Report from the Nordic competition authorities No. 1/2007

Capacity for Competition

Investing for an Efficient Nordic Electricity Market

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2007

ISBN 978-82-997472-2-6 (printed version)
ISBN 978-82-997472-3-3 (electronic version)

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Preface

At the meeting between the Nordic competition authorities in Bergen 16 – 18 August 2006 the decision was taken to establish a working group to investigate the recent developments in the Nordic power market.

The working group received the following mandate:

"In 2003, a Nordic working group issued a report entitled "A Powerful Competition Policy". The working group concluded that the deregulation of the Nordic power market has been largely successful. The Group pointed out several actions that should be considered further in order to stimulate competition in the market. One of the main conclusions was that increased transmission capacity will reduce the scope for exerting market power.

The sharp increase of the wholesale electricity prices since the beginning of 2006 has lead to a debate concerning the efficiency of the Nordic power market. There have been proposals to reregulate the power market in terms of stipulation of prices and production.

There is a need to reconsider the conclusion of the 2003 report in light of the recent developments. In particular, there is a need for a stocktaking as to the present capacity situation for production and transmission of electric power and to identify obstacles to increased capacity.

In their 2003 report the Nordic competition authorities recommended that the transmission cables between the Nordic countries should be strengthened. Nordel – the organisation of the Nordic transmission operators – has recommended the establishment of five transmission connections in the Nordic network. Even though these projects are considered to be socio-economic profitable many of them will not be undertaken in the foreseeable future. One possible reason is that the national system operators do not take into account possible positive externalities of the investments in the other Nordic countries.

For several years since the market reform, there have been few new investments in production capacity. Partly due to a gradual increase in demand the excess capacity of yesterday has now turned into a situation with more scarce production capacity. There is a need to study the prospects for increased utilisation of existing power plants as well as the possibilities for increased production capacity.

The working group shall study the development of the Nordic power markets since the former Nordic report from 2003. The group shall pay particular attention to present capacity situation in the transmission networks and production plants and explore the possibilities for increased capacity.

The working group shall draw on already existing analyses, interview market participants and consider possible procompetitive actions.

The work shall be summarised in an English written project report that may be published if so decided by the directors general. The report will be presented at the next Nordic meeting in the fall of 2007."

The members of the working group have been:

Lasse Ekeberg, the Norwegian Competition Authority (head)
Jacob Schaumburg Müller, the Danish Competition Authority
Ulrik Laudrup, the Danish Competition Authority
Erik Molin Schmidt, the Danish Competition Authority
Timo Mattila, the Finnish Competition Authority
Valtteri Virtanen, the Finnish Competition Authority
Snorri Stefansson, the Icelandic Competition Authority
Stig-Arne Ankner, the Swedish Competition Authority
Veronica Storlid Kvinge, the Norwegian Competition Authority
Margrethe Slinde, the Norwegian Competition Authority (head of secretariat)

The working group has had five meetings:

Oslo 3 November 2006
Copenhagen 2 February 2007
Stockholm 19 March 2007
Helsinki 4 May 2007
Reykjavik 18-19 June 2007

In addition the members of the working group have had meetings with their national energy regulators, transmission system operators and Nord Pool.

Conclusions and recommendations

This report is divided into four main chapters. In chapter 1 there is a stock-taking of the general development in the Nordic electricity market since the report "A Powerful Competition Policy" was issued in 2003. Chapter 2 explores the Nordic transmission system, while chapter 3 concerns production. In chapter 4 the retail market is discussed. In the following the main conclusions and recommendations from the report are presented.

The electricity price fluctuates considerably. In wet years with a great deal of precipitation, prices will normally be lower than in drier years. The electricity price also depends on several other factors, such as prices of gas and coal and the price of CO_2 allowances. In the early autumn of 2006, forecasts indicated high electricity prices for the following winter and later. However, due to above normal precipitation and inflow in Norway and Sweden as well as higher temperatures than normal in the Nordic area, the situation changed. According to Nord Pool's financial market, the price is expected to rise during the winter 2007/2008. One important reason is increased price of CO_2 allowances.

The development and integration of the Nordic electricity market is an ongoing process, and many of the problems and obstacles that were discussed in the 2003 report are still present in the Nordic electricity market. The Nordic competition authorities would like to point out that concentration in the Nordic electricity market has changed due to mergers. Vattenfall has strengthened its position in the Nordic area through the acquisition of parts of Elsam and E2 in Denmark. Statkraft has an even stronger position in Norway after the Government reversed the Norwegian Competition Authority's decisions concerning Agder Energi and Trondheim Energiverk.

Cross-ownership is still widespread in the Nordic market and may be problematic from a competition point of view. Joint ownership of plants between large competing energy producers is also quite common and should be avoided or otherwise be limited as far as possible.

In order to measure market concentration, a proper relevant market should be delineated. Analysis made by the Danish Competition Authority shows that the Danish producers are able – by bidding at Nord Pool – to a large extent to control when a connection to a neighbouring country will be congested. The existence of bottlenecks can thus be a result of strategic conduct in markets. The Nordic competition authorities recognize that separate relevant geographic markets can arise also in situations when there are no bottlenecks.

When considering the capacity of the existing transmission network, it must be noted that the actual average import and export capacities are typically lower than the nominal capacities. For instance, in 2006 the average import capacity to Western Denmark from the Nordic countries corresponded to only 60 per cent of the nominal import capacity. Sufficient transmission capacity, together with an efficient utilisation of the capacity, is one basic requirement to achieve sufficient competition in the electricity market in the Nordic area, and thus a well functioning and efficient electricity market.

Only minor investments have been made in the Nordic transmission grid during the last years. However, another phase in the development of the transmission grid is now emerging, and during the coming years several investments will be carried out and others are planned. Nordel has agreed to prioritise five investment projects in order to improve transmission capacity. These are:

- Fenno – Skan 2 (between Sweden and Finland)
- Nea – Järpströmmen (between Norway and Sweden)
- Cut 4 (South Sweden)
- Great Belt (between Eastern and Western Denmark)
- Skagerak IV (between Denmark and Norway)

The Nordic competition authorities support Nordel's five prioritised investments, on condition that the investments are socio-economic profitable. If all these investments are carried out the competition problems in the Nordic market will be reduced. However, it will not be socio-economic profitable to eliminate all bottlenecks, meaning that it will still be necessary for competition authorities to keep attention on the development of a competitive market structure and to intervene against anticompetitive behaviour.

The Transmission System Operators (TSOs) are obliged to have a good overview of available transmission capacity, expected development in power consumption and expected investments in new production capacity. Access to such information is a prerequisite for a TSO to be able to estimate the need for new investments. Price signals caused by bottlenecks in the transmission system contribute to creating incentives for efficient investments both in power production and the transmission grid. For a market to function properly, it is therefore a crucial prerequisite that correct price signals are visible for market participants and the owners.

In contrast to the market splitting model applied at Nord Pool (implicit auction), the capacity on the cross-border connections between Germany and Western Denmark, Sweden and Germany, Sweden and Poland, and Finland and Estonia are allocated through the use of explicit auctions. This allocation method results in an inefficient utilisation of the connections, and may cause that electricity flows in the wrong direction, i.e. from the high price area to the low price area. An example of such poor administration is that

the electricity was flowing in the wrong direction on the connection between Western Denmark and Germany in 24 per cent of all hours in 2006.

In an efficient electricity market, power should flow from low price to high price areas. The Nordic competition authorities support developing efficient market connections with surrounding countries and areas, e.g., the ongoing work towards the establishment of market coupling on the cross-border connection between Western Denmark and Germany in 2007.

The Nordic competition authorities support the congestion management guidelines' recommendation to use congestion rents for investments.

There may be large potential net gains from improved grid investments. The Nordic TSOs are mainly responsible for their national transmission systems. However, optimal grid investments should be based on Nordic welfare.

Competition analysis ought to be included in the TSOs' investment decisions. If quantitative analysis is too complicated to carry out, at least a qualitative assessment should be included.

Through the ITC-mechanism a European TSO is compensated for transit of electricity by the rest of the European TSO's. The ITC mechanism does to some degree effect the investment incentives of the TSO's. The Nordic competition authorities stress the importance of adopting new harmonised, binding and adequate European guidelines regarding compensation of TSOs for transit of electricity (ITC). It is essential that an ITC mechanism takes into account benefits and costs of trade supplied by market mechanisms. The costs might be defined in terms of replacement costs, cf. regulation 1228/2003 definition of forward looking long-run average incremental costs.

Increased consumption and relatively small investments in new production capacity have led to a tightening of the Nordic power balance in recent years. In general there is thus a need for increased production capacity in the Nordic region in the coming years.

In a well-functioning market, prices are the most important investment signal. Market prices will increase in situations with capacity constraints, thereby making it more attractive both for incumbents and new investors to add additional capacity to the market.

To have proper incentives to invest in new production and transmission capacity, it is important to have a stable, predictable and long-term regulatory framework.

Incentives and political instruments may be useful in stimulating investments in new production capacities. However, it is important that they do not destroy the market's ability to make the correct investment decisions, but rather that the instruments support and improve the regulatory framework in which the investment decisions are taken.

Different production technologies have different characteristics, and conditions like the technologies' cost structures and utilisation sometimes affect the investment decision. It is crucial, both in a competition and in a security of supply perspective, to have a sound diversity in the production technologies used. A market open to a wide range of production technologies is the best guarantee to achieve an efficient market. Political means and support schemes must not work against this.

The Nordic competition authorities support the work done by the EU Commission to evaluate more use of auctioning when distributing CO_2 allowances. Such a system would be more effective if implemented globally and also including other emissions gases than CO_2.

Investment in new production capacity will normally improve competition. From a competition point of view, investments in increased production capacity from new producers/entrants are viewed more favourably than those from incumbents.

In order to achieve sound electricity markets it is important that monopoly network activities and competition activities are unbundled. The Nordic competition authorities are of the opinion that the existing requirement of the Electricity-directive of legal unbundling is not sufficient to ensure that the TSOs and Distribution System Operators (DSOs) act in a neutral manner. The most efficient way to prevent any discriminatory behaviour would be ownership unbundling. The Nordic competition authorities strongly support the work of the European Commission for ownership unbundling at the transmission level. If ownership unbundling of DSOs is not feasible, the legal unbundling requirement should at least also apply to network companies which serve less than 100 000 customers[1].

The Nordic competition authorities would like to underline the importance of the work which is done towards an integrated Nordic retail market. The most important challenge is to increase the customers' price awareness. In this respect and subject to cost-benefit analysis, online metering devices should be introduced in order to make the customers more responsive to market prices.

The Nordic competition authorities are of the opinion that installing hourly metering equipment would benefit competition and cause a downward pressure on the price level in the long run. Real time price information, and accompanying real time contracts, would enable the electricity customers to be far more price responsive, which in turn would reduce peak demand and lower average costs for all customers.

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[1] Denmark already has mandatory unbundling for all sizes of distribution companies. In Finland, the requirement for legal unbundling is for DSO's that transmit 200 GWh or more per year.

1. Recent Developments

1.1 "A Powerful Competition Policy"

In 2003 the report "A Powerful Competition Policy – Towards a more coherent competition policy in the Nordic market for electric power" was prepared by a working group consisting of members from the competition authorities in Sweden, Denmark and Norway. The report focused on the wholesale market for physical delivery of electricity.

The Nordic working group examined market power in the Nordic electricity market with a view to suggest measures to increase competition and improve co-operation on national policy enforcement. The working group's opinion was that the deregulation of the Nordic electricity sector had to a great extent been successful. However, the group found that the following obstacles remained:

- *Bottlenecks in the grid divide the Nordic region into shifting constellations of relevant geographic markets.*
- *Market concentration figures in these geographic markets are very high.*
- *The high market concentration figures are partly due to cross-ownership and jointly owned production plants.*
- *Inflexibility of the production plant and capacity constraints on production enhances market power. Even a small firm can exert market power.*
- *Demand for electricity is very inelastic.*
- *Practices with negative effects on competition may have ripple effects all over the Nordic region.*
- *There are high barriers to entry.*

Based on the observed obstacles the working group suggested the following actions in 2003:

- *Mergers leading to increased market concentration must be carefully reviewed.*
- *One or two major producers dominate all national markets. The large extent of cross-ownership is an obstacle to well-functioning markets. Authorities should consider if and how more pro-competitive company and ownership structures could be created.*
- *Transmission system operators should endeavour to increase the effective capacity utilisation of the transmission grids.*
- *Transmission system operators should pay due attention to competition considerations in investment analyses of new transmission capacity.*
- *Increased transmission capacity will usually reduce the scope for exerting market power. However, increases in transmission capacity will not fully eliminate market power.*

In order to improve co-operation on competition policy enforcement in the Nordic region the working group pointed out the following in 2003:

- *Although there are separate regional geographic markets the effects of many mergers and anticompetitive business practices are inter-Nordic.*
- *Market power being exerted in one region may have detrimental effects in all parts of the market.*
- *When national competition authorities handle mergers and anticompetitive business practices there is a risk that the overall effects will not be taken into consideration.*
- *In the power market the opportunity for exchanging information under the Nordic agreement on exchange of information will be of particular importance.*
- *Procedures that will enable involvement of the Nordic national competition authorities in the handling of cases with effects in more than one country should be implemented.*
- *An inter-Nordic working group should be established in order to exchange views and promote harmonisation of the analytical framework.*
- *The Nordic Group should not be a closed forum but invite other European competition authorities to participate when relevant.*
- *Information exchange between Nord Pool, Nordic energy agencies and financial authorities should be strengthened.*

The Nordic competition authorities have followed up the recommendations in their work with the electricity-market. In section 1.2 we will present major market developments since 2003, when "A Powerful Competition Policy" was issued. Section 1.3 summarises the enforcement practises in the electricity market. Section 1.4 outlines some relevant studies regarding competition issues in the electricity market. In section 1.5 some other relevant issues are described, while section 1.6 sums up the main conclusions in chapter 1.

1.2 Market developments

1.2.1 Developments in the integrated Nordic market

The electricity price fluctuates considerably between seasons. In the Nordic system where approximately 52 per cent of the production capacity is based on hydro, climate influences the price both via patterns of consumption and via the precipitation into water reservoirs. In wet years with a great deal of precipitation, prices will normally be lower than in drier years.[2] The electricity price also depends on several other factors, such as prices of gas and coal and the price of CO_2 allowances.

[2] A dry year is a hydrological situation that appears on average every 10th year. More extreme dry years will have a repetition on 20, 50 or 100 years.

In the winter of 2002/2003, a situation with relatively high prices in the Nordic electricity market occurred. The autumn of 2002 turned out to be considerably drier than normal, and this was the main reason for the high price level. The Nordic competition authorities found no indications of inefficient competition during the period.

Prices in Denmark have at times been higher than in the rest of the Nordic countries. The Danish Council has decided that the Danish producer Elsam (now DONG) has abused its dominant position in Denmark to raise prices to excessive levels in certain hours in the period 2003-2006.

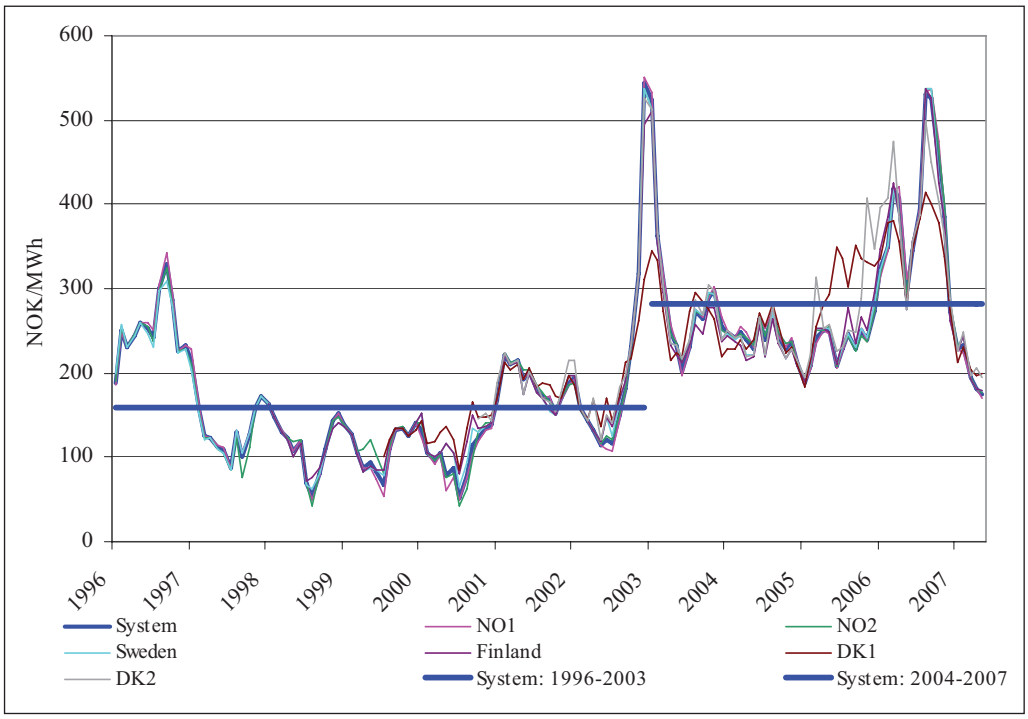
During the summer of 2006, the electricity price increased and the level of water reservoirs fell in a period where the opposite is the norm, i.e. when water reservoirs are normally being filled. The system-price at the Nord Pool Spot market reached its maximum at 630.85 NOK/MWh at the end of August 2006. This sharp increase of the wholesale prices intensified the debate concerning the efficiency of the Nordic Electricity market, and several proposals regarding the possibility to reregulate the market were promoted.

In the early autumn of 2006, forecasts indicated high electricity prices for the following winter and later. However, due to above normal precipitation and inflow in Norway and Sweden as well as higher temperatures than normal in the Nordic area, the situation changed. In January 2007 the system-price had decreased to 212.64 NOK/MWh, which is a lower price than was seen throughout 2006. The system-price remained on a relatively low level through the first half of 2007 when this report was finished. However, according to Nord Pool's financial market, the price is expected to rise during the winter 2007/2008. One important reason is the increased price of CO_2 allowances.

The figure below shows the monthly system-price and area-prices in the Nord Pool Spot market in the period from 1996 to May 2007. If we exclude 1996, which was a very dry year, the figure indicates an increasing price trend during the period. However it also seems to be a structural change in the system price in the beginning of 2003.[3]

[3] In the period 1996-2002 the system price has a mean value of 158 NOK/MWh, and from 2003 and onwards the mean value has increased to 281 NOK/MWh. Based on empirical analysis this change is found to be statistical significant.

Figure 1.1 Monthly system price and area prices on Nord Pool Spot 1996 – May 2007



Source: Nord Pool

The experience from the last few years illustrates one of the special circumstances which characterise the electricity market. There is a high degree of uncertainty regarding future prices, and this uncertainty is a challenge not only for the market players, but also for the competition authorities when considering the efficiency of the market.

1.2.2 Developments in the Icelandic Market

The Icelandic electricity market is geographically isolated. There are no interconnections with other countries, and there are no definite plans for such connections. The transmission system reaches the whole country, and thus Iceland most of the time consists of one single geographic market.

Prior to 1 July 2003, the Icelandic market was closed for competition. Almost all electricity was supplied by Landsvirkjun and sold through regional distribution companies. For all intents and purposes, Landsvirkjun had a monopoly position on investment in generation, although some DSOs obtained limited and conditional concessions to generate electricity. The Electricity Act no. 65/2003 implemented the First Electricity Directive (96/92 EC), and opened up the Icelandic market for competition.

On 1 July 2003, investments in generation were allowed subject to certain conditions; sales were partially liberalised and final customers consuming

more than 100 GWh were allowed to switch electricity supplier. End-users whose demand was metered, and who used more than 100 kWh of electricity were allowed to switch supplier from 1 January 2005. Full market opening began during 2006. Necessary IT systems became operational in April 2006, but so far few customers have used the opportunity to switch supplier.

