations for the investment.

How these factors are assessed depends on the individual company as well as on the type of investor. Investors can be either integrated electricity companies with their own customer base or independent power producers (IPPs) focusing on power generation only. A third category of investors are industrial end-users, considering tailor-made power plants for their own industrial location. Apart from these, in the renewable energy field there are also various niche players focusing on one particular energy source (e.g. wind).

3.2. Strategies of European investors in practice: New power plants

Table 3.3 shows the amount of electricity generation capacity under construction in Europe in 2002 by country and type. In 2002, some 22.7 GW were under construction in eight EU countries. By far the largest amount of capacity under construction was in Italy. Natural gas was the main primary energy source used.

Since that time, oil and gas prices have increased significantly and trends in primary energy sources to be used in Europe appear to be shifting away from gas towards more coal and nuclear power, with biomass and wind power as main runners-up towards large-scale capacity for the future.

Table 3.1: Electricity generation capacity under construction in the EU-25 in 2002

(MW)	DE	IT	PT	CZ	PL	NL	GB	FI	
Hydroelectric and pumping	1,057	160	418						1,635
Nuclear				910					910
Coal	951	2,079			678				3,708
Gas	240	11,290	784		184	868	2,490		15,856
Biomass	234	120				103		174	631
Wind									
	2,482	13,649	1,202	910	862	971	2,490	174	22,740

- **Nuclear**

Nuclear energy as a primary-energy source for electricity generation seems on the rise. Finland has started to construct a new nuclear power plant of the pressurised water reactors (PWR) type. France also has plans to construct a new nuclear power plant. In other countries, the planned nuclear phase-out is being reconsidered. The Netherlands has extended the lifetime of its single nuclear power plant. The United Kingdom's new energy sector plan creates possibilities for new capacity. Belgium and Sweden are discussing the feasibility of their planned phase-out. Germany, likewise, is discussing existing phase-out plans for nuclear energy subsequent to its change of government.

- **Gas**

In line with increased oil prices, in recent years natural gas prices also rose substantially. Security of supply concerns, sparked primarily by recent irregularities in Russian gas deliveries for Western Europe, also contributed to what appears to be decreasing attractiveness of gas as a primary-energy source for investors in the power sector. Still, lower capital intensity of gas fired power plants, their higher operational flexibility and easier permitting procedures still give natural gas a competitive edge for a significant number of investors.

- **Coal**

The economic superiority of gas-fired combined cycle power plants in the 1990s in many markets, as well as disadvantages of coal with respect to CO_2 emissions as compared to gas made it look as if coal would be in decline compared to gas. However, given the present high gas prices, coal fired power generation once again looks more economic. In addition, with carbon capture and storage technologies now entering the demonstration phase, a way around the emission issue is increasingly becoming possible. Coal is also available in relatively large quantities from a wide range of countries, making it attractive to policymakers from a security of supply perspective.

- **Biomass**

Biomass is presently in a demonstration phase with units mainly focused around 20 MW. Most developments take place in Finland, Sweden, Germany, Austria and the United Kingdom. Biomass can to some extent be burned in conventional power plants (co-firing) and such power plants can react with some flexibility changing market circumstances in biomass and fossil fuel markets. Co-firing of biomass receives particular interest in the Netherlands and the United Kingdom.

- **Wind**

After rapid on-shore developments in Germany, Denmark and Spain, interests in wind-energy now appear to be shifting off-shore. Denmark, Germany, the Netherlands and the United Kingdom have installed off-shore capacity or have serious plans to construct this capacity. As an intermittent energy source, large amounts of wind power might require flexible power plants to be available for times with low wind intensity as well as reinforcements of network infrastructure.

3.3. Factors influencing mergers

From a company viewpoint, mergers and acquisitions should increase the combined efficiency of the newly merged company and/or create market power. In the case of horizontal mergers – for example between generators, wholesale trading companies, suppliers or networks – efficiency gains mainly arise from economies of scale, risk pooling and advantages in obtaining of finance (compare annex II). Vertical mergers – for example between generators, wholesale traders and retail suppliers – can offer economies of scope but also lower transaction costs, avoidance of 'double marginalisation', and avoidance of opportunistic bargaining if a company depends on the action of the other. Acquisitions might also be driven by the acquiring company's perception that the assets of the undertaking to be acquired are inefficiently utilised and that improved management could raise the value of the company to be acquired.[16]

The realisation of efficiency gains from mergers and acquisitions can certainly benefit consumers, as the merged entity in theory should be able to provide its products cheaper and more efficiently. However, from the point of view of market policy and regulation, it should be kept in mind that mergers and acquisitions might also lead to a abuse of market power of the merged undertaking by raising on its own the market price above competitive levels.

