NordREG
Nordic Energy Regulators

Nordic Market report 2010

Report 6/2010

Nordic Market Report 2010

Development in the Nordic Electricity Market

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NordREG
c/o Energy Markets Inspectorate
P.O. Box 155,
SE-63103 ESKILSTUNA
Sweden

Telephone: +46 16 16 27 00
Telefax: +46 16 16 27 01
E-mail: registrator@ei.se
Internet: www.nordicenergyregulators.org

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1 Preface

The Nordic Market Report 2010 is the fifth annual report in a row prepared by NordREG.

The report describes the status and development of the Nordic electricity market based on data and information for the year 2009 available in May 2010. The areas covered include generation, consumption, transmission, wholesale power market and retail markets.

A working group consisting of representatives from regulators from Denmark, Finland, Norway and Sweden has been responsible for preparing the report. The working group has put the relevant data together to produce a full picture of the Nordic electricity market. The members of the group were Henrik Gommesen (Energitilsynet, chairperson), Elin Söderlund (Energimarknadsinspektionen), Mats Øivind Willumsen (Norges vassdrags- og energidirektorat) and Timo Partanen (Energiamarkkinavirasto).

Eskilstuna, July 2010

Yvonne Fredriksson
Chair of NordREG

2 Summary

The Nordic region is characterized by a unique mix of *generation sources*, with a very high share of hydropower. Hydropower accounts for virtually all of the Norwegian and nearly half of the Swedish generation capacity, making the level of precipitation vital when calculating and analysing potential generation levels. Climatic conditions such as, significantly colder winters than any other European country also influence consumption in the Nordic region, as many households are electrically heated.

Overall electricity consumption in the Nordic region in 2009 was marked by decreasing consumption in every market – from a decrease of 1,5% in Denmark to a decrease of 5,5% in Finland.

The Nordic *transmission grid* connects almost the entire region into one synchronous power system enabling increased security of supply as well as a more efficient use of the generation capacity, but congestion occurs. Congestions between the Nord Pool bidding areas are handled through market splitting, while internal congestions in general are handled through counter trade or by reducing interconnector capacity at the bidding area borders. The key future challenge for transmission network operations both in the Nordic area, and as well on the European level will be to facilitate the functioning of the pan-European wholesale electricity markets.

The Nordic wholesale power market is well functioning. The volume traded at Nord Pool in 2009 was about the same share of total consumption as that of 2008. Although trading at Nord Pool is voluntary, significantly more power is traded on the power exchange than bilaterally. During 2009 average spot prices at Nord Pool were lower than prices in 2008 due to both lower demand and generation costs for thermal power plants for most of 2009.

The Nordic retail markets are essentially four separate markets, influenced by national differences, but work on integration has started. Throughout 2009 retail prices in the Nordic region were lower than in 2008 reflecting the prices signals from the wholemarket. The share of customers switching electricity supplier differs between the Nordic countries; from app. 6 % in Denmark to 8 % in Finland and Norway and 11 % in Sweden. Both Denmark and Finland experienced significant rises in consumer switching in 2009.

NordREG has developed a set of statistical indicators to describe and assess market functioning and competition in the retail market. The indicators show competitive markets in various degrees. But they also highlight areas in each national market which could be subject to further analysis in order to determine whether further initiatives and actions should be taken in order to enhance competition and consumer awareness of activity on the free electricity market.

3 Introduction: NordREG

NordREG is a cooperative organisation for Nordic energy regulatory authorities. The mission and common goal of the organisation is to actively promote a legal and institutional framework and conditions necessary for developing the Nordic and European electricity markets.

The cooperation in NordREG is based on consensus and common understanding of the Nordic market. NordREG works by exchanging information and views, mapping and analysing energy market issues and by delivering statements and reports for harmonisation and improvement with the aim of identifying areas where NordREG can take joint action to influence Nordic or European electricity market development.

NordREG mission

In cooperation, we actively promote legal and institutional framework and conditions necessary for developing the Nordic and European electricity markets.

The specific strategic priorities of NordREG are to provide for a well-functioning Nordic wholesale market with competitive prices, be conducive to establish a common Nordic retail market with free choice of supplier, to ensure a reliable supply within the region, and finally, to regulate and monitor the transmission system operators (TSO's) with focus on efficiency and Nordic harmonisation.

NordREG has formulated its vision for the development of the electricity market

NordREG vision for the development of markets

All Nordic electricity consumers will enjoy free choice of supplier, efficient and competitive prices and reliable supply through the internal Nordic and European electricity market.

4 Generation and consumption

The Nordic power system is a mixture of generation sources such as wind, hydro, nuclear and other thermal power[1]. Hydropower is the major source of electricity generation in the Nordic region. It normally constitutes with a little more than 50 % of the total production capacity in the Nordic countries.

Electricity consumption in the Nordic region is relatively high in comparison with other European countries. This is due to e.g. the influence of cold winters in combination with electricity heated houses and the relative high proportion of energy intensive industries.

4.1 Generation capacity

The Nordic region has a total of 96 043 MW installed capacity for power generation (see table 1 below). More than half of the installed capacity comes from renewable power sources. Hydropower alone – mainly located in Norway and Sweden – accounts for more than half (51 %) of the total generation capacity. The large share of hydropower is mainly due to large rivers and significant quantities of precipitation in the mountains, filling the reservoirs during the spring flood.

CHP (Combined Heat and Power) is the second largest generation source accounting for 21 % of the total Nordic power generation capacity. The majority of the CHP capacity is located in Denmark.

The third largest power source is nuclear power, only located in Sweden and Finland and with a share of 12 % of the total Nordic generation capacity. Wind power accounts only for about 6 %, but has increased considerably during the last few years.

Table 1. Nordic Generation capacity (MW) by power source, 2009.
Source: Swedenergy, NVE, EMV

	Denmark[2]	Finland	Norway[2]	Sweden	Nordic region
Installed capacity (total)	12 808	16 566	30 956	35 713	96 043
Nuclear power	-	2 646	-	9 342	11 988
Other thermal power	9 316	10 752	899	8 608	29 575
- Condensing power	785	2 405	-	2 271	5 461
- CHP, district heating	7 544	3 238	-	3 531	14 313
- CHP, industry	587	4 256	-	1 199	6 042
- Gas turbines etc.	400	853	-	1 607	2 860
Hydro power	10	3 074	29 626	16 203	48 913
Wind power	3 482	94	431	1 560	5 567

[1] Based on for example coal, gas and biofuels.
[2] Preliminary data

Vattenfall is the largest generator with a capacity of 16 140 MW and a 16.8 % share of the Nordic capacity. Statkraft is the second largest generator with a capacity of 12 884 MW amounting for about 13.4 % of the total Nordic generation capacity. Fortum has a total capacity of 10 836 MW and 11.3 % of the Nordic capacity.