Landsvirkjun is the largest electricity producer, with about 76 per cent of total annual production. The majority of the electricity is sold to industrial users, mainly aluminium smelters and producers of ferroalloy. Landsvirkjun does not participate directly in the retail market for households and smaller businesses. In the retail market three companies have considerable market shares; RARIK, Orkuveita Reykjavíkur and Hitaveita Suðurnesja. The last two have also entered into the market for energy intensive users.

Transmission is conducted by Landsnet, a company jointly owned by RARIK, Landsvirkjun and Orkubu Vestfjarða. These companies newly formed the joint venture company Orkusalan although Icelandic Competition Authority intervened in the merger, cf. point 1.3.1. Landsnet is supposed to be managed independently of its owners.

The vast majority of Icelandic houses are heated using hot water extracted from the ground. Traditionally, the same companies have been DSOs, electricity retailers, central heating providers (hot water) and in some cases cold water suppliers. This has encouraged the construction of geothermal energy plants which produce both hot water and electricity. These activities are monopolistic but monitored by the National Energy Authority and the Icelandic Competition Authority. All households heated with electricity receive subsidies to make their heating costs comparable to those which use hot water. These households are, however, not many.

1.2.3 Development in ownership relations

In "A powerful competition policy", cross-ownership and jointly owned power plants were pointed out as one of the reasons for the high market concentration figures in the Nordic region.

Jointly owned power plants increase the risk for anti-competitive behaviour. The fact that joint ownership of plants is quite common in the Nordic countries may therefore have a negative impact on the degree of competition in the market. Collaboration with respect to, in particular, nuclear power and hydroelectric power implies a considerable risk of sensitive information, deliberately or not, being exchanged. This may reduce the degree of competition between electricity producers, and it significantly reduces confidence in the workings of the electricity market, both among other market actors and among customers. Further, extensive joint ownership implies a danger that the leading power producers may influence supply, and thus the price level throughout the entire Nordic market.

It is quite common for electricity companies in both Norway and Sweden to jointly own hydro power production plants. In Norway approximately 30 per cent of the production capacity is jointly owned by two or more companies[4]. In most cases, one of the owners has operational responsibility. From a competition point of view it is unfortunate that Statkraft, which is by far the largest Norwegian electricity producer, has ownership interests in a huge number of jointly owned electricity plants. The scope for anticompetitive behaviour as a result of jointly owned power plants is, however, about the same today as in 2003.

There have been some positive developments regarding joint ownership in Sweden during the last few years. The three major Swedish power producers have, e.g., exchanged shares in a number of previously co-owned hydropower plants in order to reach single ownership structures. In conjunction with these transactions, several agreements on so-called replacement deliveries have been terminated.

Joint ownership is still evident in the nuclear power industry in Sweden, cf. point 1.3.2. However, arrangements in the planning process regarding how to load and run jointly owned nuclear power plants have been altered to avoid obvious sharing of sensitive information between the owners. Due to political decisions, no new nuclear power and no new large scale hydroelectric power can be built in Sweden. An adverse effect of the nuclear phase-out is that it has led to a greater degree of joint ownership between the two major Swedish electricity producers, Vattenfall and E.ON Sverige.

In Finland several power plants are jointly owned by market participants, and this is considered to be a practical way for smaller market participants to make investments in power production capacity. Joint ownership which does not involve co-operation between power producers does not in principle represent a competition problem. The situation in Finland has not changed significantly since 2003.

In Denmark interactions between the players in the Danish markets have caused a market constellation with no joint ownership[5]. Neither is there in Iceland joint ownership between power producers, but there has been, to a certain degree, joint ownership between the Icelandic state and some municipalities.

Regardless of whether agreements or arrangements set up to control joint ownership of power plants can be found to involve a direct breach of the

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[4] More than 80 power plants with a total mean annual production capacity of 35 TWh and an installed capacity of 9 300 MW were jointly owned in 2003.

[5] The wind farm Horns Rev is actually owned by both Vattenfall (60 per cent) and DONG Energy (40 per cent). Yet, Vattenfall independently runs production which enters into their bid portfolio on, e.g., Nord Pool. As result DONG Energy has no influence on production but gains 40 per cent of the profit.

competition rules or not, there is always an obvious and constant risk for information sharing or other effects detrimental to effective competition between the owners. Joint ownership between large competing energy producers should therefore be avoided or otherwise limited as far as possible.

1.3 Activities by the Nordic competition authorities

This section sums up the most important cases handled by the Nordic competition authorities regarding the electricity market since 2003.

1.3.1 Merger cases

In the report "A Powerful Competition Policy" from 2003, the Nordic competition authorities suggested that mergers leading to increased market concentration should be carefully reviewed. There have been several mergers involving some of the large players in the Nordic markets since 2003. A short overview of these cases follows below, including the main issues in the competition authorities' evaluation of these cases.

Elsam – NESA

Conditional on substantial amendments, the Danish Competition Council on 24 March 2004 approved the merger between the electricity producer Elsam and NESA, which mainly operates retail sales. NESA owned 36 per cent in the other major Danish electricity producer Energy E2. Consequently the merged entity became the largest shareholder in the only other Danish producer, Energy E2.

Elsam and Energy E2 have dominant positions on the Danish wholesale market of electricity in Western and Eastern Denmark, respectively. These markets are not directly connected and as a result no real competition exists between them.

With Elsam owning 36 per cent of Energi E2 and consequently receiving a significant share of its profits, the competitive pressure between the companies was reduced.

However, beyond the clear competitive effect from the ownership structure of the two companies, the effects from the merger would also depend on the development on the electricity market. First, the Danish Competition Authority expected a positive competitive effect from exposing decentralised electricity production to competitive pressure. Second, the Danish Competition Authority expected that the transmission capacity between Jutland/Germany and Zeeland/Germany would be exploited more effectively alongside an expansion of the Jutland/Norway cable. Third, in the medium-term an increased competitive pressure between the companies was to be expected from the construction of a transmission cable between Eastern and Western Denmark.

In order to counterbalance the negative effects from the merger three commitments were set forth by the Competition Council.

First of all, Elsam agreed to sell off 600 MW in virtual capacity for an infinite period to encourage alternative competitors. The VPP auctions are held once per quarter and designed as an Anglo-Dutch auction. To date, five VPP auctions have been successfully conducted. Moreover, the merged entity agreed to dispose of all decentralised combined electric power and heat plants (CHP), amounting to 230 MW. In addition, Elsam was prohibited from managing and buying decentralised CHP plants for a period of 12.5 years.

Second of all, the merged entity was committed to sell off all ownership stakes in the transmission company Elkraft Transmission and System to the Danish Government, who became an independent owner of the transmission system (Energinet.dk). This was to ensure that all electricity producers are guaranteed an equal access to the transmission network. Furthermore, Elsam committed itself to building a 600 MV transmission cable (Great Belt) between the Western and Eastern Danish markets[6]. Together with the sales of both decentralised and virtual capacity the Danish Competition Authority assessed that the cable would imply increased competitive pressure on both markets.

Third of all, Elsam agreed to provide consumer-profile information to competitors in order to lower the entry barriers in the retail market.

DONG – Vattenfall

With the DONG - Elsam - Energy E2 - FE - KE merger in view, DONG and Vattenfall agreed to enter into a main asset swap agreement in which Vattenfall acquired central and decentralised CHPs in both Eastern and Western Denmark.[7] Moreover, Vattenfall acquired both onshore and offshore wind farms in Western Denmark. In return DONG received both Vattenfall's 35.3 per cent share in Elsam and their 40 per cent share in Avedøreværket.

These transactions were approved by the European Commission in late 2005 and consequently on 2 July 2006 Denmark had two main producers of electricity.

DONG – Elsam – Energy E2 – FE – KE

Concurrent with the DONG - Vattenfall transaction, DONG announced their purchase of Elsam, Energy E2, FE and KE in March 2006. The merger is hitherto considered the largest in the energy sector in Denmark. However,

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[6] Today Elsam (DONG Energy) is not involved in the Great Belt connection; the project is undertaken and financed by Energinet.dk.

[7] FE and KE are acronym for Frederiksberg Energy and København Energy, respectively.

due to the entry of Vattenfall and since the Elsam - NESA commitments also applied to the new entity, the European Commission assessed that competition in the post merger electricity market was unaltered.[8]

The mergers in Denmark changed the market structure to one in which there is one large producer in Eastern and Western Denmark (DONG) and a smaller producer (Vattenfall) also with production facilities in Eastern and Western Denmark. The new Great Belt cable will connect Eastern and Western Denmark and hence increase the potential for more competition.

Fortum Power and Heat – E.ON Finland

In June 2006 The Finnish Competition Authority approved an acquisition whereby Fortum Power and Heat acquired control of E.ON Finland. The approval was conditional on Fortum renouncing some of its production capacity.

Fortum is the leading energy company in Finland. E.ON Finland was a relatively small player, but very active and it had potential to become a more significant actor in the Finnish energy market. The competitive problems resulting from the agreement were related to the electricity production and wholesale market.

Due to constraints in the electricity transmission capacity, the wholesale market is national at least part of the time. In these periods, Fortum has a dominant position in Finland. Fortum owns or governs the majority of Finnish hydro power and other adjustable capacities. According to Finnish Competition Authority's analysis, and also reflecting the conclusions in "A powerful competition policy", the control of flexible production capacity increases Fortum's opportunities to affect the wholesale price level of electricity, particular in the congested hours.

Fortum was obliged to lease its share in the Meri-Pori coal-fired electricity plant until 30 June 2010 and to offer an annual 1 TWh of so-called virtual capacity to the Finnish market until 31 March 2011. The conditions are temporary because the situation in the Finnish electricity market will change by the end of the decade, e.g. when the new Olkiluoto nuclear electricity plant and the new transmission capacity between the Finnish and Swedish electricity networks will be completed.

Additionally, Fortum has to sell its peat condensate electricity plant at Haapavesi and the CHP plant and gas turbine electricity plant in Hämeenlinna. The conditions require that the Finnish Competition Authority approve the buying and leasing parties.

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[8] Commitments were made in the gas market.

Fortum appealed the decision to the Market Court. The debate in the Market Court has been related to the market definition and especially to Fortum's market power. Despite the appeal, Fortum has already executed all the conditions which were imposed. The Market Court's decision might be available during 2007. If the decision is upheld in court, this will effectively hinder increased concentration in the electricity production and wholesale market in Finland.

Sydkraft – Graninge

In October 2003 the European Commission cleared Sydkraft's (now E.ON Sverige[9]) acquisition of Graninge. Sydkraft, which is the second largest electricity company in Sweden, acquired sole control of Graninge, the fifth largest producer in Sweden. Both companies were primarily active in Sweden, but also had activities in Finland.

Sydkraft and Graninge were both active in generation, transmission, distribution and retail. The Commission investigated the effects of the merger from the production stage to sales to final consumers. The Commission was concerned that the merger would impede competition in Sweden where the three largest players, including Sydkraft, account for around 80 per cent of most electricity markets.

The Commission did not find that the removal of Graninge as an independent player would alter the competition on the Swedish or the Nordic electricity markets significantly. The definition of the geographic market was left open, but the Commission indicated that the market for production/wholesale probably was larger than Sweden. This was due both to the fact that Sweden constituted a separate geographic Nord Pool price area only during an insignificant period of time each year, as well as to the high price correlation between Sweden and Finland, and Sweden and Denmark.

The new entity would neither be in a position in which it would be able to act unilaterally or together with others to the detriment of competition. Graninge was explicitly not considered to be able to act as a so-called "maverick firm"[10]. The main reason for this was Graninge's limited production capacity. Moreover, the Commission did not find that the acquisition of Graninge would significantly influence Sydkraft's incentives to co-ordinate its actions with other Nordic electricity producers. Further, the new entity would remain less than half the size of Vattenfall, which is the largest player in Sweden. In the Nordic countries seen as a whole, the merged entity's combined market share on the production/wholesale market was below 10 per cent, and the merger was not found to give rise to serious competition concerns.

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[9] E.ON Sverige is part of the German E.ON Group.

[10] A maverick firm is a firm that does not pursue a collusive strategy and acts aggressively.

Foundation of Orkusalan

In Iceland, the foundation of Orkusalan gave rise to a merger case. Orkusalan was established as a joint venture involving Landsvirkjun, the largest electricity producer on Iceland, and two relatively large DSOs. The joint venture would produce and sell electricity, and hence contribute to unbundling between distribution, production and retail. The companies involved produce the majority of all electricity in Iceland and they own almost 98 per cent of all the hydro power generation. The joint venture would have provided about 40 per cent of all electricity to households. Landsvirkjun has a vast share of the market for sales to large industrial users. Landsvirkjun's participation in the joint venture project was the main reason for the Icelandic Competition Authority to find that the joint venture would result in the creation and strengthening of a dominant position. The parties suggested that Landsvirkjun would pull out of the project, and subject to that condition the merger was allowed to proceed.

The legislature had planned to merge the three companies via a legislative act, rendering it impossible for the Icelandic Competition Authority to intervene in the merger. However, these proposals were abandoned for the time being.

Orkusalan has commenced operation but without the participation of Orkubu Vestfjarða.

Appeal cases concerning Statkraft

In Norway there have been no mergers of importance in the electricity sector since 2003. However, the Ministry of Labour and Administration[11] has made decisions in two appeal cases concerning Statkraft's acquisitions of Agder Energi and Trondheim Energiverk respectively.[12]

In the Statkraft – Agder Energi case, the Norwegian Competition Authority defined the relevant product market as wholesale of electricity. The relevant geographic market was defined as Nordic in hours when there were no bottlenecks in the system, and smaller in hours with such capacity constraints. The Norwegian Competition Authority found that the acquisition would create or strengthen a significant restriction of competition in the electricity market, and prohibited Statkraft from purchasing the shares in March 2002.

In October 2003, the Ministry allowed the acquisition on certain conditions. Statkraft had to sell its shares in E-CO Vannkraft and in Hedmark Energi. Statkraft or Agder Energi was also to sell at least an additional 1 TWh in South Norway, unless the import capacity to South Norway was increased by at least 200 MW by 1 July 2005.

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11 The Ministry of Labour and Administration changed its name to the Ministry of Government Administration and Reform when there was a change of Government in autumn 2005.

12 Statkraft is Norway's largest producer of electricity, and had about 30 per cent of the total Norwegian production capacity before the acquisitions. The company's mean annual production is approximately 34 TWh in a normal year, not accounting for ownership shares in other companies.

In January 2002 Statkraft acquired 100 per cent of the shares in Trondheim Energiverk. Trondheim Energiverk had a mean annual production of about 2 TWh, or about 1.6 per cent of Norway's electricity production. The Norwegian Competition Authority found that the acquisition would create or strengthen a significant restriction of competition in the electricity market in Northern Norway, and prohibited the acquisition in July 2002. Alternatively, Statkraft could either sell the part of Trondheim Energiverk that produced electricity or other equivalent production operations in Northern Norway.

In February 2003 the Ministry upheld the Norwegian Competition Authority's decision, but prolonged the deadline for Statkraft to carry out the above mentioned sale(s) until 1 January 2006. Norway got a new Ministry in October 2005, and 25 November 2005 the King in Council eased the conditions attached to the decision. The new decision implied that Statkraft's acquisition of Trondheim Energiverk was approved. The approval was given on condition that Statkraft would sell its shares in Kraftverkene i Øvre Namsen and Kvænangen Kraftverk. Statkraft had already fulfilled these conditions.

Conclusions
Market concentration in the Nordic electricity market has changed due to mergers. Vattenfall has strengthened its position in the Nordic area through the acquisition of assets in both Elsam and E2 in Denmark. Statkraft has gained an even stronger position in Norway after the Government reversed the Norwegian Competition Authority decisions concerning its acquisitions of Agder Energi and Trondheim Energiverk.

1.3.2 Other competition cases

The Nordic competition authorities have also handled several non-merger cases regarding the electricity market since 2003. The major cases are described below.

Possible collusion and exploitation of dominant position in Sweden
In June 2006 the Swedish Competition Authority started an investigation of possible breaches of the competition rules in the electricity market. The investigation concerned two main competition issues.

Firstly, the Swedish Competition Authority investigated suspicions of limitation of production in order to raise prices, i.e. possible collusion. The issue was whether the companies that jointly own Sweden's nuclear power facilities had, in breach of competition rules, limited supply in order to influence the electricity prices.

The three major energy companies in Sweden, Vattenfall, E.ON Sverige and Fortum, in different constellations, jointly own the three Swedish nuclear facilities. Two of the more important decisions in the production planning process are the amount of fuel to be loaded into the reactors each year and when and for how long to stop the plant for maintenance and repairs.

The joint ownership of the nuclear facilities implies, in general, a risk that sensitive information may be shared, and consequently there is a risk of reduced competition between the owners. The Swedish Competition Authority's investigation was built on a suspicion that there might exist agreements and joint decisions between the owners with the aim of limiting production in order to raise the price level. The Swedish Competition Authority found that, previously, the loading of fuel and production within the jointly owned companies was, to some extent, planned at meetings among the owners. However, working arrangements have been changed step by step over time, the loading and production decision processes have been altered, and meetings between and information shared by the respective owners have been limited.

In its decision in May 2007, the Swedish Competition Authority stated that even if former working arrangements involved a breach of the competition rules, they had been changed more than five years earlier. Due to the limited period of the potential infringement, the Swedish Competition Authority saw no possibilities to take a decision on an obligation to stop any action or to apply to the Court for the companies to be fined.

In connection with the decision not to take any actions based upon the competition rules, a report was sent to the Government. In the report the Swedish Competition Authority highlighted the general dangers and risks for effects detrimental to competition associated with joint ownership between the large producers in the electricity market. The Swedish Competition Authority proposed some measures the Government should consider in order to boost competition in the electricity market. The proposals included measures that the Government, especially in its capacity as owner of the largest electricity producer, Vattenfall, could take to limit the existence of joint ownership. Preferably, joint ownerships should be fully dissolved and reactors that are currently jointly owned be divided among the owners. In cases where joint ownership cannot be fully terminated, jointly owned companies should instead be made more independent vis-à-vis their owners and be given responsibility for sales and balance etc. The Government might also consider the possibility of dividing Vattenfall's power-producing units into individual companies each with responsibility for results, and also consider the possibility of selling off units or acquiring a broader circle of owners. Such actions would, according to the Swedish Competition Authority's analyses, significantly improve competition in the Swedish and Nordic electricity markets.

The Swedish Competition Authority also stressed the importance of reducing the existing restrictions related to investments in electricity production in Sweden, and to stimulate market entry. In the Swedish Competition Authority's view, the current restrictions on new investments in electricity represent the greatest single obstacle to competition in the electricity market. By pursuing clearly defined, long-term energy policies, central Government should seek to encourage both investment in electrical power production and the establishment of new businesses.

As a second part of the case, the Swedish Competition Authority investigated whether vertically integrated[13] companies, mainly Vattenfall, Forum and E.ON, have exploited a single or collective dominant position in order to limit competition in the electricity market.

The investigations were started after the Swedish Competition Authority received several complaints during 2005 and the first part of 2006 from independent retail companies without integrated generating capacity. The independent retailers accused the large vertically integrated energy companies of predatory pricing (or "margin squeeze"). They claimed that the prices the integrated companies offered end-users were close to or even lower than the price independent retailers had to pay at the Nord Pool power exchange. During the same period, major integrated energy companies also started to offer different kinds of "price guarantees", so-called "Meet-the-Competition Clauses" or "Most-Favoured-Customer Clauses".

Taking into consideration the market shares of the companies involved and other details and circumstances related to the case, the Swedish Competition Authority could not establish a single or joint dominant position in any relevant market. The result was that the Swedish Competition Authority saw no possibilities to take any measures against the practices in question.

Elsam's abuse of a dominant position

Due to a complaint from the TSO in Western Denmark and an investigation initiated by Nord Pool, the Danish Competition Authority conducted an examination of the price formation in the Western Danish market for the period 1 July 2003 – 31 December 2004.