3.4. Strategies of European investors in practice: Mergers

Table 3.2 lists the top-30 European electricity companies, based on invested capital in 2001. Although the size of the companies differs according to the criterion applied, it is clear that a few, for example, EdF, E.On, RWE, Enel, Endesa, Electrabel, Fortum and Vattenfall are large players in this field. Of these companies, E.On and Electrabel are presently also active in the Dutch market. The other Dutch power companies Essent, Nuon and Eneco figure much lower in the top-30. We discuss some of these players in more detail below.

[16] cf. Annex II. It has also been suggested that efficiency gains are not the only drivers behind mergers and acquisitions, but that in some cases managers pursue such transactions in order to create companies sufficiently large so as to be protected against hostile take-overs. In this manner, managers might also seek job security or strive for increased social status associated with managing a large company. Such mergers are usually neither economically efficient, nor in the interest of shareholders.

Table 3.2: Top-30 European electricity companies based on annual invested capital and turnover, 2001 (million euros)

	INVESTED CAPITAL	
1	EdF	109031
2	EON group	67108
3	RWE group	64307
4	Enel	48188
5	Endesa	38561
6	National Grid	24645
7	Scottish Power	22272
8	Vattenfall	20395
9	Iberdrola	12955
10	Powergen	12867
11	EnBW	12137
12	Unión Fenosa	12061
13	Fortum	11207
14	Electrabel	10445
15	EDP	10416
16	HEW	9396
17	British Energy	9096
18	PPC	6977
19	Innogy	6785
20	Birka Energy	6739
21	Veag	6621
22	Essent	5732
23	Scottish & Southern Energy	5580
24	Sydkraft	5508
25	Statkraft	5474
26	Verbund	4740
27	London Electricity	3946
28	Bewag	3767
29	ESB	3617
30	Acea	1193

TURNOVER	
EON group	69839
RWE group	43970
EdF	40716
Enel	27725
Endesa	15576
Electrabel	12580
Fortum	10410
Scottish Power	9975
Powergen	8940
Iberdrola	8113
EnBW	7861
Vattenfall	7550
National Grid	7362
Essent	6644
Scottish & Southern Energy	6328
Innogy	5897
EDP	5650
Unión Fenosa	5442
HEW	4066
British Energy	3237
London Electricity	3069
PPC	3053
Veag	2248
Atel	2177
Sydkraft	2102
ESB	2040
Eneco	2037
Bewag	1979
Verbund	1685
Birka Energy	1512

Source: Eurelectric, 2006.

The table also illustrates the main trend within European power companies at the moment: mergers and acquisitions. Of the parties listed in the top-30 of 2001, Powergen has since been bought by E.On, Innogy by RWE, HEW, Bewag and Veag by Vattenfall, and London Electricity by EdF. EdF also bought a large share in EnBW (46%). Some even more recent mergers, which are currently under serious discussion include:

E.On and Endesa

The Spanish energy companies Gas Natural and Endesa were about to merge when E.On also announced an offer for Endesa of 29.1 billion euros. This second bid was substantially higher than the 22.4 billion offered by Gas Natural. The Spanish government preferring an internal Spanish merger over one with a German company changed the law to allow the Spanish regulatory commission, CNE, to also judge mergers with foreign companies. Endesa shareholders, however, prefer a merger with E.On over Gas Natural because of the higher price offered. The Spanish government considers Endesa as a strategic company for Spain and would prefer Spanish interests determining the business course of Endesa. In the meantime, the European Commission has warned Spain not to take protectionist measures (Energeia, 2006).

SUEZ, Gaz de France *(GdF) and Enel*

Shortly after Italian energy company Enel announced an interest in bidding on French Suez, this company announced a merger with Gaz de France. The merger creates the second largest energy company in Europe (after E.On), with a yearly turnover of 63 billion euros. The Italian government now accuses the French of protectionism, and the Belgian government wants Gaz de France to sell its share in the Belgian electricity company SPE, which is the second largest company in the Belgian market. Otherwise, together with Suez-owned Electrabel the company to be created would own almost all electricity production in Belgium (Energeia, 2006).