Table 2. Generation capacity by producers, 2009
Source: Regulators

	Capacity (MW)	Share
Denmark		
- Dong Energy	6 131	6.4 %
- Vattenfall	2 273	2.4 %
Finland		
- Fortum	4 926	5.1 %
- PVO	3 582	3.7 %
- Helsingin Energia	1 393	1.5 %
Norway		
- Statkraft	12 884	13.4 %
Sweden		
- Vattenfall	13 867	14.4 %
- E.ON Sweden	6 469	6.7 %
- Fortum	5 910	6.2 %
Other generators	38608	40.2 %
Total Nordic region	**96043**	**100 %**

4.2 Generation

Total power generation in the Nordic region amounted to 370.5 TWh in 2009 – a decrease of 5 % compared to 2008.

The development of the total power generation in the Nordic region during 2007-2009 is illustrated below (see figure 1). The development shows the same trends in yearly power generation in all three years.

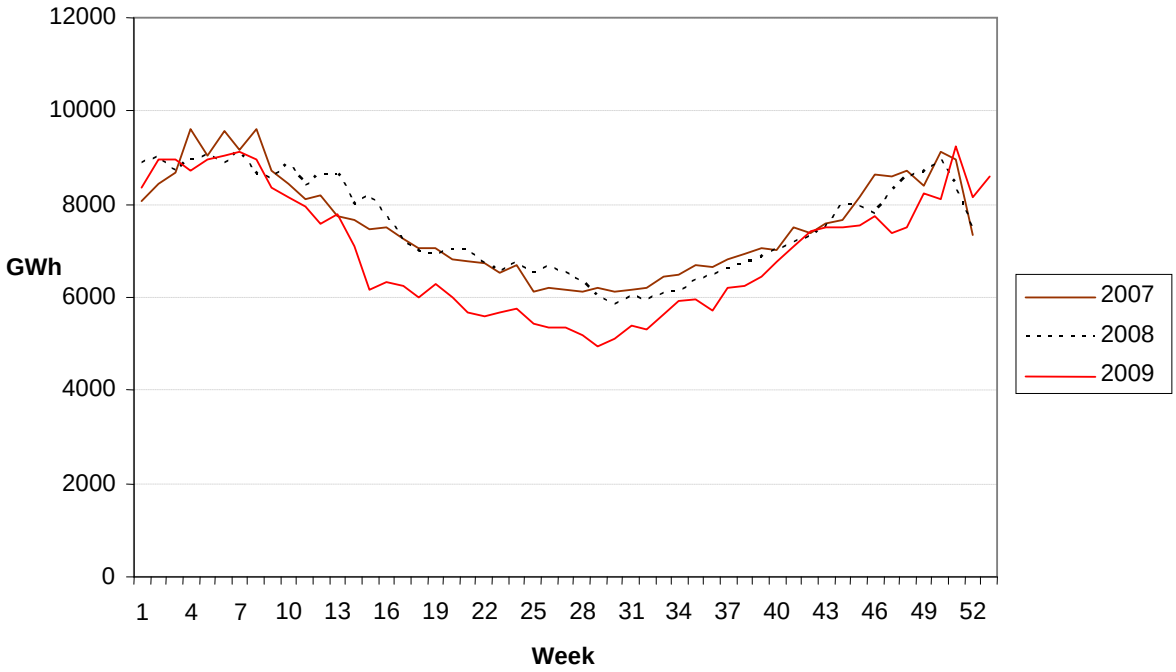

Figure 1. Total power generation in the Nordic region, 2007-2009
Source: Nord Pool

In general, thermal power generation (Finland and Denmark) in the Nordic region acts as a "swing-production" determined by the level of hydropower generation in Norway and Sweden. In 2009 there was lack of nuclear power generation which increased the use of other thermal power, shown in figure 2.

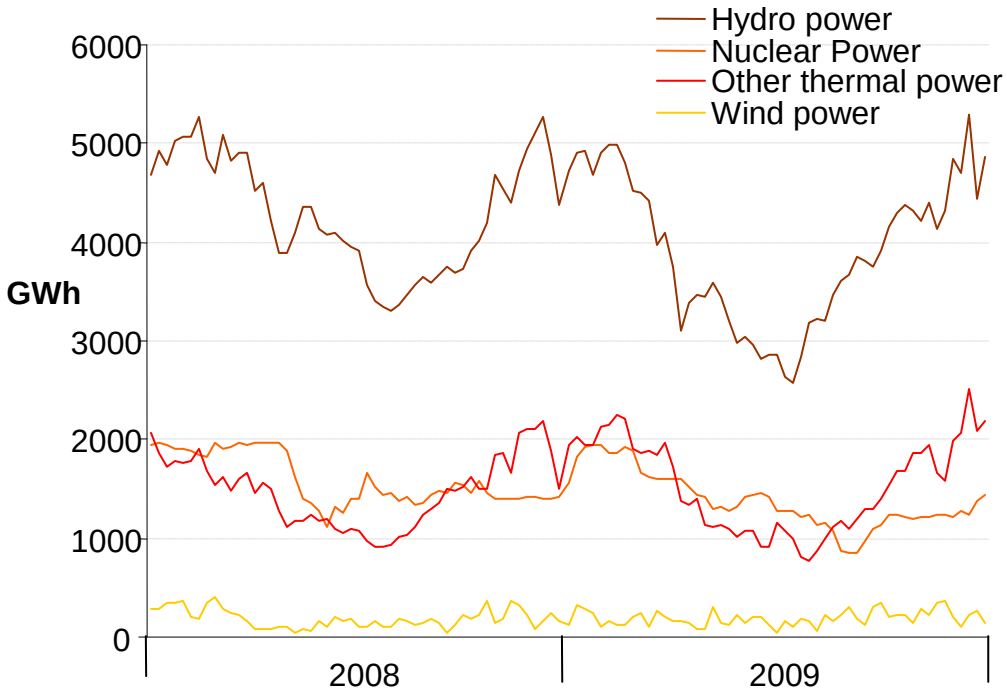

Figure 2. Power generation by power source in the Nordic region, 2008 and 2009
Source: Nord Pool

4.3 Consumption

The electricity consumption in the Nordic region varies widely due to specific conditions in each country (see figure 3).