Based on analyses of demand and supply substitution as well as of potential competition, the Danish Competition Authority found that the relevant market was limited to Western Denmark alone. This conclusion was in accordance with the market delineation in the Elsam-Nesa merger in 2004. Further, the market investigation found that Elsam was the only supplier of residual electricity and throughout the period enjoyed a dominant position in the Western market.[14]

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[13] Active in both wholesale and retail.

[14] Residual electricity equals the total demand in the Western Danish market (E) less both wind (W) and decentralised production (D) as well as imports to the Western market (I). i.e. Residual demand = E-W-D-I.

The Danish Competition Authority identified 900 hours in which Elsam had abused its dominant position by exploiting the limited capacity on the transmission cables in order to become a residual monopolist and thus obtain an unfair price. In continuation, the Danish Competition Authority found that end users had paid an excess of 187 million DKR during the hours when the abuse had taken place.

In order to avoid a continued abuse, the Danish Competition Authority ordered Elsam to place bids in a certain manner at Nord Pool Spot. Elsam was permitted to cover its average total cost plus a reasonable mark-up. The Competition Council agreed with the findings of the Danish Competition Authority and announced the decision in November 2005. Elsam appealed the decision to the Appeals Court Tribunal which in turn confirmed the abuse of a dominant position, but did not uphold the order for Elsam to place bids into Nord Pool Spot in a specific manner.

After the decision from the Appeals Court Tribunal, the Danish Competition Authority initiated a follow-up investigation for the period 2005–2006. On 20 June 2007 the Danish Competition Council decided that Elsam had abused its dominant position in 1 484 hours by imposing excessive prices on the wholesale market for electricity in Western Denmark in the period from 1 January 2005 till 31 December 2006. In continuation the Danish Competition Authorities found that the abuse caused a consumer loss of 111 million DKK. The decision from the Danish Competition Counscil is expected to be followed by a class action suit from more than a 1.000 companies with a claim of more than a billion DKK.

The Danish Comptition Authorities has initiated an ongoing investigation of the price formation on the Eastern Danish market for the period of 2003–2006.

Market surveillance of the wholesale market in Norway

In 2003/2004 the Norwegian Competition Authority and the Norwegian Water Resources and Energy Directorate (the NVE) financed the development of a model for monitoring prices and strategic behaviour in the electricity market. A surveillance group with members from both authorities has been set up, and has used the model to monitor the market since the spring of 2004.

In the short term, electricity producers with market power can unilaterally act strategically in different ways to raise the price level. For instance, one way for a producer to achieve higher prices could be to withhold some production to avoid that the price in an area falls to a level lower than in neighbouring areas.

The purpose of the market surveillance is to try to identify instances where electricity producers might have abused a dominant position. The model is designed to show "warning lights" when prices considerably exceed pro-

ducers' marginal cost. Two indices are calculated. The daily index shows a warning light if there are several hours in a day with high prices, while the mark-up index shows a warning light if there are very high prices in single hours. For Norwegian hydro power producers, the marginal cost normally equals the water's value if it is stored for production in later periods. The marginal cost is therefore estimated on a daily basis in the model.

Every other month the members in the surveillance group meet to discuss the general situation in the electricity market, as well as any warning lights which occurred in the two indexes in the relevant time period. In case of warning lights, the group considers possible explanations for the observed price formation other than abuse of market power. Physical conditions such as rain and temperature can influence the market situation considerably. Technical conditions, for instance available capacity, must also be considered. If no reasonable explanation is found, the group can carry out further investigation of the market conditions and individual producers' behaviour in the relevant period of time to try to establish whether market power has been abused or not. If the group finds reason to believe that the observed price deviations indicate abuse of market power, it will recommend that the Norwegian Competition Authority opens an investigation. In only one case has the surveillance group initiated a detailed investigation with respect to some producers' behaviour during two weeks in 2005. The company in question made some changes with respect to internal procedures, and further investigation was deemed unnecessary.

The discussions and investigations that takes place within the surveillance group contribute both to increased knowledge of how the market is functioning, and to a greater awareness among market participants that their behaviour is being monitored.

1.4 Studies regarding competition issues in the electricity market

1.4.1 Ownership Relations and Cooperation in the Norwegian Power Market

The Norwegian Competition Authority recently commissioned a study from the SNF Institute for Research in Economics and Business Administration to outline the extent and nature of cooperation among electricity producers in Norway. The report concerns ownership relations, which is a wider definition than cross-ownership[15], as well as different forms of cooperation between electricity producers.

The study shows that adjusting for direct and indirect financial ownership affects market shares and hence concentration to a considerable extent. As an example, assuming that control rights are proportional to ownership

[15] Cross-ownership involves a two-way relationship such as where company X and company Y have equity participation in each other, while ownership relations also include one-way relationships.

interests, the share of Statkraft – the major generator – in total annual generation increases from 30.2 per cent to 42.4 per cent when such direct and indirect ownership is taken into account. Similarly, the concentration index HHI[16] is almost doubled, to a value of 1997, when corrected for financial ownership. Other correction methods, with different assumptions about ownership control, produces even higher concentration estimates, with the HHI ranging from 2 371 to 2 457 depending on the particular method employed.

The results also show that concentration differs between regions. While the HHI for the country as a whole (taking into account direct and indirect financial ownership) equals 1997, the corresponding numbers are 1 783 and 3 116 for Southern and Northern Norway respectively.

The survey results indicate that many producers are involved in a range of cooperative arrangements, and the trend seems to be growing. Among the reasons given for cooperation were efficiency in operation (e.g., related to management of water-courses) and risk sharing in the development of capital-intensive projects. Membership in water management associations and joint ownership of plants were seen to restrict the commercial freedom of individual generators more often than other forms of cooperation agreements. The main channel for information exchange is through participation on the board of directors and through exchange of investment plans.

All in all, the SNF study confirms results from earlier studies that the Norwegian electricity market is considerably more concentrated than indicated by standard concentration measures.

1.4.2 Report on the performance of the Finnish electricity markets

In October 2006 the Finnish Ministry of Trade and Industry published administrator Matti Purasjoki's report on the performance of the Finnish electricity markets.[17] The report highlighted certain topics in the electricity markets.

Securing a sufficient supply of electricity
Only in a market with adequate supply can competition be expected to tend towards the selection of the most inexpensive production methods, the pursuit of efficiency and a reasonable price level. According to the report, more capacity is needed for both electricity production and the removal of congestion in transmission. Because energy investments mature very slowly, the required decisions should be made as soon as possible. Finland needs more

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[16] The HHI is used as one possible indicator of market power or the degree of competition in a market. It measures market concentration by adding the squares of the market shares of all firms in the market. The higher the HHI for a specific market, the more output is concentrated within a small number of firms. In general terms, with a HHI below 1 000 the market concentration can be characterised as low, between 1 000 and 1 800 as moderate and above 1 800 as high.

[17] Matti Purasjoki is a former director general of the Finnish Competition Authority.

electricity production in all of its forms and the usability of existing capacity must be ensured. In order to avoid problems caused by large companies dominating the market as well as by the oligopolistic market structure, these new investments should be made by independent parties.

Controlling market power
Fortum's market power (as for Vattenfall in Sweden and Statkraft in Norway) should be decreased. It seems that the Nordic competition legislation is not able to fulfil this task. The European Commission is authorised to require ownership unbundling of companies in member countries if they cannot be made to pursue the best interests of society, but the threshold for such structural intervention is probably extremely high. Instead of ownership unbundling, the ownership of hydro power controlled by Fortum should be re-evaluated and Fortum's ownership in Teollisuuden Voima Oy should be sold to independent domestic operators.

Renewal of the structure of the Nordic Power Exchange and national transmission system operators
Although supervisory authorities have not pointed out any deficiencies in the operations of Fingrid, the report finds that a wider ownership base for the company would be useful. Nordic TSOs should be merged, because it is only within the framework of one company that the elimination of electricity transmission bottlenecks can be ensured. The power exchange must operate in a transparent way. First of all, it must be ensured that the authorities with responsibilities for the electricity market have access to real-time information regarding the amounts of electricity offered at the system price, per producer and plant.

Official supervision of the electricity market
The roles of supervising authorities and the division of duties should be reorganised, and the role of the Ministry of Trade and Industry should be specified. Its tasks involve creating preconditions for the operation of the electricity market and attending to legislation, but intervention in market operations should not form part of its duties. Resources allocated both to the Competition Authority and the Energy Market Authority should be considerably increased, and the competition law should be adjusted to include measures to facilitate the supervision of oligopolistic structures.

1.4.3 The European Commission's energy sector inquiry

Significant rises in gas and electricity wholesale prices and persistent complaints about barriers to entry and limited consumer choice led the Commission to open an inquiry into the functioning of the European gas and electricity markets in June 2005. The aim of the inquiry was to assess competitive conditions and the causes of market malfunctioning. The final report was published in January 2007.

In the report, the Commission often uses the Nordic energy market as an example of a well functioning and relatively effective energy market with few problems compared to the energy markets in most other European countries.

Among other things, the Commission focuses on the prices on CO_2 allowances. There is a discussion about whether the producers of electricity and gas should be allowed to include the price on CO_2 allowances when they calculate their offer prices, and if so, how much of the price on CO_2 they should be allowed to include in their calculations.

In addition to information on the European gas and electricity wholesale markets, the report includes results from a study on liquified natural gas, the level of concentration and the price formation in six national electricity wholesale markets as well as some information about the gas and electricity downstream and balancing markets.

The main message in the report is that even after eight years of liberalisation in the electricity sector, six years in the gas sector and some encouraging initial progress, particularly regarding the electricity market, four main obstacles hindering effective competition remain in the energy markets:

1. Markets have remained highly concentrated, giving incumbent operators scope for exercising market power;
2. The unbundling of infrastructure/network and supply activities is inadequate, rendering market entry for new suppliers very difficult;
3. There is a lack of transparency causing distrust in the markets and undermining the level playing field for new entrants.
4. Possible collusion between incumbent operators to share markets.

To improve the functioning of the gas and electricity markets, the Commission will pursue follow up actions in individual cases under the competition rules and act to improve the regulatory framework for energy liberalisation. The Commission has signalled that it will probably be necessary to impose ownership unbundling between network and supply in the electricity markets.

1.4.4 EFTA Surveillance Authority's energy sector inquiry

In parallel with the Commission, the EFTA Surveillance Authority (the ESA) launched a sector inquiry into competition in the electricity markets of the EFTA States[18].

A common theme emerging from the sector inquiry is the existence of a relatively high level of concentration in the wholesale electricity markets of

[18] The EFTA States consists of Norway, Iceland and Liechtenstein

the EFTA States. According to the report, several customers expressed concerns about the incumbent producers' market power.

According to the report, the wholesale markets for electricity in Norway function fairly well in terms of competition. Compared to central and Eastern European electricity markets, the degree of cross-border integration, market transparency and market liquidity are relatively high. Certain concerns still remain in particular when it comes to increasing concentration levels, uncertainty about government policies towards new investment in generation and transmission, as well as government ownership regulations on hydro generation and special schemes for electricity intensive industry.

In the Norwegian retail market, although levels of customer switching are high, there is a lack of effective separation between the distribution and supply branches of electricity companies.

Given that the Icelandic electricity sector was only recently opened to competition, it is too early to determine whether competition is functioning effectively in the electricity markets. It is, however, clear that Landsvirkjun is dominant on the market for supply of wholesale electricity. Further, it is said that due to the high level of market concentration, vertical integration in the market, and ownership relations, the unbundling and third party access requirements imposed by the liberalisation directives could have a significant impact on the market.

1.5 Other Issues

1.5.1 Contracts for the electricity-intensive industry

Energy-intensive industry in Norway has been granted favourably priced long-term electricity contracts with Statkraft, the Norwegian state-owned company. These contracts, settled with conditions determined by the authorities, also prevailed after the deregulation of the electricity market, and in 2006 Statkraft still had commitments to the industry of 16.9 TWh/year. These contracts are subject to conditions of needs and local commitments, and the contract prices are between 0.05 and 0.20 NOK/kWh. However, the contracts are running out and the last ones will expire by the end of 2011.

The Government has stated that it wants to provide the electricity intensive industry with new contracts at favourable conditions. For the time being this does not seem to be possible due to the EEA regulation.

In Iceland, Landsvirkjun sells the electricity it produces to retailers and large industrial users via bilateral agreements. Contracts for large scale energy users are in general long term, up to 30 years with options for extension.

Following the liberalisation there have been large investments in production capacity to meet the demands of heavy industry. Interest in building aluminium smelters in Iceland has contributed greatly to these investments. Before the liberalisation of the energy market, Landsvirkjun was by and large the sole provider of energy for large scale users.

1.5.2 Cooperation between Nordic Authorities

As already mentioned, the report "A powerful competition policy" called for increased cooperation between Nordic competition authorities as well as coordination with other regulatory bodies. This has been followed up in different ways.

- A Nordic working group for electricity has been established, and it has conducted several meetings since 2003.
- There is an agreement among the competition authorities in Denmark, Norway, Sweden and Iceland regarding exchange of confidential information.
- There have been several meetings among the Nordic competition authorities concerning sharing of knowledge and discussion of best practise.
- In May 2005 the Nordic authorities with responsibilities related to the electricity market - the Energy Regulators, the Competition Authorities and the Financial Inspectorates - arranged the Nordic Energy Day.
- This report is another result of the Nordic cooperation.

1.6 Conclusions and issues to consider further

The development and integration of the Nordic electricity market is an ongoing process, and many of the problems and obstacles that were discussed in the 2003 report "A powerful Competition Policy" are still present in the Nordic electricity market.

The main conclusions from chapter 1 are:

- Concentration in the Nordic electricity market has changed due to mergers. Vattenfall has strengthened its position in the Nordic area through the acquisition of parts of Elsam and E2 in Denmark. Statkraft has an even stronger position in Norway after the Government reversed the Norwegian Competition Authority's decisions concerning Agder Energi and Trondheim Energiverk.
- Sufficient transmission capacity, together with an efficient utilisation of the existing capacity, is one basic requirement to achieve a well functioning and efficient electricity market.
- Joint ownership of production sites between large competing energy producers should be avoided or otherwise be limited as far as possible.

2. Nordic Transmission System

The Nordic power system consists of national power systems in Denmark, Sweden, Norway and Finland together with a number of cross-border transmission lines between the countries which bind the national grids into one interconnected system[19]. A well run transmission network is of great importance to obtain security of supply and to ensure competitive pressure on the market players. Figure 2.1 shows the transmission grid in the Nordic countries.

Figure 2.1 The transmission grid in the Nordic countries.

Source: Nordel

[19] Western Denmark is part of the synchronous European system and therefore has to follow UCTE rules. UCTE (Union for the Co-ordination of Transmission of Electricity) is the association of transmission system operators in continental Europe.

2.1 Transmission System Operation

The national power systems are operated by national TSOs, but with mutual agreements on both short-term operational issues and long-term developments. The Icelandic system is of geographical reasons an isolated system not connected to the Nordic system, or any other system.

2.1.1 Organisation of the Nordic Transmission System Operators

The system operators in the Nordic Power system are organised as TSOs, i.e. the system operators also own the transmission grid. The alternative organisational structure is the so-called Independent System Operator (ISO) which means that the system operator does not own the transmission grid.

The TSOs in Sweden, Denmark and Norway are all fully state-owned. Affärsverket Svenska Kraftnät is a state utility, and thus legally a part of the state, while Energinet.dk and Statnett SF are owned by the Danish and Norwegian states, respectively. The Finnish TSO Fingrid is organised as a limited company with a minor state ownership[20], while the Icelandic TSO Landsnet is owned by three state-owned power companies.

According to the Electricity Directive[21] TSOs shall be independent, at least in legal terms, from activities not related to transmission, but there are no requirements regarding ownership. All Nordic TSOs are separated from other activities. However, Fingrid is partly owned by Fortum Power and Heat Oy, the largest producer in Finland.

A comprehensive cooperation between the Nordic TSOs takes place through Nordel. Nordel's primary objective is to create the conditions for, and to develop further, an efficient and harmonised Nordic electricity market.

The formal basis for the practical cooperation between the Nordic system operators, with the exception of the Icelandic TSO, is the Nordic Grid Code. The code comprises mainly three parts: Operation Code (a binding agreement), Planning Code (recommendation) and Connection Code (demand and minimum requirements on participants who connect to the national grids). Such an agreement is necessary since operation of the interconnected Nordic Power system requires operational collaboration and co-ordination between the affected system operators. Effective collaboration provides the technical prerequisites for trading in power on an open electricity market.

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[20] Fingrid is owned by the State (12 per cent), Fortum Power and Heat Oy (25 per cent), Pohjolan Voima Oy (25 per cent) and various insurance companies (38 per cent).

[21] 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.

2.1.2 The TSOs' responsibilities

The TSOs' core responsibilities are to be *system operators* and *transmission grid owners.* In addition, the TSOs have responsibilities related to other tasks which the TSOs carry out on a frequent basis.

Nordel has described the common core of system responsibilities in the Nordic countries as[22]:

- Ensure the operational security of the power system
- Maintain the momentary balance between demand and supply
- Ensure and maintain adequacy of the transmission system in the long term
- Enhance efficient functioning of the electricity market.

There are some differences between the Nordic TSOs related to the general definition of system responsibility and the scope of their mandate. However, the mandate obligations related to technical functionality and operational reliability are broadly similar.

System operation
All the Nordic TSOs deliver *system services* to the users who are connected to the grid. System services include keeping the momentary balance, i.e. total production equals total consumption within each operational hour, and managing the frequency of the system. In order to deliver system services the system operator i.a. procures ancillary services, mainly from producers.

The TSOs operate their own Regulating Power Market for manual operational reserves. As of September 2002 the national reserves were pooled into a common Nordic regulating market. This means that the TSOs can offer and/or receive regulating services from other Nordic TSOs (provided interconnector capacity is available) to counteract imbalances and congestions.

To correct for any imbalance between production and demand during the hour of dispatch, Sweden, Finland and Eastern Denmark also have a common intra-day market, the Elbas market, operating until the hour before delivery to correct the players' imbalances. Elbas is thus a tool for the players, and not for the TSOs. Norway is currently not participating in the Elbas market, but a process has started to introduce the intra-day market in Norway during the first half of 2008, subject to the approval of the Norwegian authorities.

In Iceland the system operation is based on a system where the TSO enters into bilateral contracts with other participants in the market. These contracts include a guarantee which states that the energy production should equal the energy consumption, and each contracting party has to make

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[22] According to the report "Coordination of network operations and system responsibility in the Nordic electricity market". Report from ECON to the Nordic Council of Ministers. TemaNord 2006:518

plans for the balance one day ahead for every hour of the day. The Icelandic TSO receives daily offers for the power which is necessary to balance expected and real power usage in the transmission system. Furthermore, the TSO buys electricity to compensate for transmission losses.

A central part of the system management involves the handling of bottlenecks in the transmission system. There are different ways of handling bottlenecks in power grids. In the Nordic system *market-splitting, counter trade and import/export limitations* are used. Methods for congestion management are further discussed in section 2.2, and the allocation of congestion income is discussed in section 2.4.

Balance settlement

The Nordic TSOs apply individual price systems for balance settlement. Norway uses a one-price system (the regulating price), while Denmark, Finland and Sweden use a two-price system (the regulating price and the spot price). Furthermore, Norway and Finland use one single balance, while Denmark and Sweden uses separate balances for generation, consumption and trade. These differences between the national markets result in cost related differences for participants active in different markets. This cost difference might be an obstacle for establishing a single Nordic end-user market.[23]

The Nordic TSOs have made a proposal and started preparations to harmonise balance management from the 1 January 2009.

In Iceland, balancing power is settled monthly. The TSO's calculations are based on the average difference between real and estimated trade every hour. Real trade refers to measured usage minus acquired energy. Estimated trade refers to the difference between estimated buying and selling of balancing power. The price for the balancing power is generally somewhat lower than market prices and is fixed for every hour.

2.2 Congestion management

In situations when the capacity to transfer electricity inside or between different potential price areas is not sufficient to meet the needs of the market, a bottleneck occurs in the transmission system. Congestion management is part of the system operation and thus part of the TSOs' core business.