Centrica and Gazprom

Russian Gazprom is considering a bid on UK-based Centrica. The British government, however, is fiercely opposed to such a take-over. Chief executive of Gazprom, Alexei Miller, has subsequently announced considering selling more gas to Asian parties if opposition in Europe continues (Energeia, 2006).

These three examples, and others that are less debated such as the recent formation of Polish and Swiss national champions, illustrate that national interests still play a crucial role in the European electricity market. Consolidation and forming national champions are the preferred options at the moment. In 2005, deals amounted to 105 billion USD, compared to 38 billion USD in 2004. For the future, a continuing trend of mergers is expected (PWC, 2006b).

3.5. Strategies of selected electricity companies in more detail

Electricity company's strategies differ according to their size, home market, ownership, main products and other factors. These factors may influence their investment strategies. Tables 3.4 and 3.5 give a brief overview of key features and general strategies of selected power generation companies.

When considering the strategies of these companies in more detail, despite large differences in underlying factors, remarkable similarities in strategies appear. All companies, according to their annual reports and other corporate information, look for:

- a stable basis in a national home market;
- growth via mergers and acquisitions;
- a diversified generation portfolio; and
- investments in environmentally-friendly production capacity.

Most companies also publicly announce their intention to strive for vertical integration to reduce operational risks. Exceptions are an independent power producers such as Intergen that only own production capacity. Also, very few of the companies exclude a particular energy source from future investments. An exception in this case is Nuon, which has announced that it will not to invest in nuclear.

Strategic differences between companies mainly are a product of their present size and geographical area in which they are active, or want to become active. Smaller companies usually focus more on stabilising positioning in their home market and a limited number of foreign markets. Larger players operate in a broad range of countries. Furthermore, companies differ in their range of horizontal integration. Some in addition to electricity are also active in gas, water, waste or cable-tv and networking. Conversely, others are returning to core activities and core markets – such as Enel divesting its water and telecom activities and Fortum divesting in the UK, Germany and Hungary as these markets are not considered core markets by the company.

Remarkably, state-ownership of a company does not prevent it from becoming active in other countries, e.g. non-listed and 100% state-owned Vattenfall or recently listed EdF (2005) are just as active in foreign markets as E.On, which has been listed on stock markets for several years.

Table 3.3 Parties presently not active in the Netherlands

	Endesa	EdF	Enel	Fortum	Vattenfall
Home market	ES	FR	IT	FI	SW
Ownership	Listed	Listed 2005 (85% French state)	Listed (32% Italian state)	Listed (52% Finnish state)	Not listed (100% Swedish state)
Main products	Electricity, gas, water	Electricity	Electricity, gas, telecom	Electricity	Electricity, heat
Turnover in 2005 (million euros)	18,229	51,050	32,374	3,877	13,697
Main markets	ES, PT, IT, FR, Latin America	FR, UK, DE, IT, Eastern Europe	IT, ES, FR, Eastern Europe	Nordic countries, Baltic states, Russia	Nordic countries, DE, PL
Present power generation mix	Various sources	Various sources, mainly nuclear	Various sources; converting oil- to gas- and coal-fired plants	Various sources	Various sources
Strategy	Consolidate position in Spain and Latin-America. Develop activities in France and Italy. Telecom has been divested	Consolidate in four prime markets F, DE, UK, IT as well as in Eastern Europe and China.	Focus on core activities. Water & telecom divested. Expansion in Eastern Europe.	Expansion in Nordic Countries, Baltic States, Poland and Russia. Divestments in UK, DE, HU.	Growth in primary markets through mergers and new capacity.

Sources: Annual reports (special reference is made to Vattenfall's annual reports, which contain information on other companies as well), websites, CIEP analysis.