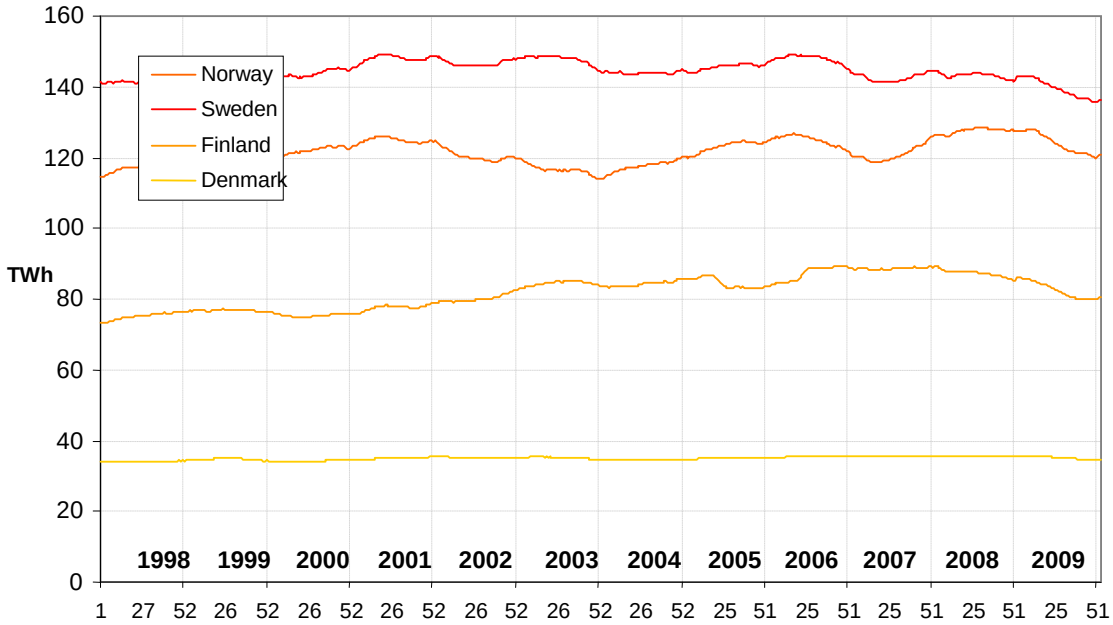

Figure 3. Electricity consumption in the Nordic countries (last 52 weeks), 1998-2009
Source: Nord Pool Spot

Denmark, with relatively warm winters and a small amount of electricity heated houses, has less seasonal variation in electricity consumption than the other Nordic countries. This in addition to a relatively small share of energy intensive industries leads to considerably lower electricity consumption than the other Nordic countries. The Danish electricity consumption has been very stable in the period 1998 – 2008. In 2009, the total electricity consumption in Denmark was 35.2 TWh, which is a decrease of 1.5 % compared to 2008.

Finland has significant seasonal temperature variations and a large amount of electricity heated houses, and hence a much more fluctuating electricity consumption than Denmark. Furthermore, Finland also has a large share of energy intensive industries leading to relatively high electricity consumption. The total electricity consumption in Finland was 80.8 TWh in 2009, a decrease of 5.5 % compared to 2008.

Much like Finland and Sweden, Norway has significant seasonal temperature variations and a large share of electricity heated houses. The share of energy intensive industry is also large and the consumption tied to petroleum activity is increasing. The total electricity consumption in Norway was 124 TWh in 2009, a decrease of 2.8 % compared to 2008.

Sweden has the highest total electricity consumption of the Nordic countries. Swedish electricity consumption is highly influenced by a large share of energy intensive industries as well as a large share of electricity heated houses. In 2009, the total electricity consumption in Sweden was 139.5 TWh, which is a decrease of 2.6 % compared to 2008.

Total electricity consumption in the Nordic region has increased steadily during the last ten years, up unto 2009, see figure 4. However, during the second half of 2006 and first half of 2007 the consumption decreased significantly mainly due to warm weather. During the second half of 2008 consumption also fell as a result of the turbulence in the financial market which lead to a falling demand. The falling trend continued on into 2009 when the total electricity consumption was 381.2 TWh, a decrease of 12.7 TWh or 3.2 % compared to 2008.

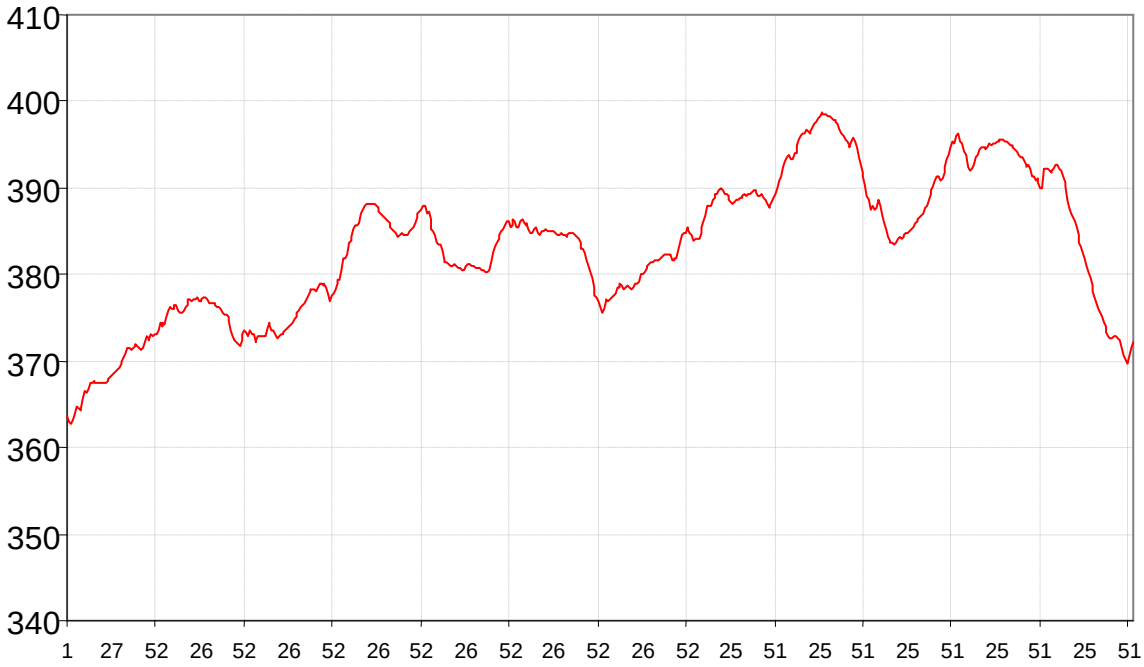

Figure 4. Development of the total electricity consumption (last 52 weeks) in the Nordic region, 1998-2009
Source: Nord Pool Spot

Figure 5 illustrates the development of the total electricity consumption in the Nordic region during 2007-2009. The figure shows the effects weather conditions have on the demand when compared with figure 6.