In the common Nordic market area, three main methods of congestion management are applied. During the planning phase market splitting is used to handle bottlenecks between elspot areas, reduction of trade capacity - often referred to as "moving the bottlenecks to the border" - is used to solve congestion problems within an elspot areas. If these methods are insufficient they are complemented by counter trade during the daily operation.

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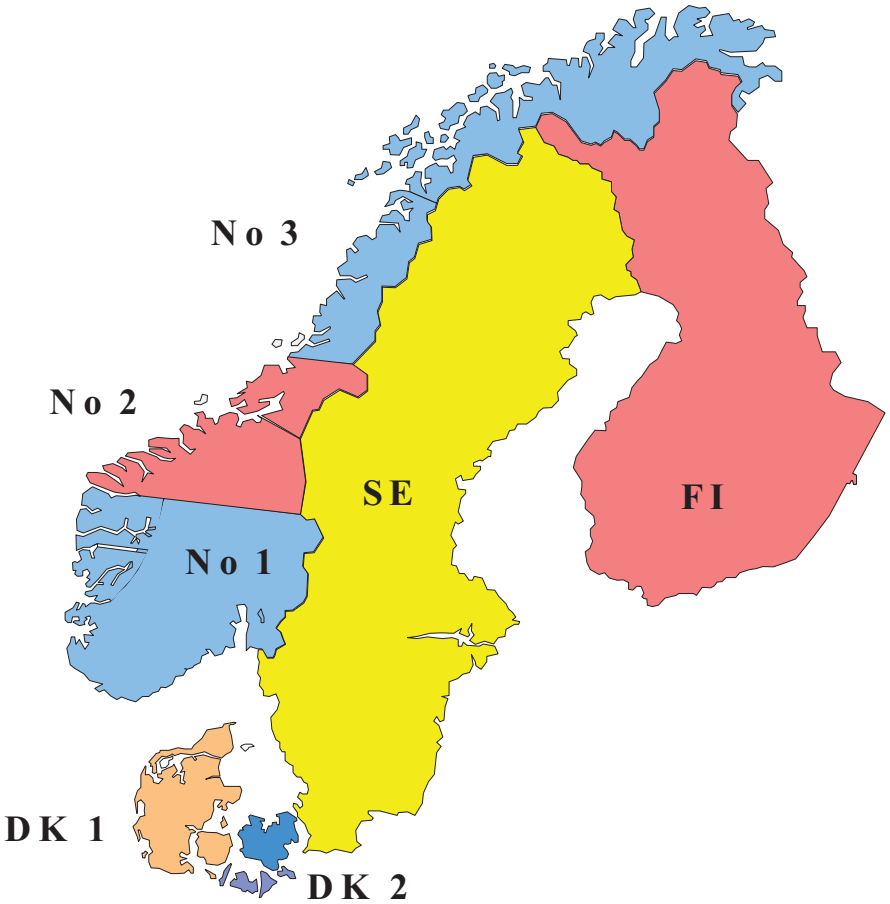
[23] Obstacles and progress towards a common Nordic end-user market are further discussed in chapter 4.

Market splitting implies that in hours with congestion, the market is split into two or several different areas each having a separate price. The prices are decided depending on bids for buying and selling in the respective areas and the transmission of power between the areas. By setting a lower price than the system price in export areas and a higher price in import areas the flows of electricity between the areas is adjusted.

The Nord Pool Spot region is divided into a number of bidding (elspot) areas, i.e. the prices may differ between these areas if there is congestion, but will otherwise be identical. Figure 2.2 indicates the possible price areas in the Nord Pool area. Most bidding areas are restricted to one country, which means that the borders between the bidding areas equal the national borders. Only Statnett uses market splitting internally. Denmark is, for natural reasons, divided into two different bidding areas since there is no direct electric connection between the western and the eastern part of the country, and Norway is divided into typically two or three different bidding areas following from some persistent (structural) bottlenecks. In Norway, the number of bidding areas and their exact geographical definition differ over time due to changes in the congestion pattern.

Figure 2.2 Elspot areas in the Nord Pool area



Source: Statnett

Using counter trade, the system operator buys upward regulation on the deficit side and downward regulation on the surplus side of the bottleneck. Upward regulation implies paying generators to increase their actual generation compared to their contracted generation, while downward regulation implies compensating generators in a similar manner to generate less than what was bid in at the given system price. The compensation for up-/downward regulation is determined by the differential between the system price and the bid price for each generator. Consumption may also participate in this process. The system is hence re-dispatched and this is why the system for congestion management is sometimes referred to as re-dispatch.

Counter trade results in one common public price for all customers except for the re-dispatch volumes, while market splitting results in separate areas with different prices. In a deficit area, a system with market splitting implies that the producers receive and consumers pay a higher price than would be the situation in a system with counter trade. Symmetrically, in the surplus area producers receive and consumers pay a lower price when market splitting is used compared to a situation with counter trade. Furthermore, the producers who participate in the re-dispatch are typically compensated for this inconvenience. Consequently, counter trade causes costs for the TSO, while market splitting creates congestion revenues for the TSO. In the same way as other costs, costs from counter trade have to be covered by the transmission tariff.

Since prices and payments are of crucial importance in a market, the handling of bottlenecks influences the market result. Fundamentally, with the use of counter trade, the prices reflect neither the marginal willingness to pay nor the marginal production costs. Hence an important criterion for a well-functioning market is not present. This will influence the use of water in hydro power plants with available reservoir capacity in the intermediate run and investments in the long run. Counter trade results in too low/high prices in the deficit/surplus area and hence in too weak/strong signals for investments in this area. All the Nordic TSOs also use, to varying degrees, counter trade to handle short-term non-structural bottlenecks inside a bidding area.

To minimise the TSO's costs related to counter trade, or to maximise TSO's revenues by market splitting the TSO has incentives to reduce the transmission capacity on the borders to their neighbouring countries. More specifically, they might reduce the import capacity into the surplus area and the export capacity out of the deficit area. This procedure often eliminates the need to use any counter trade. This system is typically referred to as *"moving bottlenecks to the border"*.

It is important to note that a movement of bottlenecks to the border does not give the same physical result as counter trade or market splitting described in the sections above. When export capacity out of an area is

reduced, the production in the area will also be reduced. Consequently, the production in the neighbouring area is increased. The result is inefficient use of resources compared to a situation where the transmission capacity is fully utilised, causing marginal production in one area to be more expensive than the marginal production in the other area.

Dansk Energi - an organisation for Danish energy companies - in 2006 filed a complaint against Svenska Kraftnät to the EU regarding Svenska Kraftnät's regulation of transmission capacity on an interconnection between Sweden and Denmark. It is submitted that Svenska Kraftnät has a policy of limiting transmission capacity on the interconnection not for reasons of security of supply of electricity but for reasons of lowering costs connected to counter trade and in order to lower the spot price in Sweden as well. Dansk Energi states that this limitation has a damaging effect on competition and trade within the internal market especially as regards Southern Sweden and Eastern Denmark.

In Iceland one possible bottleneck has been identified. The legal framework necessary to use either market splitting or counter trade is not present in Iceland. So far, the matter has been dealt with via a compromise between the TSO and the largest energy producer, Landsvirkjun. The problem is solved by moving production from some of Landsvirkjun's dams to others which have more suitable locations. However, the TSO expects the problem to remain and eventually the use of market splitting or counter trade might be necessary.

2.2.1 POMPE

Congestion management and the different methods used to handle bottlenecks, especially inside Sweden, have been intensely debated and analysed in recent years. In a report from May 2007, *POMPE – Price Areas in the Electricity Market,* the Energy Markets Inspectorate, the trade organisation Swedenergy, the TSO Svenska Kraftnät and the Confederation of Swedish Enterprise presented their common views on long-term and sustainable congestion management in the Nordic electricity network.

In the report it is stated that the ambition should be to have as few and as large elspot areas as possible and that the development and operation of the network should be based upon a Nordic rather than a national perspective. Nordel's five prioritised interconnectors should be built as soon as possible and Nordel should proceed to identify further investments that are profitable from a socio-economic point of view. Far-reaching market integration can be achieved by counter trade on those constraints which are not socio-economically profitable to reduce. A prerequisite for using counter trade as a tool for market integration is that the TSOs have agreed on how to finance the trade. The preferred principle is that costs should be paid by those who benefit from the counter trade.

Extended counter trade south of Cut 4 in Southern Sweden is suggested as a way to integrate and level out price differences between Sweden and Zealand. Another option is to consider one integrated bidding area for Sweden and Zealand. In both cases, principles and methods for the necessary counter trade must be agreed upon between the two TSOs involved, Svenska Kraftnät and Energinet.dk. This common bidding area could be further enlarged by including Finland.

The POMPE report, for technical reasons, advises against establishing a specific bidding area to solve the constraints related to the so-called West Coast Cut. Further, no bidding area border on Cut 4 should be considered, as it can be expected to have adverse effects on competition in both the wholesale and retail markets.

However, in the report it is argued that a new inter-Nordic elspot area border should be considered. The border between hydro power in the north and thermal power generation in the south is a structural border in the Nordic power system. These elspot areas would exist over national borders. The structural border goes along Cut 2 in Sweden, through Northern Finland and through South-Eastern Norway. The creation of new elspot areas along these lines would, according to POMPE, lead to a better functioning power market with an efficient use of resources, healthy competition and deep market integration. The Nordic Council of Ministers, Nordel and Nord REG, are recommended to initiate an assessment of such new inter-Nordic elspot areas.

2.2.2 A Danish example

It is important to realise that the nominal transmission capacity do not always correspond to the actual capacity available to the market. There are several reasons for this. First, connections may break down and this causes them to shut down or reduces the capacity for a period of time. Second, national TSOs may choose to reduce the capacity on the cross-border connection in order to accommodate the risk for internal congestion. Third, part of the capacity on a connection is retained to ancillary services to ensure security of supply.

As an example, Eastern Denmark has a total nominal export capacity of 2 350 MW of which 1 750 MW is linked to Sweden and 600 MW is linked to Germany. Western Denmark has cross-border connections to Norway, Sweden and Germany, which results in a total import and export capacity of 2 510 MW and 2 870 MW respectively, cf. table 2.1.

Table 2.1 Nominal cross-border connections to and from Denmark 2006, MW

	Import	Export
Eastern Denmark		
Sweden	1 350	1 750
Germany (Kontek)	600	600
Total nominal capacity	*1 950*	*2 350*
Western Denmark		
Sweden (KontiSkan)	670	630
Norway (Skagerrak)	1 040	1 040
Germany (Kontek)	800	1 200
Total nominal capacity	*2 510*	*2 870*

Source: Nordel

As already mentioned, however, the actual average import and export capacities are typically lower than the nominal capacities. In 2006, the average import capacity to Western Denmark from the Nordic countries equalled 1 023 MW, which corresponds to only 60 per cent of the actual nominal import capacity, cf. table 2.2.

Table 2.2 Average import capacity in 2006, MW

	Average import	Per cent of nominal
Eastern Denmark		
From Nordic countries	983	73 %
From Germany	516	86 %
Total import	*1 499*	
Western Denmark		
From Nordic countries	1 023	60 %
From Germany	779	97 %
Total import	*1 802*	

Source: Energinet.dk

Nord Pool administers the cross-border connection between Eastern Denmark and Germany. The connection to Germany constitutes a crucial connection between the Nordic energy system and the European cooperation grid UCTE.

In contrast to the market splitting model applied at Nord Pool (implicit auction), the capacity on the cross-border connections between Germany and Western Denmark are allocated through the use of explicit auctions.[24] This allocation method results in an inefficient utilisation of the connection, since electricity may flow in the wrong direction, i.e., from the high price area to the low price area. A result of this poor administration is that the electricity was flowing in the wrong direction during 24 per cent of all hours in 2006. Moreover, in 58 per cent of these hours Western Denmark was exporting to Germany even though the German prices were lower than the

[24] Explicit auctions are also at the interconnectors between Sweden and Germany, Sweden and Poland and Finland and Estonia.

price in Western Denmark, see table 2.3. In all these hours, the market was given incorrect signals about the resource situation. However, work is being done in order to promote market coupling on this cross-border connection.

Table 2.3 Flow direction on the cross-border connection between Western Denmark and Germany in 2006

	Western Denmark – Germany
Correct flow	76
Wrong flow	24
- Export	58
- Import	42

Source: Energinet.dk

For a market to function properly, it is a crucial prerequisite that correct price signals are visible for the market participants. The Nordic competition authorities support the ongoing work towards the establishment of market coupling on the cross-border connection between Western Denmark and Germany in 2007, and emphasise the need for a system which ensures that the power flows from low price to high price areas. The Nordic competition authorities request that such a system is established as soon as possible.

2.3 Incentives for investments in new transmission capacity

The report *"A Powerful Competition Policy"* states that in periods with no congested lines in the inter-Nordic transmission network (no bottlenecks), the relevant geographic market is delineated as the Nordic region. Bottlenecks separate the market geographically, and the delineation of the relevant geographic market(s) may therefore vary from one hour to the next. The Nord Pool Elspot price areas may or may not correspond to the relevant geographic markets. Normally, the impact of market power decreases when the transmission capacity is increased.

Since "A Powerful Competition Policy" was published, Denmark has revised its view on the scope of the relevant geographic market in Denmark. In both the merger case Elsam-Nesa and the two cases of abuse of dominance (Elsam II and Elsam III) the Danish Competition Council has stated that there are two relevant geographic markets in Denmark, the Western and Eastern part of Denmark, respectively, in all hours of the year.

The reason for this change is that analysis made by the Danish Competition Authority shows that the Danish producers are able – by bidding at Nord Pool – to a large extent to control when a connection to a neighbouring country will be congested. The existence of bottlenecks is thus not a relevant factor in describing the scope of the geographic market in Denmark.

The Nordic competition authorities recognise that separate relevant geographical markets can arise even in situations when there is no bottleneck - also in other countries than Denmark.

All the Nordic TSOs own considerable grid assets and are responsible for ensuring an acceptable level of grid maintenance, reinvestment and new investments. The TSOs have to a large degree similar guidelines related to operational and investment policies. The main focus related to grid planning concerns the national grid system, but there is also a great deal of cross-border cooperation on these issues.

In principle, estimates of economic surplus (economic welfare) should be the basis for decisions related to grid investments. However, the calculation of the socio-economic costs and benefits of grid investments is challenging. Further, in a common Nordic power system, the national TSOs should base their investment decisions on estimates for Nordic socio-economic surplus rather than the national socio-economic surplus. A potential grid investment in one country may primarily favour the users of the power system in another country or in the Nordic region as a whole. Thus, there might be welfare improvements on the Nordic level, but not on the national level.

When the TSOs analyse the profitability of a transmission line, factors like the number of congested hours, the size of price differences and the costs related to counter trade are taken into consideration. In addition, improvements of security of supply are given a considerable weight. The TSOs' incentives are further influenced by how the congestion rent is allocated and the transit cost compensation scheme, cf. section 2.4.

To ensure that the infrastructure which is necessary for a smooth operation of the Nordic market is present, analyses carried out by Nordel are important. Nordel's cost benefit analyses show that five prioritised investments should be carried out because the socio-economic benefits outweigh the costs.[25] However, Nordel's cost benefit analyses show that the benefits are distributed among all the Nordic countries and hence there is a risk that the deciding TSO will not find the investment profitable since it normally focuses on the socio-economic effects on a national level. Absent an appropriate compensation scheme, this constitutes a classical economic phenomenon known as the free rider problem. Nordel's five prioritised projects are further discussed in section 2.7.

In February 2005, Nordel's members reached an agreement over a common financing mechanism to finance the prioritised projects. The main element of this mechanism is that the congestion rents will be earmarked for the

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[25] Two of the projects are internal connections within one Nordic country (Cut 4 in Sweden and the Great Belt in Denmark), and their importance for the Nordic system as a whole is the reason why they are included among the five prioritised projects.

projects, and the aim is to speed up the construction of these transmission grid improvements. This agreement does not require any changes in the TSOs' current organisational structures, and ownership of new transmission assets will reside with the national TSOs.

It is important to realise that, from an economic perspective, it is not efficient to eliminate all bottlenecks in the system since that would imply over-investment. Instead of financing extensions or new transmission lines, the congestion rents might be used to reduce the end users' expenses by reducing the costs of utilising the grid.

The general rule in the Nordic region is that investments are to be financed and decided upon in the relevant country/countries. This means for instance that Energinet.dk is both the sole decision-maker and financier for the Great Belt connection, and that Energinet.dk and Statnett as a starting point would each have to finance 50 per cent each of the investments related to Skagerrak 4.

There are large potential welfare gains from improved grid investments. However, achieving optimal grid investments in the Nordic system might be difficult without a common Nordic body responsible for analysing, planning and financing investments with common Nordic utility. As already mentioned, the Nordic TSOs are mainly responsible for a socio-economic management and development of their national transmission systems, and the incentives for investments in new transmission capacity depend to a considerable degree on national regulations and conditions.

As an example, the Norwegian TSO Statnett is obliged to carry out welfare improving investments in the Norwegian main grid. Like all other grid companies in Norway, Statnett is subject to an income cap regulation.[26] This regulation is based upon principles for socio-economic efficiency, and is modelled in a way which is meant to create incentives for Statnett to carry out all welfare improving projects in the transmission system. One part of the regulation is the KILE[27] scheme, which purpose is to obtain greater agreement between commercial and socio-economic profitability, and which is intended to stimulate optimal grid investments.

The TSO's regulated income is supposed to provide for cost absorption if the TSO carries out efficient investments. According to Statnett, the regulatory regime in Norway is relatively neutral and results in a rather good agreement between income and expenses.

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[26] The income cap is set by the NVE, and is legally based on "Forskrift om økonomisk og teknisk rapportering, inntektsramme for nettvirksomheten og tariffer (FOR-1999-03-11-302)".

[27] KILE is an acronym for "Kvalitetsjusterte inntektsrammer ved ikke levert energi", and may be translated into "Quality adjusted income caps for non-supplied energy". The KILE scheme gives the TSO incentives to invest in transmission capacity, because if disruptions in the central grid occur, the scheme leads to a lessening of the TSO's income.

All other things equal, Statnett has a general incentive to invest in the transmission system to minimise problems related to disruption and with that negative publicity. While this is likely effective when it comes to investments which reduce the likelihood of disruption in Norway, it is probably not the case when it comes to investments which mainly result in welfare gains in other parts of the Nordic region.

In Sweden, Svenska Kraftnät is responsible for developing the grid to support the electricity market, taking into consideration security of supply and environmental standards. Svenska Kraftnät's task is to promote the electricity market, and investments in the grid are one major contribution to fulfil this task. If there is a lack of capacity in the network, Svenska Kraftnät uses counter trade to secure a balance between supply and demand. The cost of counter trade is paid by Svenska Kraftnät, and it gives the TSO an incentive to invest in new transmission capacity. When the cost of counter trade is considered to be too high, that is a clear signal to invest in new transmission lines or increase the capacity on the existing ones.

Landsnet has the responsibility to develop the transmission system in Iceland in accordance with market needs and socio-economic considerations. All major transmission construction needs a special permission from the Ministry. In the energy act and dependant regulations, the regulatory framework to give the TSO proper economic incentives to establish a cost efficient transmission structure are in place although they have not been implemented so far.

The power system in Finland also depends on the Baltic and Russian systems. The Baltic TSOs have commenced a local network investigation according to the Nordic example. They cooperate closely with Fingrid to develop network models and calculations, and to evaluate the need for investments in increased transmission capacity. Network investigations and development of investment plans are part of the cooperation between the Russian TSO and Fingrid as well.

Even though there is a common Nordic market, differences in national regulations and external conditions might lead to differences when it comes to the fulfilment of necessary investments in new transmission capacity with common Nordic utility.

In the Nordic countries the TSOs are regulated in different ways, and as a result incentives to invest in transmission capacity may differ. In the Nordic competition authorities' view, the principles for the regulation of the TSOs should be harmonised in order to achieve a level playing field.