Table 3.4: Parties presently active in power generation in the Netherlands

	Essent	**Nuon**	**E.On**	**Electrabel**	**Intergen**	**RWE**	**Eneco**	**Dong**
Home market	NL	NL	DE	BE	Global activities	DE	NL	DK
Ownership	Not listed (100% Dutch regional authorities)	Not listed (100% Dutch regional authorities)	Listed	Listed (owned by Suez)	Not listed. Owners: Canadian pension fund and international Investor group	Listed	Not listed Dutch municipalities	Not listed (100% Danish state)
Main products	Electricity, gas, heat, waste, cable	Electricity, gas, heat	Electricity, gas	Electricity, gas	Electricity generation	Electricity, gas, water	Electricity, gas, heat	Gas
Turnover in 2005 (million euros)	6.325	5.017	56.399	12.218	N.A.	43.155	3.361	N.A.
Main markets	NL, BE, DE	NL, BE, DE	Central Europe, Nordic countries, Russia, UK	BE, LUX, NL, FR	UK, NL, ES, Asia, Americas	Germany, Central and Eastern Europe	NL	DK, SW, GE, NL (buying North-Brabant's Intergas in 2005)
Present power generation mix	Various sources	Various source, no nuclear	Various sources	Various sources	Mainly gas	Various sources	Presently no power generation, only supply.	Originally active in gas. Since buying Elsam various sources.
Strategy	Stepwise growth: (1) Expand generation capacity in NL, retail growth in B, wind in DE. (2) Looking for new opportunities, e.g. LNG. (3) Merge in NL and NW Europe	Selective growth. Focus on core countries NL, BE, DE. No investments in nuclear.	European-wide growth.	Expansion from Benelux-France home market into ES, PT, DE, IT and new Member States of the EU.	Global expansion in power generation.	Focus on electricity and gas in its four main regions. Divest water operations in UK and US.	Converting from supplier to integrated generator and supplier. Building up position in gas market by looking for gas-storage facilities.	Secure its gas supply, integrate gas and electricity operations, international growth (SW, DE, NL).

Sources: Annual reports, websites, CIEP analysis.

3.6. European investors: the game

As the European electricity market begins to take shape, all electricity companies are searching for a growth strategy for this market. There are two options in this regard: mergers and acquisitions or new power plant construction. Judging from the record number and size of acquisitions during 2005, as well as the huge deals still pending completion, the former strategy is at present receiving the most attention. Risk reduction through diversification of portfolios and vertical integration are some of the basic considerations that determine the strategies of almost all companies. Stabilisation in the home market through the formation of national champions is also a strategy for many companies and one that seems to be endorsed by most national governments.

Concerning new power plant construction, at least in the discussions on this topic, a shift seems to be taking place away from gas as the preferred primary energy source to more nuclear and conventional coal, with carbon capture and storage being an option for coal plants in the longer-term. Whether this will result in a substantial shift in the overall primary energy mix in Europe and individual countries remains to be seen.

4

Possible Consequences for the Netherlands

4.1. Present situation in the Netherlands

There is currently some 20,000 MW of electricity generation capacity installed in the Netherlands (TenneT, 2005), of which large power producers Electrabel, E.On, Nuon, Essent and EPZ are the main owners. Some 25% of production is decentralized generation capacity, mainly cogeneration capacity, owned mostly by large industrial end-users, often in joint-ventures with electricity companies.

There has been hardly any recent activity around large power plants construction in the Netherlands. Only one large unit has been added to total generation capacity in recent times: a gas-fired steam and gas turbine of 800 MW, owned by Intergen, and in service since 2004. Apart from that, only wind capacity has grown significantly: from 450 MW in 2000 to 1180 MW in 2005. In contrast, a total of 200 MW of small-scale cogeneration capacity in horticulture has been taken out of service during 2002-2004.

The Dutch transmission network organisation, TenneT, expects electricity demand from 2005 to 2012 to grow by 0.5 to 3% per year (TenneT, 2005). In addition, some 1.700 MW is from plants that are older than 25 years and might need to be replaced in due time. According to TenneT, part of the increased electricity demand will be met by new interconnection capacity with Germany and Belgium over land, and Norway and the United Kingdom via sea cables.

By way of conclusion, TenneT assumes the following developments until 2012 (see Table 4.1):

- 1.900 to 3.000 MW of new large-scale capacity to be built or re-started;
- 550 to 2.100 MW of new wind turbines to be constructed on- and off-shore;
- 200 to 900 MW biomass waste capacity in waste incineration facilities or combustion/digestion; and
- hardly any new development in cogeneration capacity.