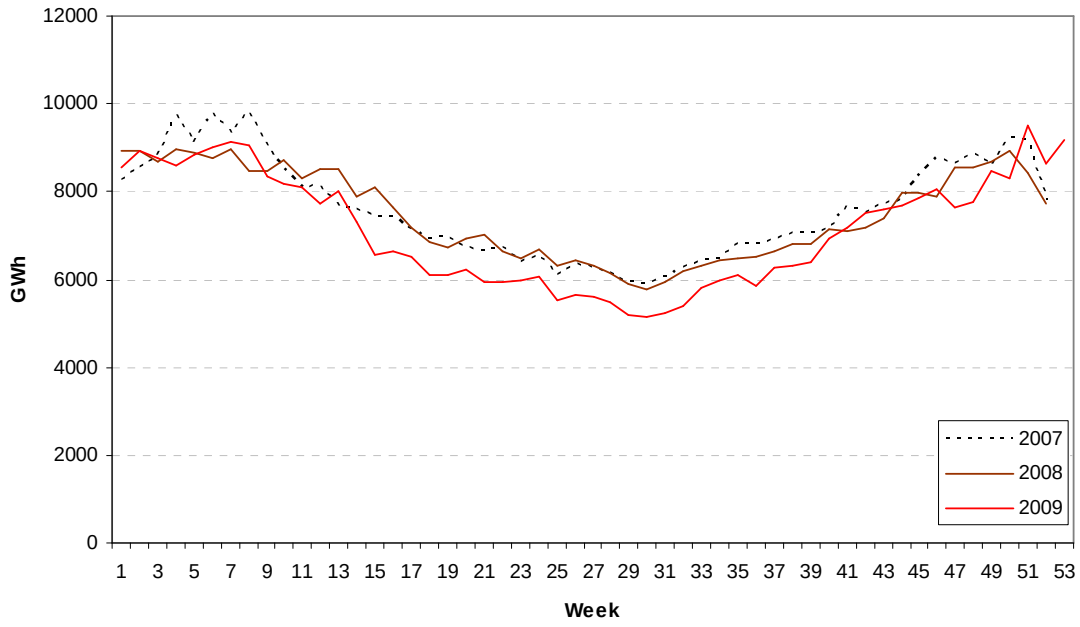

Figure 5. Electricity consumption in the Nordic region (GWh/week), 2007-2009
Source: Nord Pool Spot

4.3.1 Temperatures in the Nordic region

In 2009 the weather was characterised by relatively high temperatures in the Nordic region throughout the year in comparison to normal temperatures. The warm weather reduced the demand for electricity for heating.

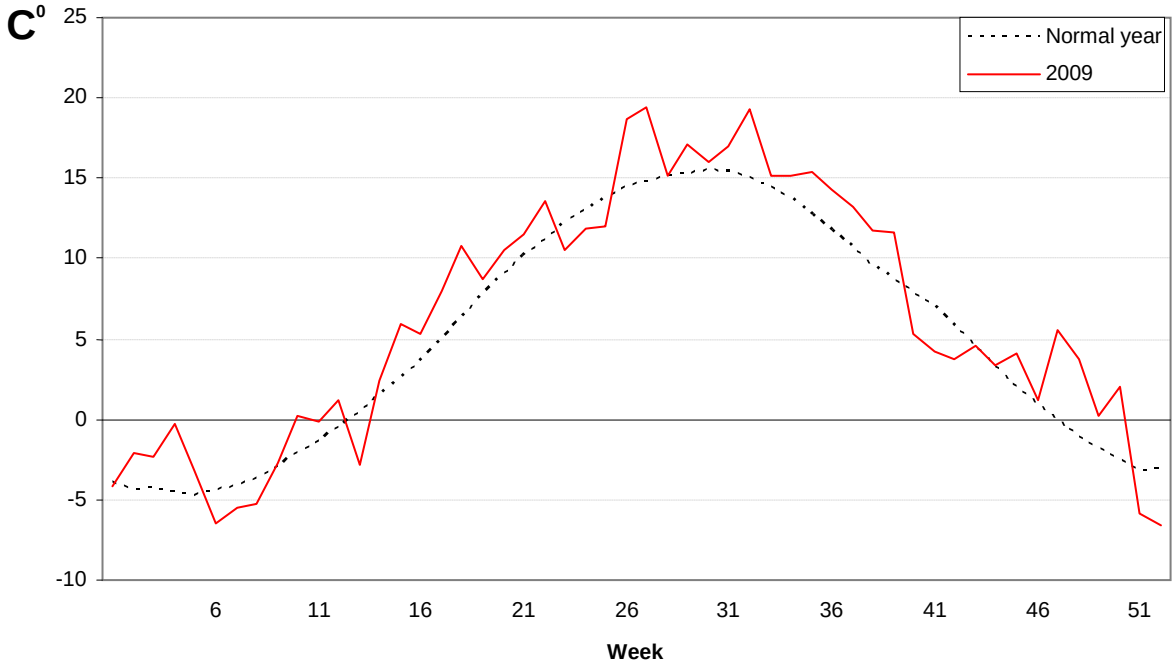

Figure 6. Mean temperature in the Nordic region[3] in 2009 compared to a normal year
Source: Nord Pool Spot

4.3.2 Peak load

Peak load[4] usually occurs during periods of cold spells. In 2009, the peak load in the Nordic region was 65 098 MW and took place on December 18, hour 18. In Denmark the peak load took place on January 5, hour 18 with a load of 6 270 MW. The Swedish consumption peaked on January 16, hour 11 (25 123 MW).The Finnish peak load happened on December 17, hour 8 with a load of 13 917 MW while Norway had its peak on December 18, hour 10 (21 953 MW).

The load during week 51, i.e. the Nordic peak load situation, is illustrated in figure 7. The load decreases significantly during night-time and peaks during the morning and late afternoon. The morning peak coincides with the time people arrive to their place of work while the afternoon-peak is related to cooking, washing, increased heating demand and turning on TVs when getting home from work.

[3] Temperature measured weekly in 12 Nordic cities (Oslo, Bergen, Trondheim, Tromsø, Helsinki, Ivalo, Stockholm, Gothenburg, Östersund, Luleå, Copenhagen and Billund).
[4] Peak load is defined as the maximum instantaneous electricity consumption or the maximum average electricity consumption over a designated interval of time.

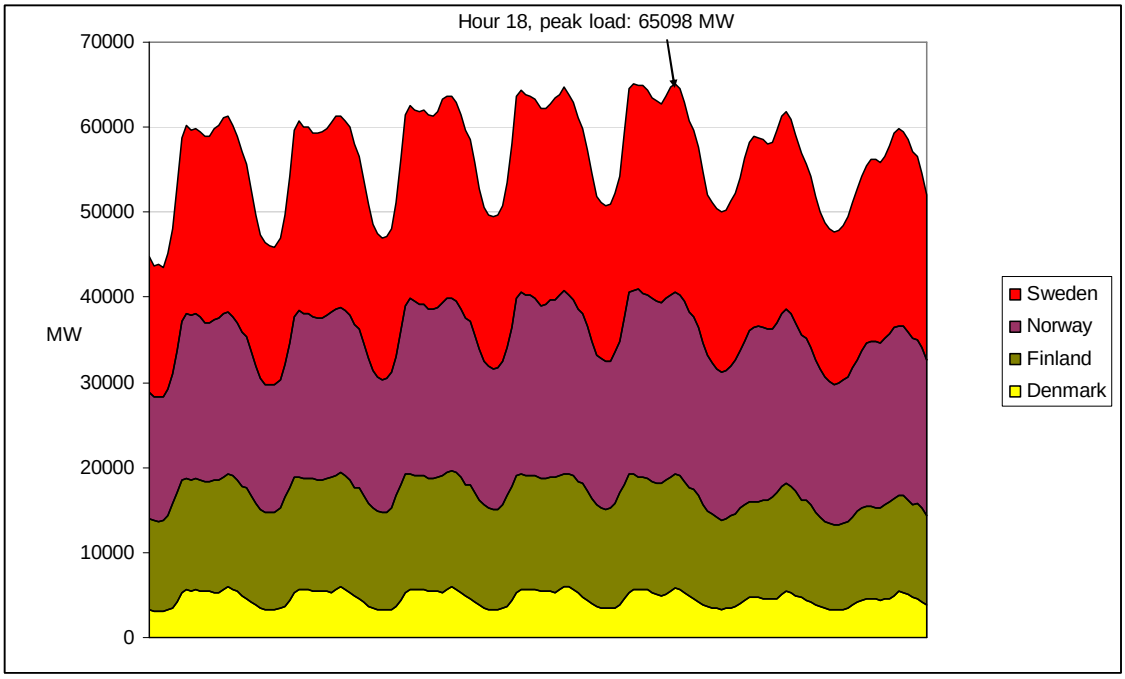

Figure 7. Load in the Nordic region during week 51, 2009
Source: Nord Pool Spot

During the most strained hour in the Nordic region in 2009, December 18, hour 18 the aggregate consumption in the Nordic area exceeded the aggregate production leading to a net exchange (net import) of 843 MW from adjacent countries, see figure 8. In cold spells, such as week 51, most of the available generation capacity of the Nordic region is taken into operation.