2.4 Allocation of congestion income and compensation for transit

A transmission network with sufficient capacity is needed to handle intensified cross-border trade if an integrated Nordic and real internal European electricity market is to work properly. The integration of the pre-existing, predominantly nationally designed, transmission networks across Europe into one market requires large new investments in cross-border capacities. One question is whether there are strong enough incentives for the TSOs to invest in sufficient transmission capacity.

The Nord Pool system of congestion incomes and the Inter TSO Compensation mechanism (ITC-mechanism) are two instruments which aim at creating appropriate cost and capacity allocation signals in the market, as well as the correct signals for the funding of new investments and maintenance of transmission capacity.

Congestion income

The guiding principle in the EU regulation is that it is important that congestion income be returned to network customers, i.e. that it is used to improve the TSO's network operations. The EU regulation states that congestion income shall be allocated to investments in transmission lines or used to lower the tariffs. The congestion management guidelines specify that transmission investments are the prioritised targets.

Congestion incomes are part of the market splitting system. In hours with separate price areas, a so-called "congestion rent" is created. In the period 2002-2006 the Nordic TSOs received 457 million Euros in congestion rent from the Nordic countries, cf. table 2.4.

Table 2.4 Congestion rent in the Nordic countries 2002-2006 (1000 €)

	2002	2003	2004	2005	2006	Total
Denmark	42 378	43 515	15 634	37 807	32 039	171 373
Sweden	19 766	17 690	13 836	43 151	38 024	132 467
Finland	16 058	14 735	7 953	15 008	12 821	66 575
Norway	19 562	17 872	11 478	20 764	17 521	87 197

Source: Statnett

This system generates a congestion rent for the TSOs and costs for the market actors. The TSOs' congestion income is equal to the transferred volumes through the bottleneck multiplied by the price difference between the areas. Congestion incomes should be allocated to investments in the network or used in other ways which benefit the network users.

The Nordic TSOs have a common agreement with Nord Pool Spot regarding the distribution of congestion rent between the TSOs for the period 1 September 2006 - 31 December 2011. During the first years of the agree-

ment, Nord Pool Spot distributes the total congestion rents on a scale that reflects each TSO's part of the expected investment costs (940 million Euros) related to the five prioritised investments, cf. table 2.5. During the last years of the contract period, congestion income per interconnector will be divided equally between the owners of that interconnector.

Table 2.5 Distribution of congestion rent

	Expected investment cost (M€)	Distribution of congestion rent (Per cent)
Svenska Kraftnät	356	37.87
Energinet.dk	300	31.91
Statnett	164	17.45
Fingrid	120	12.77
Total	**940**	**100**

Source: Nordel

This distribution of congestion rents has a clear advantage since it clarifies that there should be a link between congestion rents and future investments in transmission capacity. However, the current distribution also has an important disadvantage. If a certain interconnector constitutes a bottleneck with corresponding high congestion rents in many hours, this is the market's price signal to the owner of the interconnector that capacity is a scarce factor. To contribute to the financing of investments in an interconnector with scarce capacity, the congestion rent should be granted in full to the owner instead of being divided among all the TSOs.

In the Nordic area the TSOs are economically regulated. In such regimes extra income from i.e. congestion rent can not be transformed into profits. The rent functions as a source of finance and – in this sense provides the TSO with the proper incentives to invest in new and stronger interconnections.

The Nordic competition authorities support the congestion management guidelines' recommendation to use congestion rents for investments.

The Inter TSO Compensation Mechanism (ITC)

In order to compensate for costs incurring from hosting cross-border flows of electricity in the network (transit), a compensation scheme has been established. The principles of the ITC mechanism is outlined in the EU regulation on cross-border exchanges of electricity[28], and aims at promoting the establishment of a fully integrated single European electricity market, i.a. by creating sufficiently strong incentives for TSOs to maintain the existing network.

[28] Regulation (EC) No 1228/2003 on conditions for access to the network for cross-border exchanges in electricity.

The specified requirements for the ITC mechanism are that it should be non-transaction based, cost-reflective, non-discriminatory, transparent and simple. The TSOs should be compensated for costs that they incur from hosting cross-border flows of electricity on their networks. This compensation should be given by the TSOs from which the cross-border flows originate and where they end. The regulation states that costs should be calculated on the basis of forward looking long-run average incremental costs (LRAIC), taking into account e.g. losses, investments in new infrastructure and costs related to the existing infrastructure. It is explicitly pointed out that recognised standard-costing methodologies should be used when establishing the size of the costs which have been incurred. In addition benefits from hosting cross-border flows should be taken into account.

An ITC mechanism built on these principles has not yet been achieved, and the present model for ITC is based on a voluntary agreement among the members of ETSO[29]. The model was introduced in 2002 and has been modified step-by-step from year to year. The model is a two-step model which calculates compensation to each TSO and thus the total fund. The total annual amount of compensation is for the time being just below 400 M. Financing is mainly claimed from the TSOs that have caused the transit. A small part is covered by a fee on declared imports of electricity from neighbouring countries which are not party to the ITC agreement. In the prevailing system, compensation is based on regulated costs for assets and maintenance, and transmission losses on a so-called horizontal network for each TSO, multiplied by a simple transit key.

One objection that has been raised against this model is the use of regulated cost when calculating the costs incurred. Regulated costs may vary substantially between the countries, and often do not reflect the costs related to building new cross-border transmission lines which are needed to develop a well functioning electricity market. In Denmark for instance, the regulated costs are close to the replacement costs since the Danish transmission lines have been transferred to Energinet.dk at market prices, while the regulated costs in Sweden are much lower than the replacement costs. Svenska Kraftnät is therefore a net payer in the system although Sweden has considerable transit.

According to the regulation from 2003, the Commission is supposed to issue guidelines on the ITC mechanism. ERGEG[30] has previously been asked by the Commission to propose binding guidelines for a new system, but such an agreement has not yet been reached. Instead, ETSO has been asked to try to reach an agreement on a new EU-wide compensation mechanism. The process is expected to be finished in early autumn 2007. The European

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[29] Association of European Electricity Transmission System Operators, ETSO.
[30] European Regulators' Group for Electricity and Gas, ERGEG.

Commission will then decide upon new "Guidelines on ITC compensation and Tarification", which are planned to enter into force from 2008.

A well functioning Nordic and European electricity market is of outmost importance in order to achieve a successful balance between the future energy challenges as competitiveness, sustainable development and security of supply. Developing cross-border trade in a more efficient way and not establishing any hampering mechanism is of vital importance. It is essential that an ITC mechanism takes into account benefits and costs of trade supplied by market mechanisms. The costs might be defined in terms of replacement costs, cf. regulation 1228/2003 definition of forward looking long-run average incremental costs.

2.5 Decision criterion for new investments

The TSOs are obliged to have a good overview of available transmission capacity, expected development in power consumption and expected investments in new production capacity. Access to such information is a prerequisite for a TSO to be able to estimate the need for new investments. As already mentioned, it is not socio-economic profitable to fully eliminate all bottlenecks. Price signals caused by bottlenecks create incentives for efficient investments both in power production and the transmission grid.

When evaluating potential new grid investments, costs and benefits related to each project are quantified when this is possible. Relevant quantifiable conditions include reduced bottlenecks in the system, reduced costs due to losses in the energy system, reduced costs due to disruptions in the grid and changed transit costs. The TSOs also consider conditions which are not quantifiable, for instance environmental impacts, security of supply and the need to arrange for a well functioning power market.

There may be a real danger for under investment in projects which lead to significant positive effects in other countries than the one where the investment would be carried out. To try to level out this effect, certain common Nordic economic incentives have been established through the allocation of congestion income for investments in projects which are beneficial for the Nordic region as a whole, cf. section 2.4. Further, the affected TSOs will enter into cooperation when it comes to investments in new transmission lines between different Nordic countries.[31]

The major investments in the Nordic grid system are a result of a common planning process between Fingrid, Energinet.dk, Statnett and Svenska

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[31] This is the case, for instance, in the planning of a new transmission line on the section between Järpstrømmen and Nea, where the Swedish and the Norwegian TSOs cooperate, and in the case of the planning of a fourth transmission line on the section between Denmark and Norway, which involves the Danish and the Norwegian TSOs.

Kraftnät. However, the decision making is bilateral: The two parties involved in an interconnection enter into an agreement, and the national authorities and company boards approve/decide.

In Sweden, cost-benefit analyses for interconnectors are based on Nordic socio-economic efficiency. The competitive effects are observed and taken into account in a simplified way when they are considered relevant.

In Finland, socio-economic profitability is the primary basis for investments. When an investment affects export/import capacity, profitability for the Nordic region socio-economy is considered, while only the profitability for Finland is considered in decisions regarding internal connections. Evaluations of potential investments in new transmission connections to the Baltic countries or Russia resemble the evaluation of investments in interconnectors in the Nordic region when considering risk level. Fingrid does not carry out any analyses of market power related to Nordic or domestic investment projects, since this issue is not regarded as the TSO's task in Finland.

In Norway, a consequence analysis is undertaken for each project. To simplify the analysis, the TSO assumes perfect competition in the power market, which is to say that the producers place bids with a price equal to their marginal cost of production.

According to Statnett, it undertakes an approximate estimation of new investments' effect on the competitive conditions. This may for instance include the assumption that increased transmission capacity into an area with only one major player will have positive effects, all other things equal. Analyses which model market power have been used in exceptional cases. Such analysis does, however, require assumptions regarding the players' behaviour, and are quite complicated and linked to significant uncertainty.

When considering whether an investment is socio-economic profitable, Statnett focuses on the investment's effect in Norway. According to Statnett, they also assess whether an investment will have positive effects in other Nordic countries. If an investment is profitable for the Nordic region as a whole, but not for Norway alone, Statnett may negotiate with other Nordic TSOs about how to split the project related costs.

The investment criterion for transmission lines in all the Nordic countries is based on economic/socio-economic profitability. However, there are differences related to how the economic profitability is calculated, i.a. regarding if and how competition issues are taken into account. The Nordic competition authorities' opinion is that competition analysis ought to be included in the investment decisions. If quantitative analysis is too difficult to carry out, as might often be the case, at least a qualitative consideration regarding competition issues should be included.

Energinet.dk has conducted a thorough economic analysis prior to the approval of the Great Belt connection, in order to investigate whether the welfare utility was outweighed by the cost of establishing the connection. Besides improving the security of supply, the analysis identified three major benefits of building the connection. First, a direct effect is that electricity will be able to flow more freely and hence increase competition on the market. More competition will naturally put a downward pressure on the electricity price. Second, the overall cost of producing electricity is expected to fall since the improved mobility of the market enables the electricity to be produced at the cheapest plant. Third, significant savings can be made from buying reserve capacity from the heating plants since Eastern and Western Denmark will be able to draw on each other's capacity reserves. In all, the total economic gain is expected to amount to € 40 millions a year.

The Great belt connection is expected to cause changes in the distribution of consumer and producer surplus. In general, consumer surplus is expected to increase due to the aspects outlined above. Intensified competition is expected to put downward pressure on prices, and hence producers' surplus is expected to fall.[32] Moreover, the connection is expected to reduce the overall congestion income, see table 2.6.

Table 2.6 Expected changes in allocation between consumer surplus, producer surplus and congestion income caused by the construction of the Great Belt connection, M€

	Norway	Sweden	Finland	Denmark	UCTE	Total
End user	42,0	52,9	25,2	0,7	10,5	131,3
Congestion income	-6,0	-1,9	-0,7	0,4	1,6	-6,7
Producers	-37,6	-49,1	-28,1	3,4	-9,9	-121,3
Total	**-1,6**	**1,7**	**-3,5**	**4,4**	**2,1**	**3,4**

Source: Energinet.dk

Competition effects should be carefully modelled in order to incorporate a more accurate picture of the socio-economic benefits. This implies that models should focus more on market power instead of just modelling the effects under perfect competition. However, market power is rather complicated to model and hence models based on perfect competition are used in most cases. Since increased transmission capacity will increase competition

[32] Denmark stands-out in comparison with the rest of the Nordic countries since the overall effect generally benefits both producers and consumers. A closer look on the Danish market reveals that the producers in Eastern Denmark and the consumers in Western Denmark actually lose in comparison to their counterparts in the other part of the country. This is because consumers in Western Denmark initially have a lower price level than consumers in Eastern Denmark. The price difference arises primarily from a larger share of CHP and wind production in Western Denmark. The construction of the Great Belt connection will put an upward pressure on prices in Western Denmark and a downward pressure on prices in Eastern Denmark. Consequently, consumers in West Denmark will be worse off while consumers in Eastern Denmark will be better off, and vice versa for the producers.

from neighbouring countries and thereby reduce market power, one should expect the benefits to be larger when market power is included into the model. A model which incorporates market power will therefore intuitively calculate a larger gain from increased transmission capacity. In some studies, Nordel has used a calculation model (MARS) to estimate the value (cost) of possible abuse of market power. The model is under development.

2.6 Obstacles for investments in new transmission lines

The main obstacle for investments in new transmission lines is related to the licensing process. The licensing process is comprehensive and normally lengthy. For example, the Finnish Ministry of Trade and Industry is now handling the application for the construction of Fenno-Skan 2, which was one of Nordel's five prioritised projects in 2004. It is estimated that the transmission line could be in use at the earliest in 2010.

Transmission lines often involve substantial environmental intervention, and third parties very often file complaints. Treatment of complaints prolongs the licensing process.

Transmission lines and cables are expensive, and investments in the transmission system require large amounts of capital. The profitability of investments in the transmission system involves substantial uncertainty and thereby a risk for over or under investment. This uncertainty is partly linked to general difficulties in estimating the overall positive and negative effects of a future investment and partly to uncertainty related to future investments in production capacity and developments in consumption.

Investments in transmission and production capacity influence each other reciprocally, and coordination is important to ensure beneficial overall solutions. Since the planning and construction period for new transmission lines is lengthy, this creates challenges when it comes to coordination with new production capacity or increased consumption which may be realised in a shorter period of time. Insufficient coordination may lead to substantial socio-economic costs.

In some cases power projects are not carried out even though licenses have been granted, i.a. wind power projects in Norway. This creates substantial uncertainty related to the need for increased transmission capacity between different areas, and further complicates the TSO's profitability analysis. To reduce this uncertainty, there might be a need for larger commitments from applicants before they are granted a license.

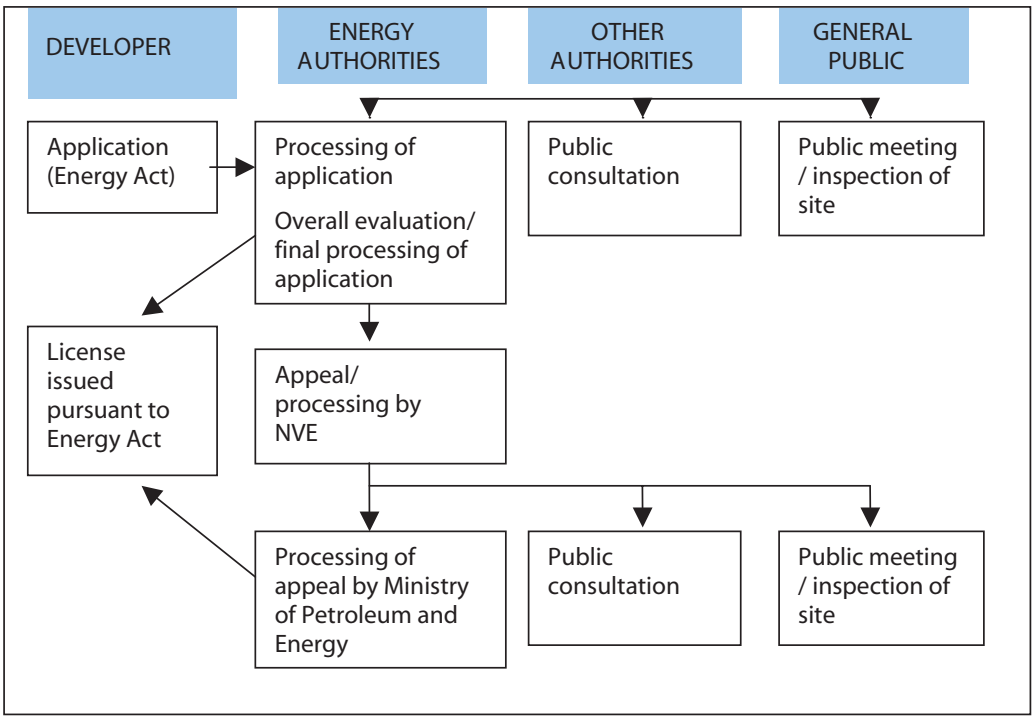
When applying for a license for new investments in the transmission system, Statnett has in some cases been instructed to consider alternative routes or other remedial measures by the relevant authorities. For the time being, no application from Statnett has led to a final refusal. However,

Statnett has recently applied for several licenses which are rather controversial because of the impact that the planned investments will have on the landscape, and it is not a matter of course that they will be approved by the authorities.

The fact that the EU has not yet concluded a transmission compensation system creates uncertainty and is another obstacle for investments in increased transmission capacity.

Figure 2.3 shows the administrative procedure for licensing electrical installations pursuant to the Norwegian Energy Act.

Figure 2.3 Administrative procedures for licensing electrical installations pursuant to the Norwegian Energy Act



Source: Ministry of Petroleum and Energy: Energy and water resources in Norway – Facts 2006.

In Iceland, all new transmission lines have to be approved by the relevant government minister. As the Icelandic TSO is compensated for all costs, the main obstacles for investments in new transmission lines are related to the political process, and environmental factors.. The TSO estimates that even without any significant delays, the construction of new transmission lines takes a little more than five years.

Not all transmission lines that are applied for are granted a license. As an example United Power submitted an application in the end of 2004 to the Finnish Ministry of Trade and Industry requesting a licence for the construction of a 1 000 MW direct current (DC) cable for transmission of elec-

tricity between Russia and Finland. The objective was to import electricity to Finland and the Nordic power market. The Ministry of Trade and Industry rejected United Power's application in December 2006, and stated that the project had both negative and positive impacts.

The project's impacts on the supply and price of electricity favoured granting the project a licence, but the transmission line's impacts on the power system as well as on the electricity grid did not favour a construction licence. The Ministry stated that, in its current state, the Finnish power system and main grid is not dimensioned to receive a connecting capacity of the abovementioned size or the amount of electricity to be transmitted to the main grid.

Further, the transmission line's impacts on the continuity of electricity supply and the security of energy supply did not favour a construction licence. The Ministry stated that the project would significantly increase the import dependency in the power market, and particularly the dependency on imports from Russia. The realisation of the project would edge out current CHP generation and condensing generation, as well as postpone investments in new domestic production capacity.

2.7 Investments in new and future transmission capacity

Only minor investments have been made in the Nordic transmission grid during the last years. However, another phase in the development of the transmission grid is now emerging and, during the coming years, several investments will be carried out and others are planned. The uncertainty regarding location of future production and consumption is one of the main challenges when planning new grid investments. Table 2.7 gives an overview of closed, ongoing and potential projects in the Nordic transmission system from 2000-2010.

Table 2.7 Closed, ongoing and potential projects in the Nordic transmission system 2000-2010

		Time-schedule – line in operation	Capacity MW	Estimated cost
Nordel's five prioritised interconnectors				
Fenno-Skan 2 (Finland-Sweden)	Decided	2010	800 MW	150 M€
Nea- Järpströmmen (Norway- Sweden)	Decided	2009	1	
Cut 4 (South Sweden)	Decided	2011/2012		
Great Belt (Denmark)	Decided	2010	600 MW	165,6 M€
Skagerak IV (Denmark - Norway)	Not decided	–	–	
Closed projects				
Konti Skan	In operation	2006	740 MW2	33,7 M€
Finland – Russia	In operation	2002	400 MW	15 M€
Ongoing projects				
Nor-Ned (Norway – Netherlands)	Under construction	2007	700 MW	4.6 bill. NOK
Projects where a license has been granted				
Stenkullen-Lindome (Sweden)	Concession not yet granted	2009	400 kV	
Tjeldbergodden – Trollheim (Norway)		[3]		
Kassø-Revsing (Denmark)		2009		60,6 M€
Horns Rev 2 [4] (Denmark)		2009		116,6 M€
Rødsand 2 [4] (Denmark)		2009		46,9 M€

Source: Energinet.dk, Statnett, Fingrid, Svenska Kraftnät

1 As a first step the capacity on the line will be increased by 200 MW. When reinforcements to Mid-Norway are completed, the capacity will be increased by up to 750 MW.
2 The reinforcement of Konti-Skan 1 cable increased the capacity from 270 MW to 385 MW. Total capacity on Konti-Skan 1 and 2 is thereby increased from 620 MW to 740 MW.
3 License is granted but construction is postponed until it is decided whether a gas fired power plant is to be built at Tjeldbergodden.
4 Connection of wind farm extensions at Horns Rev 1 and Rødssand 1. The two new farms will each have a production capacity of 215 MW.