Table 4.1: TenneT scenarios for new electricity capacity in the Netherlands until 2012 (three scenarios, of which lower and upper limits are given)

(MW)	2006	2009	2012
New large-scale production capacity	0	1.900 - 2.400	1.900 – 2.650
Re-start of already outphased capacity	120	0-400	0-400
On-shore wind	180	350-600	550-1.050
Off-shore wind	100	520	1.000-1.600
Biomass waste	150-210	130-480	200-900
New decentral cogeneration capacity	0	260	260
Decentral cogeneration capacity to be outphased	70-140	140-280	215-420

Source: TenneT, 2005.

When comparing these scenarios with the announced plans of investors in the Netherlands, a substantial mismatch can be observed. During 2005 and 2006, a large number of new investment plans were announced (Table 4.2 and Appendix III). If all plans were to be completely realised, a total of 9,150 MW of new capacity would be built up to 2012. These plans comprise some 280 MW extension of existing gas capacity, 4,000 MW of new combined cycle gas turbine (CCGT) capacity, 1,100 MW of coal plants and 3,600 MW of multifuel plants. The latter are mainly coal fired power plants, for which developers have announced intention to also use for co-firing biomass. Plans have been announced by parties already active in the Dutch generation markets (e.g. Essent, Nuon, Electrabel, E.ON) but also by companies active in Dutch electricity supply but which do not yet own generation capacity in the Netherlands (e.g. Eneco, RWE). A common feature of most investor plans is their reliance on existing sites. The Rijnmond area (in particular the Maasvlakte) and the Eemshaven in the North part of the Netherlands are preferred sites for these plans.

Table 4.2 Generation Capacity Planned and under Construction in The Netherlands (MW)

Biomass	130
Total CCGT	3.640
Total Coal	1.100
Total Multifuel	3.600
Gas Extensions	280
TOTAL NEW CAPACITY planned / under construction	**8.750**

Source: CIEP survey, see Annex III.

Elan Energy Consulting analysis (2005) suggests that subsequent to liberalisation of the Dutch market in 1998, existing overcapacity had to be reduced. With increasing demand overcapacity gradually disappeared. Increasing imports meant that demand could be met without attracting interest from entrant developers. Due to low margins and possibly the uncertainty until full liberalisation in 2004, neither were incumbents very eager to invest. Declining reserve margins and the realisation that new investments would also be needed in neighbouring to sustain the high Dutch import levels has changed the market situation. New investment plans on a massive scale started to come to the fore since 2004. Strategic behaviour might subsequently have induced some investors to announce their own plans in order to defer investment by competitors, leading to a current boom in plans. It is unlikely that all plans will be realised. Strategic behaviour might also be a reason for the fuel choice in many investment plans: a large part of new capacity announced is of the multi-fuel type, allowing investors to adapt the fuel to some extent according to changing market circumstances.

According to Elan, all plants are planned for existing sites for three reasons. First, there are few good sites remaining in the Netherlands with straightforward connection possibilities to the existing transmission network, access to cooling water and easy bulk supply of primary energy (e.g. coal, biomass). Second, most incumbents have space available on their existing sites or are choosing to replace an older plant with newer capacity. Third, the legacy of central planning prior to deregulation means that incumbents have inherited ownership or options on some of the more obvious development sites.

4.2. European Context for New Investments in the Netherlands

Investment decisions on power generation capacity in the Netherlands are partly influenced by European trends, but also by global and national considerations. This paper has discussed the European level, not going into detail about important global factors such as oil, gas and coal price developments, or the influences of climate change on international demand for Dutch near-shore sites with sufficient cooling water. In our opinion, the influence of the European context on electricity

generation in the Netherlands is twofold – on the one hand from European *policies*, on the other hand from European *investor strategies*.

At the *policy level*, three key influences play a role. First, European Union policy in recent years has played a crucial role in the development of a liberalised European electricity market and will continue to do so in the future. In 2007, national markets in the European Union must be open to all customers. Considerable progress has been made towards the ultimate goal of one well-functioning European electricity market. The present investigations of the European Commission regarding competition in the European electricity market are meant to further the process of integration of national markets into this market on a European level.

It is not clear how long a further integration process will take and when markets will converge. Rather, the process is likely to continue step-by-step through the development of several regional markets in Europe, after which a further integration of these regional markets can take place. In this way, existing differences in electricity prices in Europe are likely to be gradually reduced in the future, thus substantially influencing decisions of European power plant investors. Initiatives for further market integration especially in the North West European market are underway and might well lead to more efficient connection of various national markets.