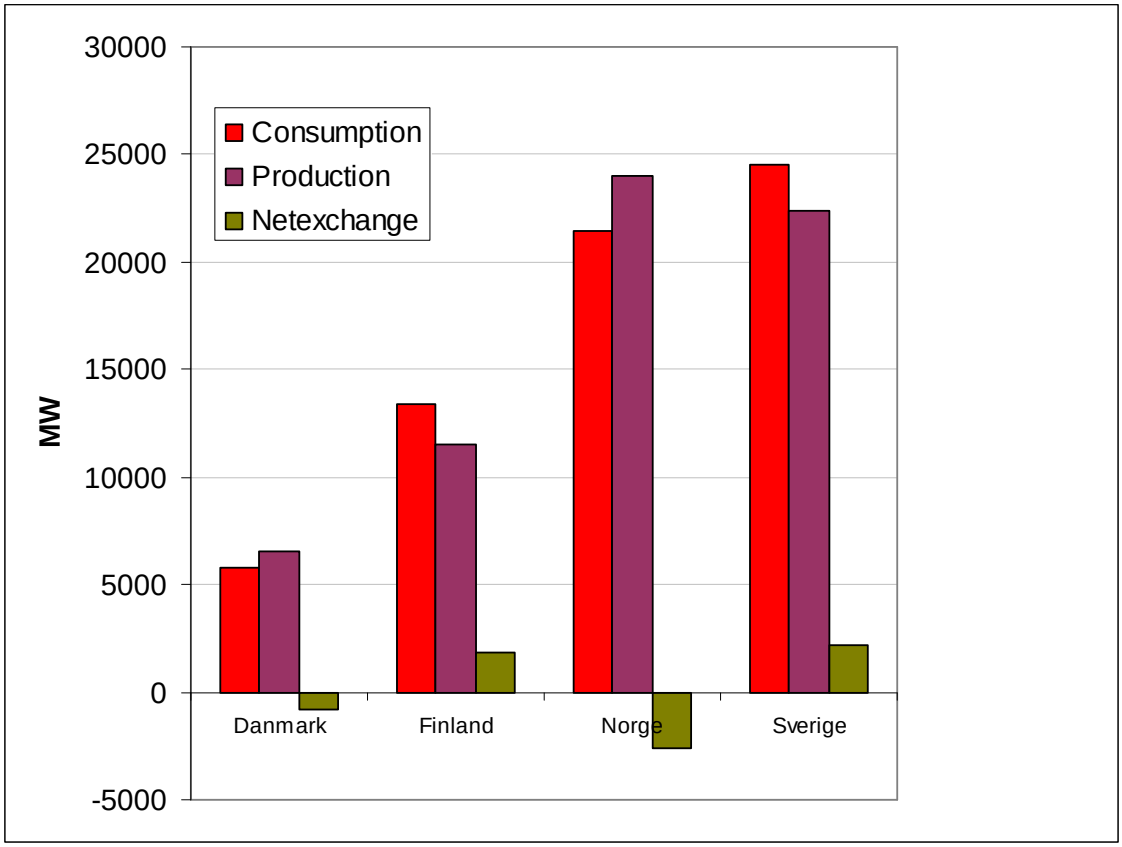

Figure 8. Consumption, generation and exchange in the Nordic region, December 18, hour 18
Source: Nord Pool Spot

4.4 Security of supply

4.4.1 Finland

The Energy Market Authority has estimated that Finland had 13,100 MW of generation capacity available in winter season 2009/2010. The power reserves related to system disturbances in Finland were 1,180 MW. At the end of 2009, the installed nominal capacity of power plants was 16,566 MW. The peak load in total electricity consumption in 2009 was 13,920 MW compared to the record peak load in February 2007 of 14,808 MW. During the 2009 peak demand, power generation in Finland was about 11,120 MW and import to Finland 2,800 MW. In the winter season 2009 – 2010 the peak load was measured on the 28th of January 2010, which amounted to 14,320 MW. During the 2010 peak, power generation in Finland was about 11,400 MW and import to Finland 2,920 MW.

The import capacity of electricity in year 2009 from neighbouring countries to Finland was about 3,850 MW. At the beginning of year 2007, transmission capacity increased by 350 MW when the Estlink DC line between Estonia and Finland was completed.

During the consumption peak in January 2010, the domestic generation capacity and electricity import capacity were sufficient to cover Finland's electricity consumption, due to which there was no need to restrict consumption.

4.4.2 Sweden

The electricity consumption in 2009 peaked in January at a level of 25 123 MW. The electricity production in Sweden was then 24 774 MW and the net import was 349 MW.

The addition from new electricity generation capacity amounted to 1 532 MW in 2009. A large number of projects in new generation capacity are planned for the next few years. There is a great deal of uncertainty about these projects but if all of them will be launched, it will be possible to increase the electricity generation capacity by 1 300 MW by 2012. Wind power projects stands for about half of this increase.

4.4.3 Denmark

Electricity consumption in Denmark peaked in January: In DK-West production exceeded demand by app. 577.000 MWh, which was exported. In DK-East demand exceeded production by app. 57.000 MWh. The gap was covered by import from adjacent countries. Capacity in generation and transmission was adequate to support the consumption throughout the year without interruptions or restrictions in consumption.

At present there are no plans for major addition to the total Danish generation capacity, however, an increased development and use of renewable energy sources – i.e. wind power – is scheduled for the coming years.

4.4.4 Norway

Norwegian electricity consumption peaked December 18, hour 10, with a level of 21 951 MW. There were Norwegian net export at the time, as the electricity production was 25 086 MW. In Norway, more than 95 % of the installed capacity is hydro based, thus production is highly dependent on weather conditions. In 2009, the inflow level was 124.9 TWh. That is 2.4 more than in a normal year. This contributed to Norway beeing net exporter during most of the year.

Installed Norwegian power production capacity was 30 789 MW at the turn of 2008 - 2009, an increase of 476 MW from the year before.

4.5 Generation and consumption: Conclusions

The unique mix of generation sources in the Nordic region in combination with the different weather situations in the region has to be taken into account when comparing electricity generation and consumption patterns with other European countries.