Table 2.8 Transmission projects under consideration

	Considerations
Denmark	
Western Denmark- Germany	Expansions to 1 500 MW (north direction) and 2 500 MW (south direction) are planned to be carried out in 2010 and 2015 respectively.
Sweden	
Stockholms ström	New structure of the national grid and connecting regional lines in Stockholm County.
Baltic Wind Link	New cable between Sweden and Germany. A parallel investigation is assessing the possibility of connecting the planned wind power park Kriegers flak to the cable.
SwedLit	A preliminary study is currently being conducted to assess whether it is economically viable to construct a cable between Sweden and Lithuania.
Sweden – Estonia	Under consideration
Sweden – Russia	Under consideration
Finland	910 km new transmission lines are planned and a license has been applied for. In addition, there are plans for another 1 840 km transmission lines where licenses have not yet been applied for.
Norway	Statnett has applied for licenses for three more potential projects, and other grid companies have plans for two other projects.
Iceland	Reinforcement of the grid in connection with increased alumnium production and new power plants, and plans for two lines to transport electricity to aluminium smelters.

Source: Energinet.dk, Statnett, Fingrid, Svenska Kraftnät, Landsnet

In addition to the connections mentioned in the table above, three new transmission lines have been commissioned in Norway since 2003[33]. However, all these lines are within one elspot area, and thus have small implications for the functioning of the Nordic market. In Finland 200 km of new 400 kV and 140 km of new 110 kV transmission lines have been built since 2002/2003.[34]

Svenska Kraftnät's annual investments in transmission lines from 1992 to 2006 was fairly stable, with an average of about 300-400 million SEK. Investments in the coming years are expected to be considerably higher.

Nordel's five prioritised interconnectors

Nordel has agreed upon five prioritised transmission interconnectors, cf. table 2.7. Four of these lines have now been decided upon, while Skagerak

33 Klæbu - Viklandet, Viklandet – Fræna, Fardal - Mel

34 Among others Toivila – Vihtavuori, Ylikkälä – Lempiälä.

IV is still under consideration.[35] A basis for a decision is expected to be presented to the parties in late 2007.

The Nordic competition authorities support the planned investments which will reduce the competition problems in the Nordic market. If all five transmission investments are carried out, the number of hours with a similar day-ahead price in the Nordic countries will increase from about 33 per cent in 2006 to 75 per cent after the investments, according to Nordel estimates. There may still be a need for further investments. However, achieving a situation with one common price in all hours is not an objective. As already mentioned, in an efficient transmission system there are some periods with bottlenecks and separate geographical markets.

When Fenno-Skan 2 is put into operation and the connecting lines to central Sweden are reinforced, there will be a strong transmission network from Finland to the middle of Sweden. To obtain an efficient east-west bound network from Finland to Norway to handle capacity needs in wet and dry years, there may be a need for further reinforcements. The transmission grid from north to south on the west coast of Sweden is sometimes congested (i.a. during nights and weekends, dry years and hours with large import needs in Norway). The situation will be improved when Nordel's five cross-sections have been built, but further reinforcements on the Swedish west coast may be necessary.[36]

Nordel is currently working on the new system development plan. Different scenarios for year 2015 and 2025 are investigated. Socio-economic analyses including e.g. producer and consumer benefit, investment and operational cost, security of supply and system adequacy are performed. Competition aspects will be taken into account. The result will be published in the beginning of 2008.

2.8 Conclusions

- Efficient utilisation of existing transmission capacity and socio-economic capacity expansions is one basic requirement in order to achieve sufficient competition in the electricity market in the Nordic area, and thus a well functioning and efficient electricity market.

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[35] The preliminary studies from 2003 made by Statnett and Energinet.dk concluded that the economic gains from building Skagerrak 4 outweighed the costs. However, the decision to construct a 700 MW line between Holland and Norway raised some doubts about the gains. As a result, Statnett and Energinet.dk has initiated a revaluation of the previous study. In comparison to the previous study, it is cautiously estimated that an improved energy balance in Norway and Sweden will lower the utility from the connection, whereas improved capacity between Western Denmark and Germany is expected to increase the social utility of Skagerrak 4.

36 According to the POMPE report.

- Price signals caused by bottlenecks in the transmission system contribute to create incentives for efficient investments both in power production and the transmission grid. For a market to function properly, it is a therefore a crucial prerequisite that correct price signals are visible for market participants and the owners.

- In an efficient electricity market, power flow should go from low price to high price areas. The Nordic competition authorities support developing efficient market connections with surrounding countries and areas, e.g. the ongoing work towards the establishment of market coupling on the cross-border connection between Western Denmark and Germany, Sweden and Germany, Sweden and Poland, and Finland and Estonia.

- The Nordic competition authorities support the congestion management guidelines' recommendation to use congestion rents for investments.

- A well functioning Nordic and European electricity market is of outmost importance in order to achieve a successful balance between the future energy challenges as competitiveness, sustainable development and security of supply. Developing cross-border trade in a more efficient way and not establishing any hampering mechanism is of vital importance. It is essential that an ITC mechanism takes into account benefits and costs of trade supplied by market mechanisms. The costs might be defined in terms of replacement costs, cf. regulation 1228/2003 definition of forward looking long-run average incremental costs.

- There are large potential net gains from improved grid investments. The Nordic TSOs are mainly responsible for their national transmission systems. However, optimal grid investments should be based on Nordic welfare.

- Competition analysis ought to be included in the TSOs' investment decisions. If quantitative analysis is deemed too difficult to carry out, at least a qualitative consideration should be included.

- The Nordic competition authorities recognise that separate relevant geographical markets can arise even in situations without a bottleneck.

- If Nordel's five prioritised investments are carried out, the competition problems in the Nordic market will be reduced. However, it will not be socio-economic profitable to eliminate all bottlenecks, meaning that it will still be necessary for competition authorities to maintain competitive market structures and intervene against anticompetitive behaviour.

3. Production

Increased demand and relatively small investments in new production capacity in recent years indicates a need for increased production capacity in the Nordic region in the coming years. In this chapter, incentives and obstacles for investments in new production capacity are discussed. Finally, an overview of existing production capacity as well as plans for increased capacity is provided.

Table 3.1 shows the installed capacity by production technology in the Nordic countries at the end of 2006, total installed capacity at the end of 2001 and the increase in total capacity from 2001 to 2006.

Table 3.1 Installed capacity 31.12.2006, MW

	Denmark	Sweden	Finland	Norway	Iceland	Total
Hydro power	10	16 180	3 044	28 691	1 162	49 087
Nuclear power	-	8 965	2 671	-		11 636
Other thermal power	9 554	8 094	10 743	244	113	28 748
Wind power	3 135	580	86	333	-	4 134
Geothermal power	-	-		-	432	432
Total installed capacity 31.12.2006	12 699	33 819	16 544	29 268	1 707	94 037
Total installed capacity 31.12.2001	12 480	31 721	16 827	27 893	1 427	90 348
Increase since 31.12.2001	219	2 098	-283	1 375	280	3 689

Source: Nordel Annual Statistics 2001 and 2006

From table 3.1 it can be seen that the total production capacity has increased by 3 689 MW from 2001 to 2006. This equals a 4 per cent increase, which implies a relatively small change in total production capacity in a five-year period.

Table 3.2 Electricity consumption in the Nordic Countries 2001 and 2006, TWh

	Denmark	Sweden	Finland	Norway	Iceland	Total
Consumption 2001	35 432	150 512	81 604	125 464	8 028	401 040
Consumption 2006	36 392	146 366	90 111	122 572	9 925	405 366
Increase in consumption 2001-2006	960	- 4 146	8 507	-2 892	1 897	4 326

Source: Nordel Annual Statistics 2001 and 2006

Table 3.2 shows total consumption of electricity in the Nordic countries in 2001 and 2006. Comparing 2001 and 2006 the increase in consumption was 1 per cent. Since the numbers in table 3.2 not are adjusted for differences in temperature between the years, comparing the consumption in two years, without such an adjustment, will not necessarily provide an accurate picture of the underlying increase in demand.

3.1 Incentives to invest in new production capacity

In a liberalised market, an investor will carry out investments in new production capacity as long as the investments are expected to generate a sufficient return on the invested capital. The expected return on the capital has to take into account all risks concerning future revenues and costs which are generated or affected by the investment. An investor's decision-making is influenced by several factors, such as expectations about price and demand, current and future tax regimes, government aid schemes, etc.

In a well-functioning market, prices are the most important investment signal. Market prices will increase in situations with capacity constraints, thereby making it more attractive both for incumbents and new investors to add additional capacity to the market. Some argue that the hours with extreme prices provide the most important incentives to invest, while others believe that more steady-going developments in the market price are most motivating.

Different production technologies have different characteristics, and characteristics like the technologies' cost structure and utilisation time affect the investment decision. Power plants with low variable costs (base-load plants) are characterised by high utilisation rates, while peak-load plants have higher variable costs and shorter periods of operation.

In general, an increase in base load capacity will contribute to a reduced electricity price. Thermal power plants have a cost structure with fixed costs related to investments and maintenance, and variable costs mainly consisting of fuel costs. Fixed costs dominate in the production of nuclear power, while variable costs are more important for oil and gas fired power plants. Peak load power plants are available in time periods with relatively high prices, and consequently contribute to reduce the price level in such periods. Investments in peak load power plants will therefore tend to neutralise price differences over time, and large investments in peak load capacity will lead to reduced price differences between seasons and years. Investments in base load power plants with very low variable costs (e.g. nuclear) will not have such a price neutralising effect.

A hydro power plant's production potential for energy is mainly decided by inflow of water. When considering investments in hydro power plants, producers have different incentives to invest in production capacity (energy) and reservoir capacity (power).

Wind power production is characterised by very high fixed costs and insignificant variable costs. This cost structure implies that the market price on electricity will always exceed the production costs, and thus that production will be profitable whenever it is possible to produce.

In order to evaluate the incentives to invest in production capacity, it is interesting to look at the expected future change in consumption and prices. All other things equal, a higher consumption tomorrow will result in more capacity constraints and as a consequence higher prices. Using Denmark as an example, table 3.3 illustrates the expected increase in demand for electricity in Denmark by comparing the maximum observed demand during the winter 2005/06 with the forecasted demand of the winter 2009/10. It can be seen from the table that the demand for electricity in Denmark is expected to increase by 10 to 17 per cent during this period.

Table 3.3 Forecasted changes in consumption compared to the maximum realised peak consumption during the 2005/2006 winter

	Present	Forecast		Relative increase	
	2005/2006 MWh/h	2009/2010 Normal year MWh/h	2009/2010 Ten years winter * MWh/h	2009/2010 Normal year	2009/2010 Ten years winter*
Western Denmark	3 750	4 150	4 400	10,7 %	17,3 %
East Denmark	2 690	2 950	3 000	9,7 %	11,5 %

* Statistically, national 10 year winters coincide between the Nordic countries every 30-40 years.
Source: Nordel 2006

Another factor which influences the incentive to invest in production facilities is expansions of the transmission network. This is because a larger transmission capacity will affect the competitive pressure on the region and hence the price formation.

Uncertainties regarding new investments increase the investor's required return and hence deter otherwise profitable investments. Furthermore, since established players gain from their market know-how and economies of scale, new players are relatively worse off if uncertainties arise in a market. As a result, transparent long-term plans for transmission expansions should be made and applied.

Today, the production capacity is to a great extent concentrated within a number of incumbents within the Nordic Power Markets. Table 3.4 indicates the production by seven large generators in the Nordic region from 2002 to 2005.

Table 3.4 Production from selected generators 2002-2005, TWh

	2002	2003	2004	2005	Proportion in the Nordic countries
Vattenfall	70,6	61,5	70,9	72,2	18,5 %
Fortum	46,5	51,2	50,7	49,2	12,6 %
Statkraft	40,4	39,2	34,3	48,5	12,4 %
Sydkraft/E.ON	30,9	29,5	34,0	35,1	8,7 %
Elsam	16,2	18,0	14,6	11,3	2,9 %
E2	12,5	14,1	10,8	9,2	2,4 %
E-CO	9,9	7,4	8,7	9,1	2,3 %
Others	156,1	142,4	155,0	156,4	40,1 %
Total Nordic countries	**383,1**	**363,3**	**379,0**	**391,0**	**100 %**

Source: NordReg 2006

It can be seen from table 3.4 that the seven large producers control approximately 60 per cent of the total production in the Nordic region. One way to obtain increased competition would be to induce more entrants to enter the market by making investments in production capacity. From a competition point of view, investments in increased production capacity by new producers/entrants have a more favourable effect than similar investments by incumbents. New production capacity built by incumbents does not necessarily contribute to more effective competition. For the last few years, new entrants have not made any major investments in new production capacity in the Nordic region.

An incumbent will most likely have lower costs than a new entrant when making new investments. This is due to larger market related know-how as well as benefits from large scale operations. This implies that potential entrants meet higher barriers in the market for investments in new power production capacity. This may in the long run result in ineffective competition and thereby in higher end user prices. One difference in the incentives between entrants and incumbents, which may cause an incumbent to be more reluctant to carry out new investments, is that these investments may lower prices and thereby "cannibalise" some of the profits otherwise made by the incumbent.

3.1.1 Political instruments to stimulate investments

Several policy mechanisms affect a producer's decision to invest in new power production, for instance direct support schemes, regulatory mechanisms and other economic policy instruments. Incentives and political instruments may be useful in stimulating investments in new production capacities. However, it is important that they not destroy the market's ability to provide the economic signals for market players to make the correct investment decisions, but rather that the instruments support and improve the regulatory framework in which the investment decisions are taken.

The EU Emissions Trading Scheme (EU ETS)[37] - governed by the Emissions Trading Directive - is designed to promote reductions in greenhouse gas emissions in a cost-effective and economically efficient manner. This means that the directive aims at providing economic incentives to invest in production technologies with lower emissions of preferably emissions free production technologies. The overall aim is that yearly average pollution from CO_2 in the period 2008-2012 is reduced by 8 per cent in the EU compared to the emissions in 1990.

Technically, by offering fewer allowances than needed on the market the allowances obtain an economic value. The economic value creates costs that give the producers incentives to reduce the CO_2 emission and hence to invest in less CO_2 intensive production.

In the first phase (2005-2007), the directive requires that Member States allocates at least 95 per cent of the allowances free of charge. The allowances are allocated on the basis of historical production levels (Grand Fathering), meaning that e.g. Danish companies in this period are given allowances on the basis of their production levels in the period 1998-2002. In the second phase (2008-2012), at least 90 per cent of the allowances are to be allocated free of charge.

As a result the scheme gives the Member States an opportunity to either sell or allocate the remaining allowances free of charge. In the first phase, most countries have chosen to allocate all allowances free of charge.

The introduction of the ETS has caused an upward pressure on electricity prices in Europe. Although this effect was expected it has caused an intensified debate whether Grand Fathering is the most efficient allocation method. One of the arguments against Grand Fathering is that the free allocation of allowances causes wealth to be redistributed from the state to producers. It has been discussed whether all the allowances should be fully allocated through an auction.

For the period 2005-2007 Norway has established a separate trading scheme for CO_2 allowances. The Norwegian Government has in June 2007 put forward a proposal for a new trading scheme for quotas for 2008-2012[38]. The proposal implies that a lower share of the allowances will be allocated free of charge in the period compared to the EU ETS. The Norwegian Government has stated that allowances might not be allocated free of charge after 2012. The Government will support a similar development of the EU ETS.

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[37] Directive 2003/87/EC

38 Ot.prp. 66 (2006-2007) Om lov om endringer i klimakvoteloven m.m.

The Commission has expressed a willingness to consider changes and further harmonisation of the allocation method, including auctioning for the period after 2012. For future schemes EU may consider to use auctioning as allocation method, either for a share of the allowances or full auctioning. Use of auctions provides an equal opportunity to obtain allowances for new entrants as for existing participants. Auctioning part of the allowances does not lead to an efficient allocation compared to a situation with full auctioning, as the allocation to individual installations still needs to be carried out.[39]

The Nordic competition authorities support the work done by the EU Commission to evaluate more use of auctioning when distributing allowances. Such a system would be more effective if implemented globally and also including other emissions gases than CO_2.

The EU has also introduced a regulation on *"Guarantee of origin of electricity produced from renewable energy"*. The purpose of this regulation is to stimulate efficient and environmentally friendly energy production. In Sweden this law was implemented in 2006 to stimulate CHP production. Companies producing electricity and district heating using highly efficient CHP facilities or renewable energy sources can receive such guarantees of origin. The idea is that the guarantees can be used in advertising and marketing campaigns, and contribute to boosting efficient and renewable electricity production.

In order to increase the proportion of renewable electricity, Sweden introduced a system for trading in *energy certificates* in May 2003. The electricity certificate is a market-based support system, and the objective is to increase the production of renewable electricity by 17 TWh by 2016 as compared to 2002. The system replaces earlier public grants and subsidy schemes. It is based upon the principle that there are sellers and purchasers of certificates and a market to bring them together. Producers of renewable electricity receive certificates and retailers have an obligation to buy a certain quota of renewable electricity.

In Finland, the Ministry of Trade and Industry grants *energy aid* to projects which aim at steering energy production and use in a direction that involves lower carbon dioxide emissions. Of these projects, the ones which promote new production technologies are considered the most important, but aid may also be granted to new production plant investments.[40] Finland also has plans for special legislation concerning a *feed-in tariff* and special

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39 Auctioning of CO_2 emission allowances in the EU ETS, Report under the project "Review of EU Emissions Trading Scheme", European Commission, Ecofys, October 2006.

40 The maximum amount of aid is 40 per cent of total investments in wind or solar energy production plants and 30 per cent of investments in production plants using renewable energy (40 per cent if the plant is based on a new energy technology). In most cases, aid granted is between 10 and 30 per cent.

transmission tariffs for peat, small-scale electricity production as well as for production using renewable energy. The aim is, besides supporting the use of renewable energy, to promote small scale production.

In Norway, a *system for direct support to new investments in renewable energy* is planned to become operative in 2008. The scheme is supposed to cover the first 3 MW of installed capacity effect in new hydro power plants, upgrading of existing hydro power plants and investments in other renewable power production.[41] The scheme is based on a fixed mark-up per kWh of electricity produced, and it is suggested to differentiate the mark-up between different production technologies.[42] The investors may be granted support for 15 years. Before the scheme can enter into force, it must be notified to and approved by ESA.

As a consequence of the interplay between grid and production facilities, investments in new production capacity may reduce or postpone grid reinforcements. A situation of energy shortage, e.g., as a result of a sharp increase in consumption in a specific area, can therefore either be solved by increased transmission capacity into that area or by establishing more production capacity within the area. In order to stimulate favourable location of new production capacity, Statnett introduced a *"grid efficient phasing-in tariff"* in 2005.[43] This means that new production capacity facilities with a favourable and efficient location in relation to the current grid obtain a reduced grid leasing tariff compared to the current level for a period of 15 years. In order to be eligible for the phasing-in tariff, new production capacity has to be established within those areas and energy volumes where it is documented that new production will bring grid savings. These locational signals are meant to give market participants stronger and clearer financial incentives, and hence lead to the establishment of new production capacity which in turn will generate considerable grid-related cost savings.