Second, European environmental policies have played, and will play an important role in influencing the primary-energy choice of electricity generators in the Netherlands. This role however is mostly indirect, working through the transposition of European regulations into national legislation. Provisions stimulating renewable energy sources and cogeneration as well as emission reduction policies influence the decisions of power plant investors towards low-carbon, low-emissions and more efficient capacity.

A crucial influence for the future in this respect will be the decisions taken on a global level regarding greenhouse gas emissions reduction after 2012. The EU will be one of the players in these negotiations. Targets agreed upon at EU level will be translated into the settings for the European Emissions Trading Scheme, and in this way will crucially influence the efforts needed at national level, which are subsequently related into emissions permits for individual plants. Current investments have to be made in absence of any certainty in this field. Present highly volatile prices do not facilitate long-term predictions either.

Third, it is increasingly acknowledged by European policymakers that the European Union is operating in a global energy market where national interests are becoming more important. The expected increasing dependency of the European Union on imported primary energy sources has substantially inspired the recent Green Paper of the Commission. Coordinated actions on a European level have been suggested, but also met with resistance from individual Member States. The primary energy mix therefore is likely to remain a national competency in the near to mid-term future. However, the topic has risen high on the agendas of the Member States, suggesting that on this level regulatory actions will be investigated. This leaves the challenging question of how to come to national arrangements for a primary energy mix in electricity generation in a market developing into a European scale and in which the choice of primary energy sources for individual power plants is left to the respective investors.

On an *investor level*, the increasingly important consolidation trend suggests that Dutch electricity generators will have to prepare for more competition from non-Dutch parties in future. These parties are likely not so much to compete for building plants on new sites in the Netherlands, but rather to look for strategic mergers or cooperation with the incumbents. What the consequences will be for the type of power plants to be constructed in the Netherlands if all formerly Dutch electricity companies were to merge with foreign parties is difficult to predict. Technology choices are influenced primarily by economics, availability of fuels and suitable sites as well as by national regulations. The background of an investor should therefore only matter to a limited extent.

European market developments and policies set general conditions for the investments in power plants in the Netherlands. In the transition period towards a fully functioning European electricity market, careful national regulation with an eye towards gradual market opening remains of paramount importance. And even in a completed European market, national regulation and legislation together with global fossil fuel price developments are likely to remain of key influence to power generation investments in the Netherlands.

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Annex I: The EU 'Acceleration' Directive

The currently applicable common framework for the liberalisation process of EU electricity markets is set by directive 2003/54/EC (second electricity directive or 'acceleration directive').[17] The main elements contained in the directive are:

Eligible customers

The directive provides that from 1 July 2004 all non-household consumers, and from 1 July 2007 all customers be free to choose their electricity supplier. This means a considerable quickening of the timetable provided in first electricity directive, which is why directive 2003/54/EC has also been labelled as an 'acceleration directive'.

Access provisions and regulatory authorities

The options for regulating access provisions have been limited as compared to the first electricity directive. Whereas the latter granted Member States the opportunity to choose between negotiated and regulated third party access for the transmission and distribution systems, now regulated third party access has been made compulsory.[18] A regulatory authority has to set or approve the terms and tariffs for third party access or at least the methods to establish them. Also balancing services are subject to regulated terms and tariffs.

Unbundling

In addition to the requirement for electricity companies to keep separate accounts for distribution, transmission, and sales activities, the transmission and distribution system operators have to be legally independent from other parts of an integrated electricity undertaking. However, Member States can postpone the unbundling requirement for distribution activities until 1 July 2007. Special provisions with regard to the influence of affiliated, i.e., parent companies on the operations of the system operators (so-called Chinese walls) are designed to further reduce the incentives for system operators to discriminate between system users as well as to limit the opportunities for the parent company to strategically influence the long-term behaviour of the system operators, such as investments in system extensions. These Chinese walls also have to be established around distribution activities within a electricity undertaking as long as they are not legally independent. Ownership of assets, such as transmission and distribution networks, does not have to be transferred to the system operators and can remain, for example, with the formerly fully integrated electricity supply company.

Public Service Obligations (PSOs)

The directive gives power to Member States to impose public service obligations on undertakings operating in the electricity sector. Such obligations, which need to serve the general economic interest, can relate to security of supply, quality of electricity provision and environmental protection but also to the price of supplies.