The high share of hydropower, representing virtually all of the Norwegian and nearly half of the Swedish generation capacity, has a great influence on the amount of electricity generated from various sources, thus making levels of precipitation vital

when calculating and analysing potential generation levels. In addition, the Nordic region has significantly colder winters than any other parts of the Europe, influencing the electricity consumption as many households are electrically heated.

5 Electricity transmission

Today, the transmission grids in the Nordic region are closely linked together providing a solid foundation for a common Nordic electricity market. The transmission grids were originally built to meet the needs of each country, but early in the development of the national power systems it was recognized that the systemic differences between the countries meant that linking the systems together would enhance security of supply and make possible a more efficient use of the existing generation capacity.

5.1 Transmission network

The Nordic transmission grid is part of the transmission network in north-western Europe, as shown in Figure 9.

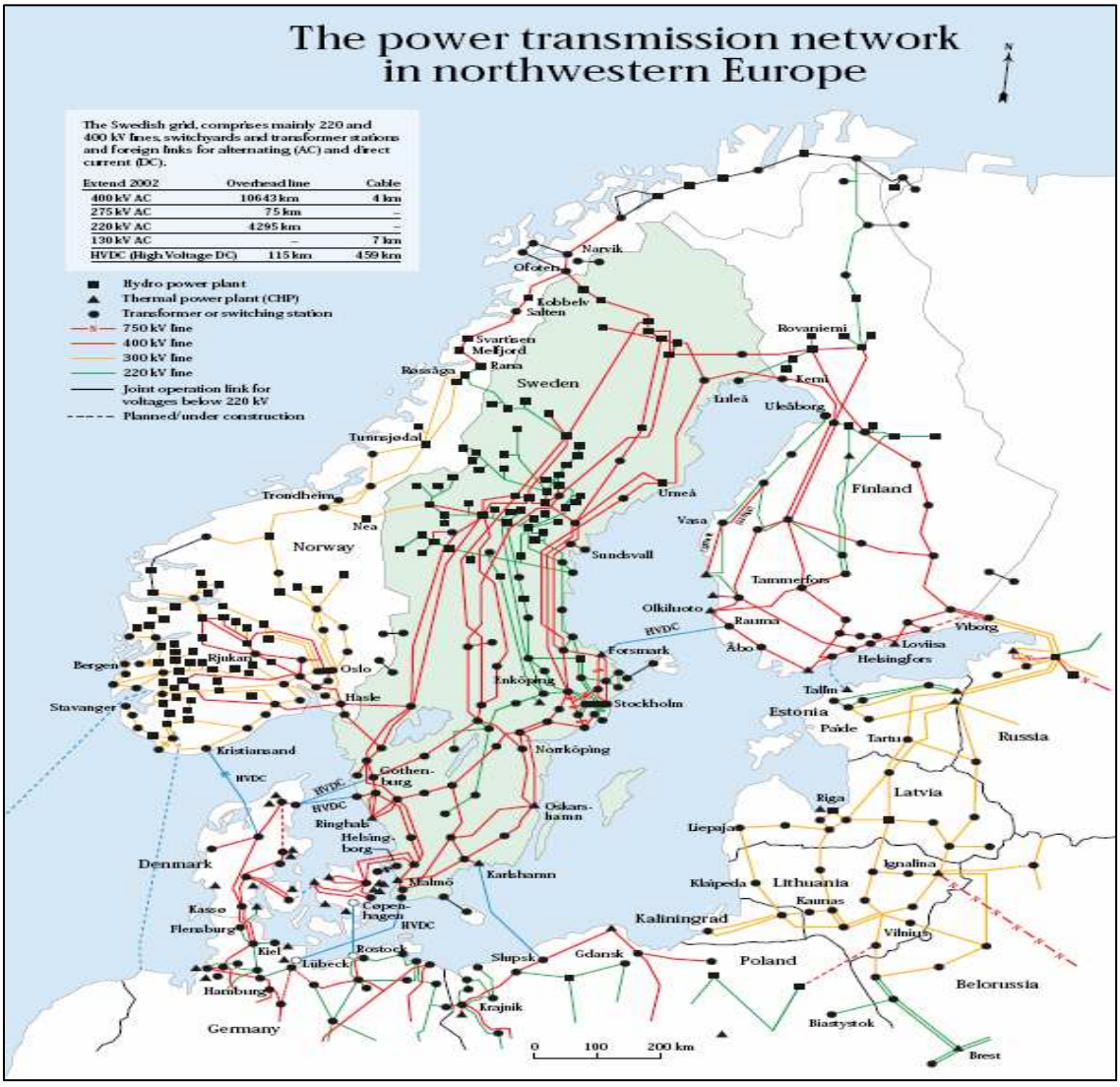

Figure 9. Transmission network in north-western Europe
Source: Svenska Kraftnät

The Nordic transmission grid basically combines the whole Nordic region to one synchronous power system (excluding western Denmark). Interconnectors also link the Nordic market to Germany, Poland, Estonia and Russia and the Netherlands. However, as illustrated in the figure, there are at this time no transmission lines connecting western Denmark to eastern Denmark. Eastern Denmark is synchronous with the Nordic grid while western Denmark is synchronous with the UCTE area in continental Europe. However a cable linking eastern Denmark and western Denmark is planned to be operational during 2010.

In November 2009 EMCC (European Market Coupling Company) started operations. This connection combined the German and Nordic power markets into one market, where the prices and capacities were calculated in a coordinated fashion. A further continuation to this process is planned for 2010 by connecting the EMCC to France, Belgium, Luxembourg and the Netherlands.

Each Nordic country has an appointed Transmission System Operator (TSO). The TSO's are responsible for the safe operation of the grid while allocating as much interconnector capacity as possible to the market.[5] The Nordic TSO's have the overall responsibility to ensure balance between supply and demand of electricity during the operating hour.

5.2 Congestions in transmission

The electricity price in the Nordic wholesale market is determined on a day-ahead auctioning process. In this process the objective is to utilize the generation fleet in an optimal way and generate electricity using the combination of generating plants that yields the lowest total cost of electricity. As the demand patterns and specific costs of the generation fleet over the entire area do not coincide there subsequently emerges a need for transmission of electricity through the Nordic grid. This demand may sometimes even exceed the available physical capacity of the transmission system. As a result of this congestion the generation fleet across the Nordic region will need to be operated in a suboptimal fashion, which subsequently leads into price differentials. Eliminating entirely these congestions that lead into regional price differentials would require substantial investments in the transmission capacity.

Congestions in the Nordic spot market are handled through market splitting, while internal congestions within the bidding areas are handled through counter trade or by reducing interconnector capacity at the bidding area borders. Counter trade is mainly used after gate closure of the day-ahead markets.

Market splitting was enforced in 75 % of the time in 2009, meaning that there were one or more bottlenecks between the spot areas within the Nordic power system. During these hours, there were different prices in two or more areas, indicating the value of the connectors between areas. For different reasons the allowed exchange capacities are

[5] Energinet.dk in Denmark, Fingrid in Finland, Statnett in Norway and Svenska Kraftnät in Sweden.

often lower than the nominal transmission capacities. Figures 10 and 11 show the transmission capacities between the different elspot areas as per May 2010 and the percentages the price areas have shared the price in 2009.