Other elements which influence investment decisions are the principles related to the transmission tariff. All the Nordic TSOs apply point tariffs, meaning that the customer pays for the right to feed in or take out electricity at a single connection point and with that gets access to the entire net-

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[41] To finance the support scheme, the Government has proposed to allocate NOK 20 billion (approx 2.3 billion Euro) to a fund to strengthen the efforts to increase the production and use of renewable energy as well as to increase energy efficiency. The first NOK 10 billion were allocated in the state budget for 2007 and another NOK 10 billion will be proposed to be allocated in the 2009 state budget. The state owned agency Enova will manage the yield from the fund.

[42] In St.meld. nr.11 (2006-2007) Om støtteordningen for elektrisitetsproduksjon fra fornybare energikilder (fornybar elektrisitet) a support-rate at 4 øre/kWh is proposed for hydro power, 8 øre/kWh for wind power and 10 øre/kWh for bio power and immature technologies. Because of uncertainty regarding the future price level of electricity, the support will be reduced by 0.6 øre for each øre the average system price at Nord Pool exceeds 45 øre/kWh during a year.

[43] In 2007 the "grid efficient phasing-in tariff" is offered in two areas in Norway. One area constitutes Middle Norway and the other includes Bergen and parts of the neighbouring areas (the BKK-area).

work system. However, the share of the tariffs that is covered by the producers and consumers respectively differs widely between the countries, and the price signals' structure also differs. Finland, Norway and Sweden have time (or load) differentiated tariffs to varying degrees, while the Danish markets do not. Only Norway and Sweden use locational signals in the tariffs.

Tariffs based on marginal losses are not sufficient to cover the total costs related to the grid. Differences in the design of the residual tariff might affect competition and result in sub-optimal production and consumption decisions. In particular, this will be the case when some countries cover the residual costs from the production side while other countries cover them from the consumption side. In the long run, both tariffs on installed capacity and on energy production affect the producers' profitability and thus their willingness to invest.

3.2 Obstacles for investments

Before the electricity market was deregulated, there was less focus on business profitability in the electricity sector. The result was a situation with surplus capacity both in production and transmission. However, the period with surplus capacity, and accompanying low electricity prices and investments is now in the past. Scarce production capacity has contributed to an increased price level which improves the expecting rate of return of potential projects. Currently there is a need for more production capacity in the Nordic market.

Construction of power plants normally requires a license. In most cases this process takes several years from when the constructor applies for a license until a final decision is reached. This is due to a lengthy process involving hearings, feasibility studies, etc. The process is often prolonged due to complaints from affected parties and the subsequent handling of the complaints. Figure 2.3 illustrates the licensing process pursuant to the Norwegian Energy Act.

Construction of new production capacity almost always results in an intervention in the surrounding countryside. As a result, affected parties often file a complaint regarding environmental and landscape issues. In Norway especially hydro power and wind power have been considered to cause undesired environmental impacts.

In Norway, issues regarding gas fired power plants and emissions of carbon dioxide are also heavily disputed. For the time being, with the prevailing Government in office, there will be no new licenses for gas fired power plans granted without plans for carbon capture and storage. Requirements for carbon capture and storage are costly, and thereby affect the projects' profitability. The Norwegian Government and Statoil are collaborating on

establishing a full-scale CO_2 capture and storage project for the gas power plant which is under construction at Mongstad.

Uncertainty regarding future emission allowances also makes it difficult to plan investments. In general, predictable, long term and stable external conditions are important in order to facilitate new investments in additional production capacity. Very often, uncertainty is linked to if and when new plants will be in operation, even if necessary permits are in hand and decisions are taken.

The Energy Markets Inspectorate in Sweden has initiated a study this year in which they will look into different issues related to investments in new production facilities. In the study ongoing and planned investments in new production by different types of investors will be described and their effect on market concentration analysed. Incentives that encourage as well as obstacles that hamper new investments will also be examined in the study.

Denmark has a high population density. This means that it is very difficult to find sites that do not have any neighbours close by. As a result, the main obstacle for establishing new production capacity is to find appropriate construction sites

In Finland market participants show great interest in investments in nuclear power. A third reactor in Olkiluoto is going to be built and it will probably be in use by the year 2010. The obstacles for new investments are mainly institutional. Processes to obtain the relevant licences and also construction are lengthy. However, also in Finland the construction of new production capacity often result in environment-related complaints. For example, the construction of wind mills or waste burning plants may take a long time because of court processes.

Market participants would also be interested in investments in hydro power, but all suitable rivers in Finland are already used for this purpose. It might be possible to increase the capacity of existing power plants. Further, there might be scope for some kind of water reservoirs to achieve more hydro power production capacity, but establishing such reservoirs would be very difficult from an environmental point of view.

Electricity produced by thermal power is fully dependent on the need for heat. If demand for heat increases, more capacity will be available for electricity production. In general coal-fired power plants are not very attractive because of the uncertainty of the cost of CO_2 allowances. Market participants have criticised the existing uncertainty related to available allowances for the next emissions trading season (2008-2012). This uncertainty makes it very difficult to plan any new investments.

The main obstacles in Iceland are related to environmental factors.

Construction of new power plants related to the heavy industry meets increasing opposition due to the intervention of undisturbed remote areas. There is opposition both against the industry and the power plants.

3.3 Production capacity

Table 3.1 in the introduction of this chapter shows the installed capacity by technology by the end of 2006, as well as the total increase in capacity from 2001 to 2006 for all the Nordic countries. Table 3.5 below gives an overview of how the increase in production capacity is allocated among the different technologies in the Nordic market.

Table 3.5 Installed capacity by technology in the Nordic countries 2001 and 2006. MW

	2001	2006	Increase
Hydro power	47 874	49 087	1 213
Nuclear power	12 076	11 636	- 440
Other thermal power	27 361	28 748	1 387
Wind power	2 835	4 134	1 299
Geothermal power	202	432	230
Total installed capacity	**90 348**	**94 037**	**3 689**

Source: Nordel Annual Statistics 2001 and 2006

It can be seen from table 3.5 that wind power and other thermal power than nuclear contribute to approximately 35 per cent of the increase in installed capacity each.

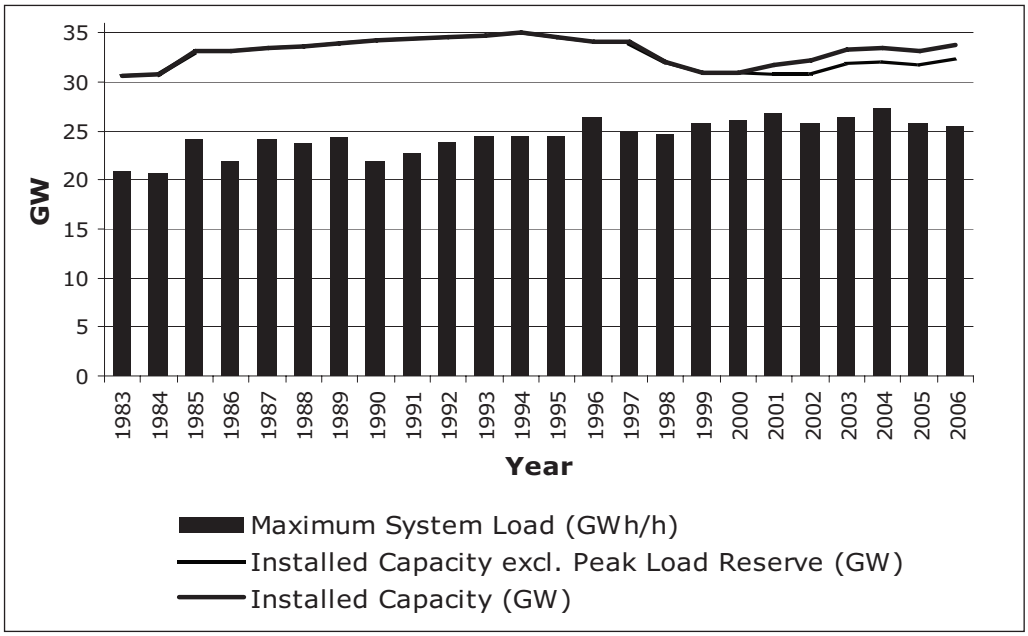
The nuclear power capacity in the Nordic countries decreased from 2001 to 2006, due to the closing of the second Barsebäck nuclear reactor (600 MW) in Sweden in 2005. However, modernisation processes have led to increased capacity in some other Swedish nuclear reactors by 5-10 per cent, and there are similar plans for other reactors during the next few years. After several failures in Swedish nuclear reactors during 2006, the Government has decided to postpone decisions about permits to increase capacities. However, the total capacity in Swedish nuclear plants is expected to increase by about 1 000 MW during the next few years.

It goes without saying that wind power production is dependent of the wind, and thus is rather inflexible. The relatively large investments in wind capacity may have an uncertain effect on the ability to satisfy demand during periods of peak demand.

There is a need for flexible capacity (e.g. hydro power) to allow the producers to respond quickly to changes in demand. Increases in production capacity cannot therefore be entirely covered by wind power or other inflexible plants. However, there is still a considerable share of flexible capacity in the Nordic region.

After the deregulation of the electricity markets, some of the excess capacity has been phased out or mothballed, as it was simply not profitable. Figure 3.1 below illustrates this fact for the Swedish market which was deregulated in 1996. The situation in Sweden was further aggravated by the decision to close down the nuclear reactors at the nuclear plant in Barsebäck in the south of Sweden[44].

Figure 3.1 Installed capacity and System Load in Sweden 1983-2006



Sources: Nordel, Swedenergy and Svenska Kraftnät

As a temporary solution, the Swedish TSO has procured reserve capacity to specifically handle peak demand situations by the use of a so-called "peak-load reserve". The TSO also provide a reserve to handle disturbances in the transmission system. This peak load reserve amounts to 2 GW of reserve capacity and demand reduction (approximately 500 MW). The reserve capacity corresponds to the area between the thin and the solid line in figure 3.1.

The solid line in figure 3.1 shows total installed capacity, and the bars show the maximum annual system load. However, installed capacity overestimates the actual available capacity at any moment in time, and especially during demand peaks. If the availability of individual power plants and limitations in transmission capacity are taken into account, Svenska Kraftnät maintains that the maximum production capacity during a "normal" year in Sweden is in fact between 26 and 27 GW, excluding the peak load and disturbance reserves. By comparison, the all time high system load in Sweden

[44] The first and second reactor in Barsebäck was closed down in 1999 and 2005 respectively, which each meant a capacity loss of 600 MW

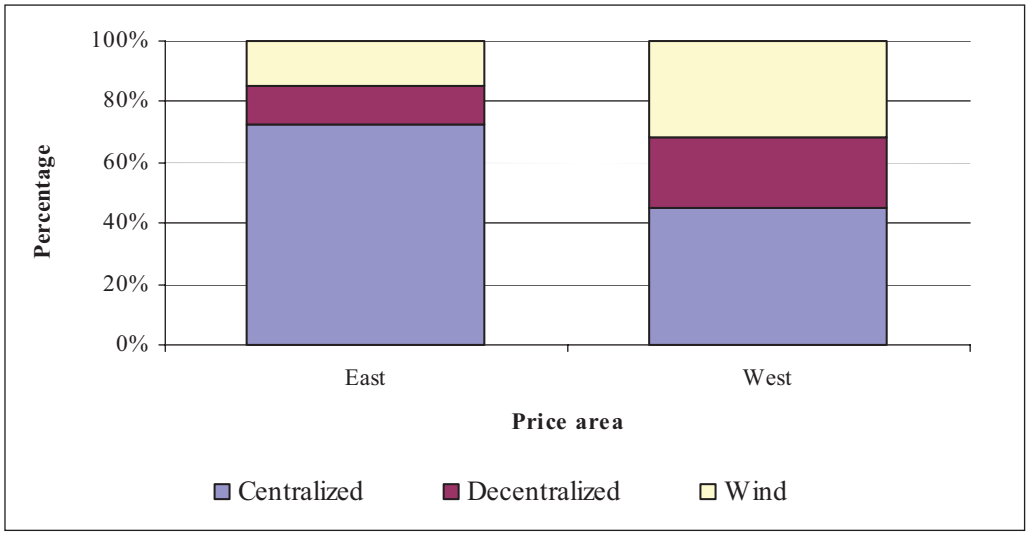
occurred during 2004 when the load reached 27 300 MW. Also, according to the Finnish Energy Market Authority, the actual available capacity in Finland was approximately 13 650 MW in the end of 2005, while installed capacity amounted to 16 617 MW. Installed capacity is thus not a good indicator of the available capacity in the market at a given point in time.

In 2007, power production capacity amounts to 5 040 MW in Eastern Denmark and 7 572 MW in West Denmark. The installed production capacities exceed annual power demand, which amounts to approximately 2 690 MW and 3 750 MW in Eastern and Western Denmark, respectively. Hence, Denmark has a significant excess of production capacity and is therefore a net exporter of power.

Cross-border trade and import/export capacity influence the available capacity both in each country and in the common Nordic market. In a cross-border system based on implicit auctions, power will flow from low to high price areas. This mechanism contributes to increasing the power supply to areas with a scarcity of power and accompanying high prices.

The composition of the production capacity varies considerable among the Nordic countries, cf. table 3.1. Figure 3.2 takes a closer look into the composition of the Danish production capacities, and shows that the power generation is primarily based on centralised CHP using coal and natural gas as fuel (74 per cent in Eastern Denmark and 54 per cent in Western Denmark).[45] Wind mills and decentralised CHP constitute the remaining part of the Danish production capacities.

Figure 3.2 - Production capacity by technology in Denmark, 1 January 2007



[45] CHP stands for Combined Heat and Power. Centralised CHP is large CHP plants, while decentralised CHP are smaller CHP units.

DONG Energy and Vattenfall own most of the Danish production capacities, and both companies have significant capacities in both Western and Eastern Denmark. DONG Energy is the largest producer with approximately 70 per cent of all CHP capacity and 46 per cent of all capacity in Denmark, while Vattenfall owns 30 per cent of all CHP capacity and 19 per cent of all capacity in Denmark.

Table 3.6 Net increase in production capacity (MW) 2006-2009 (decided and planned)

	Hydro power	Nuclear power	Other thermal	Wind	Installed capacity	Available capacity at peak
Denmark			-160	550	390	-160
Finland	50	0	140	40	230	130
Norway	410		620	350	1 380	1 010
Sweden		600	900	1 250	2 750	1 420
Iceland	724		256		979	N/A
Nordel	**460**	**600**	**1 500**	**2 190**	**4 750**	**2 400**

Source: Nordel 2006 and Icelandic Energy Regulator

Table 3.6 indicates that the production capacity in the Nordic region is expected to increase by 4 750 MW from 2006 to 2009, which equals a four per cent increase compared to the situation in 2006. The largest increase will be in Sweden where a total of 2 750 MW is planned during the coming years, of which 1 250 MW will come from wind power plants. In total there are plans to increase wind power capacity by 2 190 MW at locations in various different places in the Nordic region. Increased wind power capacity will have only a minor significance for peak load capacity.

In addition to the expected capacity increases to 2009, there are several plans for investments that will be completed after 2009. For instance will a new nuclear power plant in Finland add 1 600 MW. Further six gas fired power plants with a total capacity of 3 000 MW have been granted licenses in Norway, i.e., 2 400 MW more than the capacity increase indicated in the table above. In addition, licenses have been applied for or pre-notified plans submitted to NVE for seven other gas fired power plants.

In Denmark, there has been, in general, limited incentive to increase production capacity due to the significant excess of production capacity. Environmental issues have, however, resulted in large subsidies to renewable power production. These subsidies create an incentive to invest in wind power production at the expense of thermal production. In addition, new wind power capacity will result from the Danish Windmill-Scrap-Programme which seeks to promote larger but fewer windmills. This implies that the Danish Government subsidises the replacement of old windmills by new ones with greater capacity.

In 2007, the Danish Government put forward the energy plan "A visionary Danish Energy Strategy". The strategy's primary aim is to ensure that renewable energy plays a more significant role in the Danish electricity production. It presents objectives for Denmark which are to be accomplished before the year 2025. Denmark wants to be totally independent of fossil fuels in the long run. In order to accomplish this, the Government wants to double the use of renewable energy so that at least 30 per cent of all energy production originates from renewable energy sources. Thus, the Danish declaration of intent exceeds the EU energy settlement of March 2007, which aims at a 20 per cent share of renewable energy for all EU members.

To ensure that the objective in 2025 is reached, the Government has presented the following ideas and initiatives regarding production capacity.

- *Strategic plans for wind capacity:* The Government wants to prepare onshore and offshore plans for wind infrastructure.
- *Demonstration and experimental sites:* In accordance with the EU research development and innovation rules, the Government wants to establish demonstration and experimental sites both on- and offshore for wind power across Denmark.
- *Improve conditions for wind investment:* The Government wants to improve the public framework under which investments in wind capacity are made.

Furthermore, the program contains a number of initiatives which promote the use of bio fuels alongside garbage as input into the production of electricity and heating. Moreover, the program supports biogas as an input in heat production.

3.4 Conclusions

- Investment in new production capacity will normally improve competition. From a competition point of view, investments in increased production capacity from new producers/entrants are viewed more favourably than similar investments from incumbents.

- To have proper incentives to invest, it is important to have a stable, predictable and long-term regulatory framework to ensure profitable investments in new production and transmission capacity.

- Existing support schemes must continuously be reviewed and, if necessary, changed to ensure that the goals are fulfilled without interfering with the functioning of the markets involved.

- The Nordic competition authorities support the work done by the EU Commission to evaluate more use of auctioning when distributing

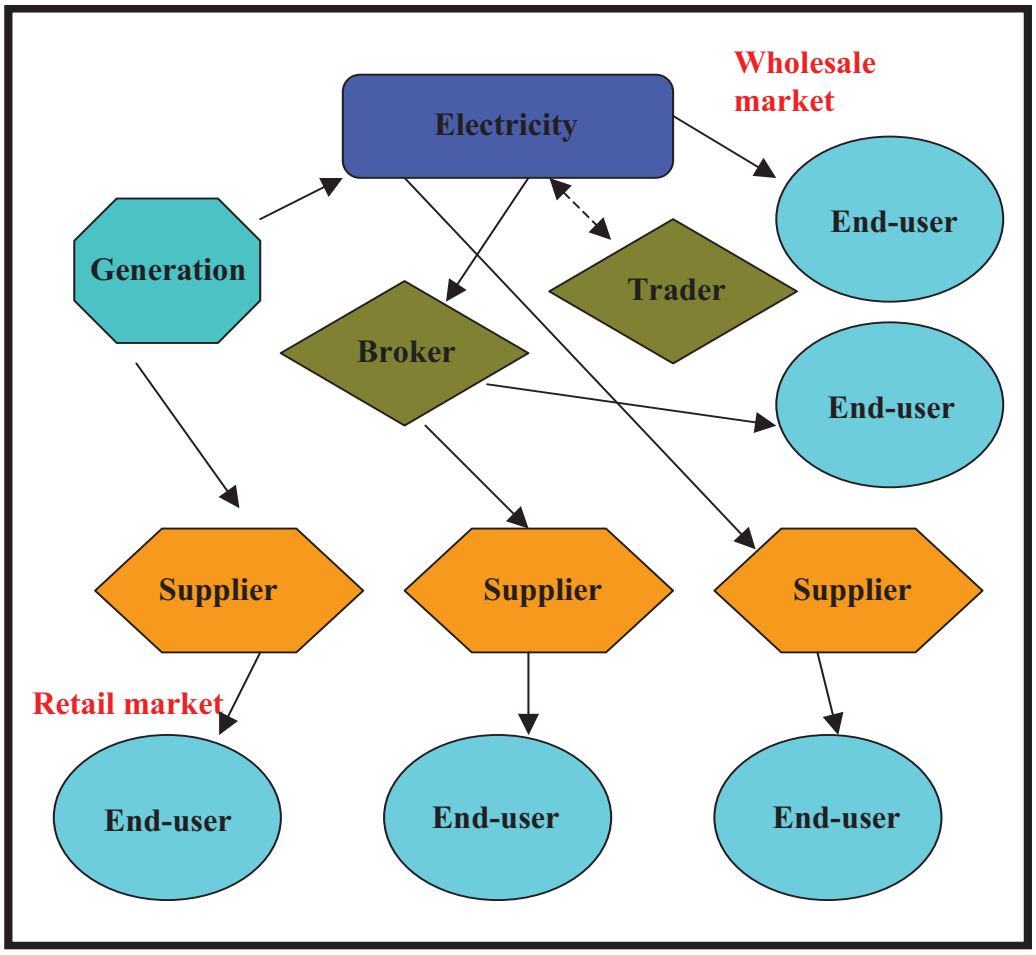
allowances. Such a system would be more effective if implemented globally and also including other emissions gases than CO_2.