New generation capacity

The electricity directive provides that Member States need to adopt an authorisation procedure, laying down the criteria, which need to be met in order to obtain an authorisation for the construction of new generation capacity. Member States are obliged to monitor the supply/demand balance in their national

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[17] European Union (EU), 2003, Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC. *Official Journal* L176, 15.07.2003, pp. 37-55.

[18] Directive 96/92/EC additionally included the option of a 'Single Buyer' procedure. This access model, included to facilitate French reservations with respect to liberalisation policies, was eventually not applied by any Member State and is therefore not explained here.

electricity markets. Should this monitoring process indicate that market parties do not provide sufficient new generation capacity under the authorisation procedure, Member States may organise tenders for new generation capacity.

Annex II: Efficiency incentives for mergers

Efficiency motivation for merger	Economic Basis of effect
Economies of scale	If each firm incurs fixed costs and assets that are not fully used, combining the activities can cut average fixed costs; large scale operation can also reduce the variable cost of production. Moreover, average transaction costs in purchasing and selling can be reduced (increased bargaining power).
Economies of scope	A merger might reduce costs via disparate activities that however share the same facilities (e.g. electricity and gas suppliers sharing the same customer centre).
Pooling risks	It may be efficient for two companies to pool their risk by merging. Mergers provide an efficient form of risk pooling if using markets to pool risk is expensive and subject to high transaction costs. Combining Research and Development activities is one example. For the electricity sector, the combination of differently structured generation portfolios can bring benefits in the management of fuel price risk.
Elimination of transaction cost	It may be more efficient to conduct business within a firm rather than between firms. Bilateral contracts offer an alternative to vertical or horizontal integration, but are less efficient than common ownership of two activities, if the cost of establishing and operating a contract is higher than the cost of managing the interaction within the undertaking.
Elimination of negative externalities between producers of complements	In some conditions, mergers eliminate special economic problems (e.g. double marginalisation and hold-up problems in the case of vertical mergers).
Advantages for obtaining finance	Large companies may have an advantage in raising funds. However, this advantage often derives from a combination of economies of scale (in financial transactions), risk pooling (between the company's activities, e.g. regulated networks and competitive generation) and reduced transaction costs.

Source: Adapted from Shuttleworth et. al., 2003.

Annex III: Power plant projects in the Netherlands

As of June 2006

Location	Project Name	Type of plant	Capacity (MW)	Efficiency	Project Partners	Estimated Investment (million €)	planned start-up	Status
Recently completed			**800**					
Rotterdam	Rijnmond Energie	CCGT	800		Intergen, Eneco		2005	operational
Under construction			**430**					
Pernis		CCGT/CHP	300		Air Liquide, Shell	260	2007	Under construction (since January 2006)
Delfzijl		Biomass	100		Evelop	200	2008	Under construction
Likely								
Moerwijk		Chicken dung	30		DEP, Delta, ZLTO		2008	Permits granted
Planning			**8040**					
Sloe Gebied		CCGT	800	57%	Delta and undisclosed partner	600	2009	Procedure retaken after delay
Rotterdam Rijnmond		CCGT	400		Intergen, Oxxio	> 200	2009	Planning
Rotterdam Maasvlakte Europoort; Eemshaven;		CCGT	840		Eneco, International Power		2009	Planning; investment decision planned for end 2006
Moerwijk		CCGT	400		Essent			planning
Flevoland	Flevocentrale (nieuw)	CCGT	900		Electrabel		2009	MER startnote
TBD	Magnum'	IGCC, CCGT	1.200		NUON	1000	2011	Permit procedures started for three alternative locations
Rotterdam, Maasvlakte		Coal	1.100	46%	E.ON	1200	2012	MER in preparation, Building start planned for 2008
TBD		Coal/Biomass	1.600		RWE	1500	2012	Planning
Rotterdam, Maasvlakte		Coal /Biomass	800		Electrabel		2011/12	Planning; investment decision planned for

				2007
Extensions (planning)		**280**		
Clauscentrale	Conventional Gas	280-320	Essent	Startnote MER
Subtotals (Plans and under construction				
Biomass		130		
Total CCGT		3.640		
Total Coal		1.100		
Total Multifuel		3.600		
Gas Extensions		280		
TOTAL NEW CAPACITY planned / under construction		**8.750**		

Source: Elan Energy Consulting; Energeia; Company websites, press releases.