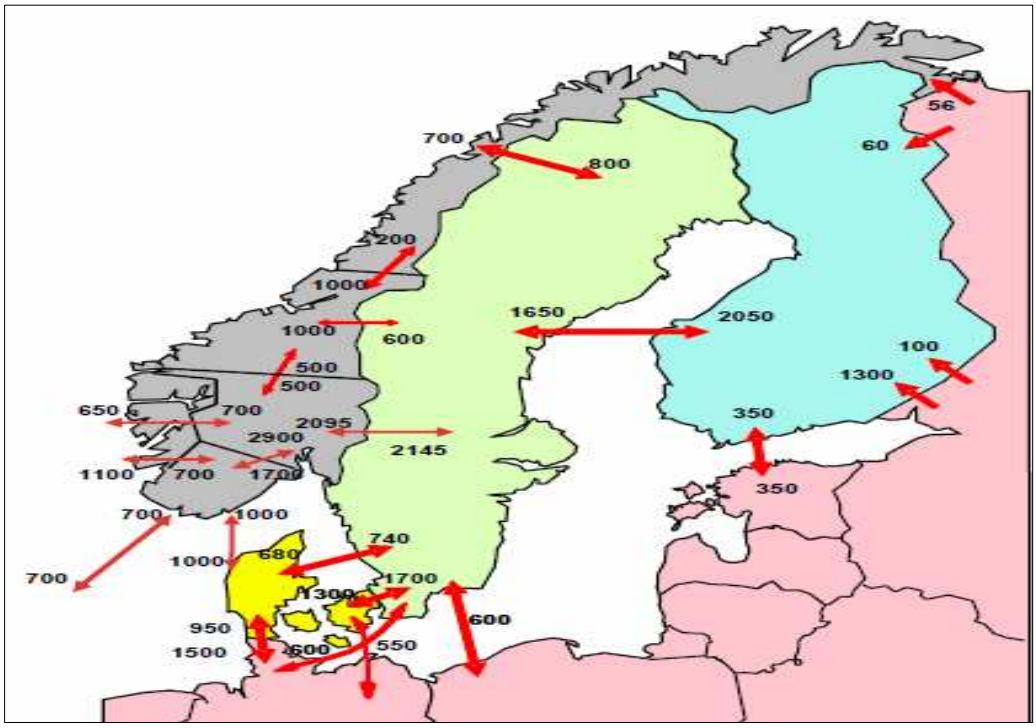

Figure 10. Transmission capacities between the Nordic price areas May 2010.

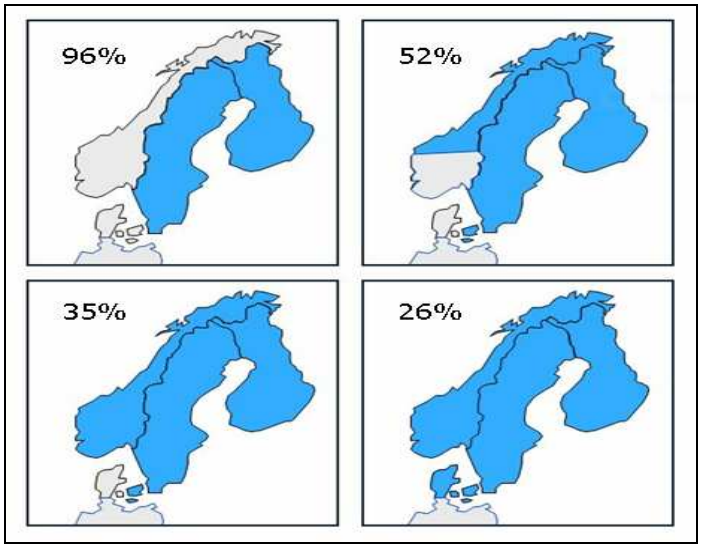

Figure 11 Shares of the annual hours the different prices areas have shared the same price.

Figure 12 below shows the congestion hours between all the price areas. The percentages in the figure illustrate the share of annual hours the neighbouring price areas have had different prices. The percentages are given to both directions separately and adding the percentages of both congestion directions yields the total congestion between the two price areas.

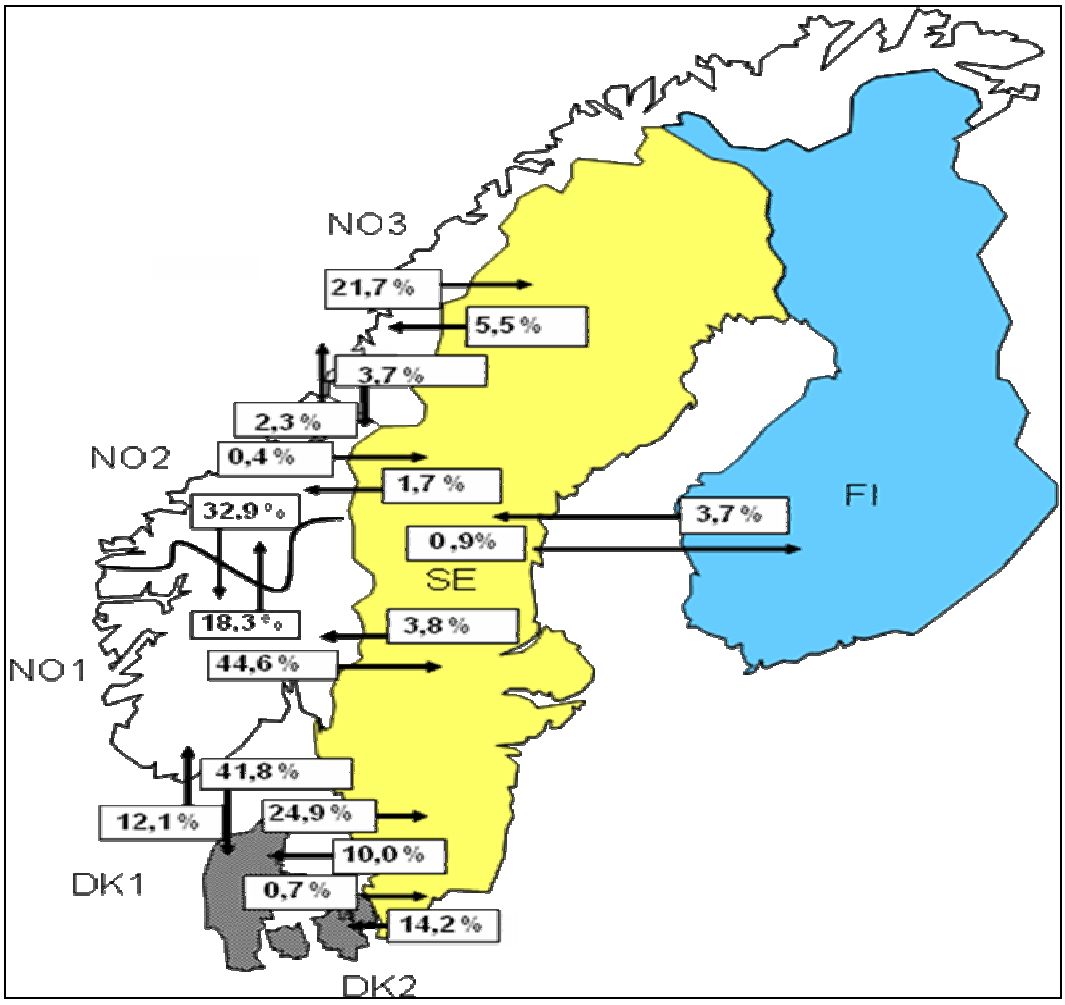

Figure 12 Shares of the annual congestion hours between different prices areas.