- It is crucial, both in a competition and a security of supply perspective, to have a sound diversity in the production technologies used. A market open to a wide range of production technologies is the best guarantee to achieve an efficient market. Political means and support schemes must not work against this.

4. The retail market

The electricity sector is divided into a wholesale market and a retail market, cf. figure 4.1 below. End-users purchase electricity both in the wholesale and the retail market.

Figure 4.1 illustrates the parts of the electricity sector which are exposed to competition



Source: NordReg

An end-user that operates in the wholesale market may buy electricity from sellers located in another Nordic country, either by purchasing on the exchange or from a broker. An end-user operating in the retail market does not, however, have access to an integrated Nordic retail market. An integrated market is defined by the NordReg Retail Working Group as a market where a supplier can sell electricity to a customer located in another Nordic country at reasonable administrative costs. It is currently possible to buy electricity from other Nordic electricity suppliers, but the administrative costs are relatively high. The Nordic retail market is separated due to tech-

nical, regulatory and commercial barriers. Thus, end-users operating in the retail market have to buy electricity from domestic suppliers.

The price paid by end-users in the retail market depends on how efficiently both the wholesale and the retail markets function. Even if competition is strong and profit margins are relatively small in the wholesale market, the price paid by end-users may be high if competition is weak in the retail market. Sufficient retail market competition is therefore a prerequisite for a well-functioning electricity sector.

4.1 The national Nordic retail markets

4.1.1 Prices

In a market with perfect competition, the retail prices should equal the wholesale prices plus a competitive mark-up in the retail market. Thus, the price development in the retail market should reflect the development in the wholesale market. If there are different prices in the different elspot areas, these price differences would also be reflected in the retail market prices.

The retail prices vary a lot between the Nordic countries and this is not mainly due to differences in elspot prices. The Finnish retail prices are quite stable, while the Norwegian prices to a large extent follow the system price at Nord Pool. In general, Swedish end-users seem to be paying a higher price than Norwegian and Finnish end-users. The regulated Danish "obligation to supply" prices are also somewhat higher than the retail prices in Norway and Finland. A more integrated Nordic retail market is likely to lead to a harmonisation of the retail price levels in the Nordic countries.

4.1.2 Market concentration and vertical integration

Whereas the wholesale markets are heavily concentrated at the national level, the number of retail suppliers is relatively high, although the combined market shares of the three largest retailers (the CR3) have increased during the last few years. The CR3 is quite large in all the Nordic countries.

Table 4.1 CR3 in the Nordic countries

	CR3 Market share	Total number of suppliers
Sweden	Almost 50 %	Almost 130
Norway	56%	117
Finland	35-40%	75
Denmark*	Above 80%	40
Iceland	Above 80 %	6

* The four largest suppliers

There are considerable fewer suppliers actively marketing themselves on their respective entire national market than the total number of suppliers in each country. That is, many sell only in local areas.

Some customers have a tendency to favour local or regional suppliers. It is therefore of some interest to consider competition on local and regional markets. A common feature of the national Nordic retail markets has been the persistently high market shares of local incumbent suppliers. However, even if local concentration is high, this does not necessarily mean that competition is weak, provided that customers may readily switch to competing suppliers in case of high prices from the dominant supplier. The number of national suppliers that offer electricity on a national basis is therefore also of interest. According to the figures above, the number of active national suppliers is considerably lower than the total number of suppliers.

The structure in the retail markets differ between the Nordic countries. In Finland mainly companies with electricity production are active in the retail market, while in Norway, Denmark and Sweden there are several retailers who do not have their own production. In Iceland all retailers have some production, but they also buy electricity in the wholesale market, mostly from Landsvirkjun.

In Finland, the retail price has in some periods been below the spot market price of electricity, and consequently it is hard for independent retailers to compete. In Sweden there has been an investigation of the three largest retailers selling electricity below the spot price, cf. point 1.3.2.

In order for competition to work properly, DSOs and TSOs have to grant access to the transmission and distribution network to all suppliers on non-discriminatory conditions. All suppliers have to get access to the same information at the same time. This implies that no supplier should have preferential access to data from the DSO, for instance customer related data or meter IDs.

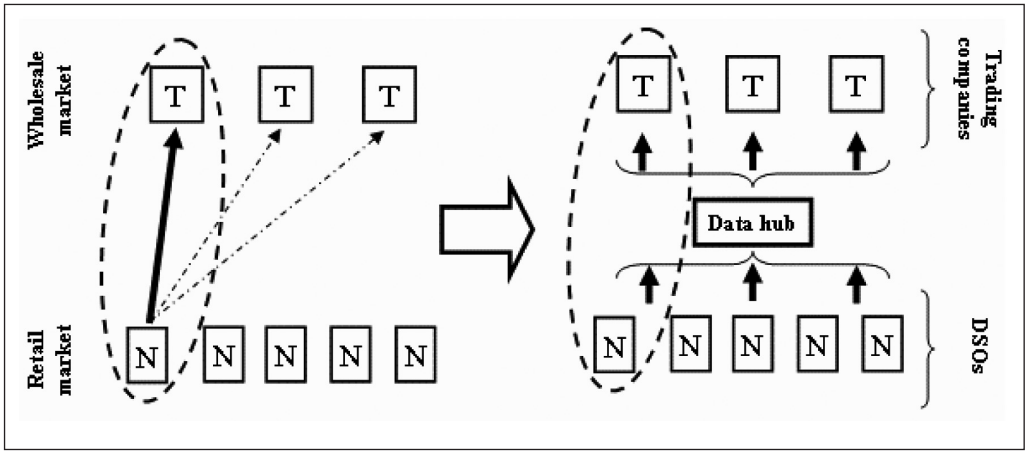
The first EU electricity directive of 1996 obliged vertically integrated companies to grant third party access to transmission and distribution networks, and it mandated a minimum level of unbundling of network business from other activities.

The second electricity directive of 2003 obliged member states to introduce a regulated third party access regime under which third parties have a right to access the network in a non-discriminatory manner based on published tariffs. National regulators have to monitor the overall activities of the network companies, deal with complaints, and control network tariffs. The Directive requires legal unbundling, as well as accounting and management unbundling, between network activities (transmission and distribution) and all other activities. In practice this means that the TSOs and DSOs

have to be independent legally, organisational and when it comes to decision making. The Directive permitted the postponement of legal unbundling of distribution companies until 1 July 2007, and it allows Member States to exempt distribution companies from the legal unbundling obligation altogether if they serve less than 100 000 connected customers.

A great number of retailers in the Nordic countries have ownership stakes in local grid companies. This may distort the network company's incentives, for instance to provide customer related information to independent retailers in a non-discriminatory manner, cf. figure 4.2. As a result, independent retailers may have difficulties related to entering the market, and this may lead to ineffective competition. Vertical integration may in this way represent a significant problem in the retail market, yet it is very difficult for the competition authorities or the energy regulators to prove breaches of the legislation.

Figure 4.2 illustrates how vertical integration may distort the DSO's incentive to share information in a non-discriminatory manner.



The thin dotted line in the figure illustrates the distorted incentive for the vertically integrated company to share customer information with competing firms. Since at low cost, the vertically integrated DSO may discriminate by providing its own supply branch with information that helps it to compete with its rival suppliers.

In order to improve competition, the Danish energy regulator has appointed a working group to investigate whether it is possible to form a standardised data link between the network companies and the retail and wholesale market. The idea is that the grid companies should report their data directly in a standardised manner to a database which should be accessed by all the trading companies. This constellation would ensure that the data is passed on in a non-discriminatory manner. A similar project (EMIX) is carried out by Swedenergy.

The Nordic competition authorities would like to stress the importance of legal unbundling between network activities and activities which are exposed to competition, but are of the opinion that this requirement is not sufficient to ensure that the DSOs act in a neutral manner. Ownership bundling of network operations and supply of electricity is common, and there are lots of examples of integrated network companies which act in a discriminatory manner, i.e. share customer related information with the in-house supplier. Under such structural conditions, it is of great importance that there are functional requirements which prevent discriminatory behaviour and that the national regulators have adequate means to penalise any such behaviour which may take place. However, ownership unbundling is the most efficient way to prevent any discriminatory behaviour because it relies on incentives rather than external monitoring and ex post penalties, and is therefore the desired market structure. If ownership unbundling is not feasible, the legal unbundling requirement should also apply to network companies which serve less than 100 000 customers.

4.1.3 End-users' price awareness

Competition may only function effectively if customers do in fact take advantage of the opportunity to switch supplier in situations with significant price differences. Customers may either change supplier or renegotiate a contract with the present supplier to be able to buy electricity at a lower price. The number of customers who switch electricity supplier varies considerable between the Nordic countries. The most active switching behaviour has been seen in Norway, followed by Sweden, Finland and Denmark.

Table 4.2 Customers that have switched supplier at least once, per cent

	Customers that have switched supplier at least once
Denmark	5
Finland	11 [1]
Norway	30 [2]
Sweden	57 [3]
Iceland	Less than 1 per cent

1 Customers that have actually changed supplier in 2005
2 Customers that have another supplier than the dominating in the grid area 31 December 2006. Total number of supplier shift is more than 2 million.
3 Including renegotiations with former incumbent supplier.

It is important to note that a low switching rate does not necessarily indicate inefficient competition, since it may imply that competition is strong and that customers therefore have little to gain from switching electricity supplier. If, however, a low switching rate is observed along with high price disparity, it may indicate that some suppliers have market power.

The customers' price awareness also depends on which price contracts are

being offered. For instance in Sweden long-term contracts are quite common, while spot price contracts are less common, although they are becoming more and more popular. The price in such contracts is equal to the spot market price at Nord Pool, plus a specified mark-up. In between these two types is the so-called variable electricity price contract, which is the most common contract in Norway. Normally, the expected annual payment is lowest for the spot price contracts. This is because the customers bear all the risk related to the price development on the exchange. Fixed price contracts contain a price hedging element which the customers normally have to pay for in the form of a higher price.

The larger the share of customers with spot price contracts, the greater will be the customers' price awareness. Markets function more effectively when customers respond to high prices by lowering their consumption. When the spot market prices increase, this has a direct effect on the prices paid by consumers with spot price contracts. This induces customers with such contracts to reduce their consumption.

However, even spot price contracts have a time lag. In Norway and Sweden, spot prices in spot price contracts are based on the average monthly prices at the Nord Pool Spot. Maximum price awareness - and thus demand responsiveness - requires metering of electricity consumption on an hourly basis, cf. section 4.3.

4.2 Potential benefits from an integrated Nordic retail market

Competition will increase when former national markets are integrated into one common market, giving that the concentration levels in the national markets are quite similar. This arises because consumers benefit from having more suppliers to choose from, and the suppliers' margins may fall as a result of competition from a larger number of companies.

There are no large differences in the concentration levels among the national Nordic retail markets. Hence, there is no doubt that market concentration will be reduced in one integrated Nordic retail market relatively to the degree of concentration in today's national markets. As already mentioned, there are some tendencies for the national retail markets to be dominated by a few firms, although the general impression is that the national retail markets are less concentrated than the national wholesale markets. Thus, market integration is expected to give some advantages in terms of increased competition.

Furthermore, by increasing the number of suppliers that operate in the market, some suppliers may grow without jeopardising the objective of effective competition. In short, an integrated Nordic retail market will enable restructuring and larger companies, and thus make it easier for suppliers to reap benefits from economies of scale.

NordReg has reviewed the conditions for the establishment of one common Nordic end-user market in an economically beneficial way.[46] According to NordReg, there are no legal rules or technical, regulatory or other factors that can bar a supplier from one Nordic country from entering the electricity end-user market in another Nordic country. However, with the exception of the largest Swedish and Finnish suppliers Vattenfall and Fortum, there are very few Nordic suppliers that operate in more than one retail market. Vattenfall did not succeed in its attempt to establish a Norwegian branch, and the Norwegian retailers Statoil and Fjordkraft entered, but did not manage to stay very long in the Swedish retail market.

The several remaining barriers of technical, regulatory and commercial nature create factual barriers between the countries, and the result is to a large extent four national end-user markets. For instance it is compulsory to enter into balance agreements separately for each country. Further, it is necessary to duplicate the data systems for each country, it is of great importance (but not absolutely necessary) to establish an office in the target country, and it is unavoidable to bear the other significant risks of operating in another Nordic market.

Because there are quite a number of international data system vendors, the harmonisation of the Nordic retail markets would probably decrease their development costs and to a greater extent enable them to utilise economies of scale. Harmonisation would make it possible for national vendors to sell their products outside their current market area, which implies that there would be more players in an integrated market. Because of increased competition, the customers would probably be offered the systems to lower prices, which again would be economically beneficial for the consumers of electricity.

The Nordic competition authorities would like to underline the importance of the work which is done towards an integrated retail market. However, the most important challenge is to increase customers' price awareness in an expedient manner. One important measure to achieve this goal is to have efficient metering systems as discussed in section 4.3.

4.3 Metering

Metering may be performed automatically or manually, and the manual metering may either be performed by the customer through self-reading, or by the company which is responsible for the metering. A great number of customers in the Nordic countries have automatic reading systems, and some of these systems also have the potential for two-way communication. In addition to the handling of meter values, there are commercial interests

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[46] "The Integrated Nordic End-User Electricity Market, Report 2/2006"

in other value added services based on the capability for two-way communication.

4.3.1 Metering in the Nordic countries

The requirements for metering differ among the Nordic countries. One common feature of the Nordic retail markets is, however, that the local grid companies have a monopoly when it comes to gathering customer data from meter reading.

In Denmark, the grid companies charge a price for metering in accordance with a public regulated revenue frame. In Finland, the prices for network services, such as distribution and metering of electricity, have to be made public, and reasonableness and regional impartiality must be followed in the pricing. After collecting the data, the grid companies in all the Nordic countries are required to share the data in a non-discriminatory manner to all suppliers.

In Norway there has been a requirement of hourly metering for all customers with an annual consumption above 100 000 kWh since 2005. This requirement covers approximately 90 000 of a total of 2.5 million metering points, and about 60 per cent of the total electricity consumption in Norway.

In Sweden, there is at present a legal obligation on the network companies to meter the energy consumption once every year, but monthly metering will be required from 1 July 2009. These rules apply for all standard customers, including small and middle sized consumers, and it is the network companies' responsibility to install meters and to meter the electricity consumption. In the prevailing price regulation for network tariffs, it is taken into account whether a network company has introduced techniques for monthly or hourly metering for standard customers.

Swedish high voltage customers and electricity customers with an agreement for 63 ampere or more and Finnish electricity customers with main fuses of over 3 x 63 ampere are to be metered on an hourly basis.

Finnish customers with consumption that exceeds 3 x 63 ampere have to pay for the hourly metering equipment if they want to buy electricity from competing retailers. 3 x 63 ampere customers and smaller may buy electricity from whom they want without any additional costs, but are limited to electricity products based on load curve based balance settlement.

In Finland, the DSOs are responsible for all metering equipment needed in retail sale and distribution of electricity. This means that the DSOs acquire, own and install the equipment as well as control and maintain it. Other companies may perform the metering on behalf of a DSO, but the DSO will still be responsible for the metering. The electricity customer is entitled to

acquire and own metering equipment which meets the DSO's technical requirements.

In Iceland, the TSO monitors what goes in and out of the transmission grid, but the DSOs are responsible for metering end users, other than energy intensive industries and smaller power generation plants. This includes that DSOs are responsible for all equipment as well as control and maintenance thereof. Only larger users are measured with demand meters. Some households that use electricity for heating also have special meters.

4.3.2. Metering and price-awareness

Online reading will benefit the functionality of the market, since data regarding consumption may be supplied as often as desirable. More frequent reporting of consumption data would enable the grid companies to better forecast demand. Online meters would also benefit competition and lead to decreased electricity prices in the long run. However, changing all of the meters is rather expensive for the grid companies.

Short and long run gains and losses by making hourly metering equipment mandatory are evaluated in a report made by the Danish Energy regulator. According to the report, the cost of implementing online readers exceeds the gains for households. However, the report also stresses that due to the fact that the unit price of online meters has fallen during the last few years and is expected to continue to fall, such investments will probably be economically profitably in the future.

The Norwegian energy regulator has undertaken several similar investigations regarding this matter, and has previously reached the same conclusion as the Danish energy regulator. However, the Norwegian energy regulator finished another cost-benefit analysis in June 2007 where they reached the conclusion that online meters should be installed with all customers.

There are significant benefits related to the implementation of online readers for grid companies. First, the company will have improved liquidity because it will be able to collect payments that more accurately reflect costs. Second, the implementation may reveal cheating customers and hence contribute to collect payment for otherwise unpaid consumption. Third, the administrative costs will be reduced significantly. Fourth, the grid company will be better able to plan its electricity procurements and future investments in infrastructure. Fifth, in the longer run the grid companies may offer alternative products and/or services related to the metering device. This may bring about new business areas, e.g. alarm watch, TV, internet or remote control for energy consumption.

The above mentioned benefits have already caused some grid companies to propose the installation of online meters, despite the fact that the grid com-

panies bear the cost. As the price of online meters decreases, more grid companies are expected to replace customers' existing metering equipment with online meters. Some grid companies have already installed online meters and borne the costs themselves.

The Danish Transportation and Energy minister has appointed a working group to investigate whether there is a need for a standardised online meter to ensure a well functioning market. The working group is expected to report back during summer 2007.

Since only one party within a grid area may be responsible for the quality of the meter values, metering of electricity is typically considered to be a monopoly. Other tasks related to metering and processing could be carried out under competition.

The Nordic competition authorities are of the opinion that installing hourly metering equipment would benefit competition and cause a downward pressure on the price level in the long run. Real time price information and accompanying real time contracts would enable the electricity customers to be far more price responsive which in turn would reduce peak demand and lower average costs for all customers.

4.4 Conclusions

Regulations governing changes of supplier, metering etc, need to be harmonised in order to create a joint Nordic end-customer market. Preconditions for an efficient end-user market are technological solutions and contractual forms that promote greater flexibility among customers. More frequent electricity metering would make it possible to introduce new contractual forms whereby electricity customers could respond to price differences on the power exchange or be offered fixed prices for various periods and adapt their consumption accordingly. This would yield benefits from both an efficiency and a competitive point of view. Monthly metering is a step in the right direction, but increased frequency would generate further benefits. This would enable electricity consumers to respond to high electricity prices by reducing their consumption, and this would strengthen the consumers' position in the market. Prices are often high during consumption peaks when the electricity network is under severe pressure. More flexible demand would therefore also benefit the power balance and ensure that the network is used more efficiently and thereby reduce the need to expand network and production capacity.

- Unbundling between network activities (monopoly) and activities which are exposed to competition is important. The Nordic competition authorities are of the opinion that the existing requirement of the Electricity-directive of legal unbundling is not sufficient to ensure that the TSOs and DSOs act in a neutral manner. The most efficient way to

prevent any discriminatory behaviour would be ownership unbundling. The Nordic competition authorities strongly support the work of the European Commission for ownership unbundling at the transmission level. If ownership unbundling of DSOs is not feasible, the legal unbundling requirement should also apply to network companies which serve less than 100 000 customers.

- The Nordic competition authorities would like to underline the importance of the work which is done towards an integrated Nordic retail market. The most important challenge is to increase customers' price awareness. In this respect and subject to cost-benefit analysis, effective metering devices should be introduced in order to make the customers more responsive to market prices.

- The Nordic competition authorities are of the opinion that installing hourly metering equipment and introducing real time contracts would make the electricity customers far more price responsive.

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