Substantial reinforcements in the Nordic transmission system are planned to be made in the coming years, though generally it is not economically efficient to expand the network capacity to a level where the demand for transmission is met at all hours and at all interconnectors.

In June 2004, Nordel recommended, based on energy balances and market based analysis, reinforcement of five limiting cross-sections in the Nordic transmission grid. The following lists these connections and their expected year of commissioning:

- Central to Southern Sweden (The South Link), 2013

- Funen to Zealand in Denmark (Great Belt connection), 2010
- Finland to Sweden (new Fenno-Skan 2 connection), 2011
- Norway to Sweden (new connection Nea-Järpströmmen), 2009
- Norway to Denmark (Jutland) (new Skagerrak connection), 2014

The recommendations were given with the five reinforcements as a non-prioritised"package". For all the cross-sections, except the one between Funen and Zealand in Denmark (the Great Belt), there are transmission lines today which have limited capacity in relation to the demand.

In March 2008 Nordel announced a new Grid Master Plan recommending three new reinforcements to the Nordic Grid:

- Sweden – Norway, South (Extension of the South Link into South-West Link), 2015/2016
- Sweden – Norway, North – South axis (420 kV AC line Ørskog – Fardal), 2013
- The Arctic region (420 kV AC line Ofoten – Balsfjord – Hammerfest), 2014/2016

The third package of the European Energy Market Opening will change the future scene even on the Nordic level. The creation of ENTSO-E as a pan-European body arranging the common action of the various regional TSO:s has already replaced the well established Nordel action pattern..

The present Regulation 1228/2003 provides in Article 8(4) for the Commission to "… amend the Guidelines on the management and allocation of available transfer capacity of interconnections between national systems set out in the Annex, in accordance with the principles set out in Articles 5 and 6, in particular so as to include detailed guidelines on all capacity allocation methodologies applied in practice and to ensure that congestion management mechanisms evolve in a manner compatible with the objectives of the internal market. …"

Based on Regulation 1228/2003 Congestion Management Guidelines have been amended for the management and allocation of interconnection capacity by the 1st of December 2006. They are based on the following principles arising from the Regulation:

- Economic efficiency and promotion of competition,
- maximization of capacity available and use of interconnectors,
- transparency on a non-discriminatory basis,
- secure network operation, and
- revenue neutral mechanism.

According to Article 9, the regulatory authorities, when carrying out their responsibilities, shall ensure compliance with this Regulation and the guidelines adopted pursuant

to Article 8. Where appropriate to fulfill the aims of this Regulation they shall cooperate with each other and with the Commission.

The roles of the regulatory authorities in the Nordic countries with regard to capacity allocation and congestion management vary. It is clear though, that the main responsibility for this issue lies with the system operators. The role of the regulatory authorities with regard to the system operators differ, from a very limited role for the Swedish regulator to a situation where NVE as only regulatory authority has to approve of the Nordic Grid Code. However, after the establishment of the ENTSO-E and the pan-European regulatory agency, ACER the preparation of the network codes will take new forms.

5.3 Electricity transmission: Conclusions

The Nordic region operates almost entirely as one synchronous power system through transmission grid. The combined system has enabled an increased security of supply as well as a more efficient use of the generation capacity – during wet years hydropower flows southwards and eastwards whereas during dry years thermal power flows northwards and westwards.

However, increasing cross border power flows also strains the transmission lines and increases the demand for transmission capacity. Sometimes this leads to congestion. Congestions occurring between the Nord Pool bidding areas are handled through market splitting, while internal congestions in general are handled through counter trade or by reducing interconnector capacity at the bidding area borders. Counter trade is mainly applied after gate-closure of day-ahead markets and in certain cases on day-ahead markets.

The key future challenge for transmission network operations both in the Nordic area, and as well on the European level will be to facilitate the functioning of the pan-European wholesale electricity markets. The next key tests for the network operations will be the creation of the CWE - EMCC connection in September 2010.

6 Wholesale power market

The wholesale power market is a common Nordic market, where electricity is traded on the Nordic electricity exchange, Nord Pool. The market participants at Nord Pool – more than 400 members from over 20 countries – are electricity generators, electricity suppliers, portfolio managers, industrial companies and other large electricity consumers.

Nord Pool was founded in 1993 in Norway as Statnett Marked. In 1996 Sweden joined the power exchange and the world's first multinational exchange for trade in power contracts was established. Statnett Marked was renamed as Nord Pool. In 1998 Finland joined Nord Pool and in 1999 Western Denmark joined the market place. In 2000 the Nordic wholesale power market became fully integrated when Eastern Denmark joined Nord Pool.

Trading at Nord Pool is voluntary, however all day-ahead cross-border trading must be done at Nord Pool Spot. About 75 % of the power generated in the Nordic region is traded via Nord Pool Spot's physical spot market. The remaining 25 % is traded bilaterally. The Norwegian Water Resources and Energy Directorate (NVE) are responsible for regulating Nord Pool Spot.

The Nordic region consists of several bidding areas at Nord Pool Spot. During 2009, there were two areas in Denmark and one in Finland and Sweden[6] respectively. In Norway there were two areas until 13 April, from that date and onwards there were three. The capacities for the exchange of electricity between the bidding areas are calculated and coordinated by the TSO's and distributed to Nord Pool Spot for exchange purposes, before price calculation at Nord Pool Spot. The prices for the spot areas and the flow between the areas are then calculated. This ensures an exchange where electricity flows from a low price area to a high price area. If the available capacity between the areas is adequate, the prices will be equal. If not, there will be price deviations between the spot areas.

The physical market at Nord Pool consists of two sub-markets, the day-ahead market *Elspot* and the intra-day market *Elbas*. In the day-ahead market, electricity is traded for the next day's 24 hours. In the intra-day market, participants in Norway[7], Finland, Sweden, Germany and Denmark can trade for the forthcoming day after the day-ahead spot market has closed. Remaining transmission capacities or capacities in the opposite direction of the day-ahead outcome is available for the intra-day market. In the financial market the players can secure prices for future purchases or sales of electricity.

The Nordic market also has a common regulating market in order to ensure the balance between generation and consumption in the hour of operation. The different market solutions are used depending on the distance to the operating hour, see figure 11.

[6] From 2011 Sweden will be divided into four bidding areas.
[7] Norway joined the Elbas market on 4 March 2009.

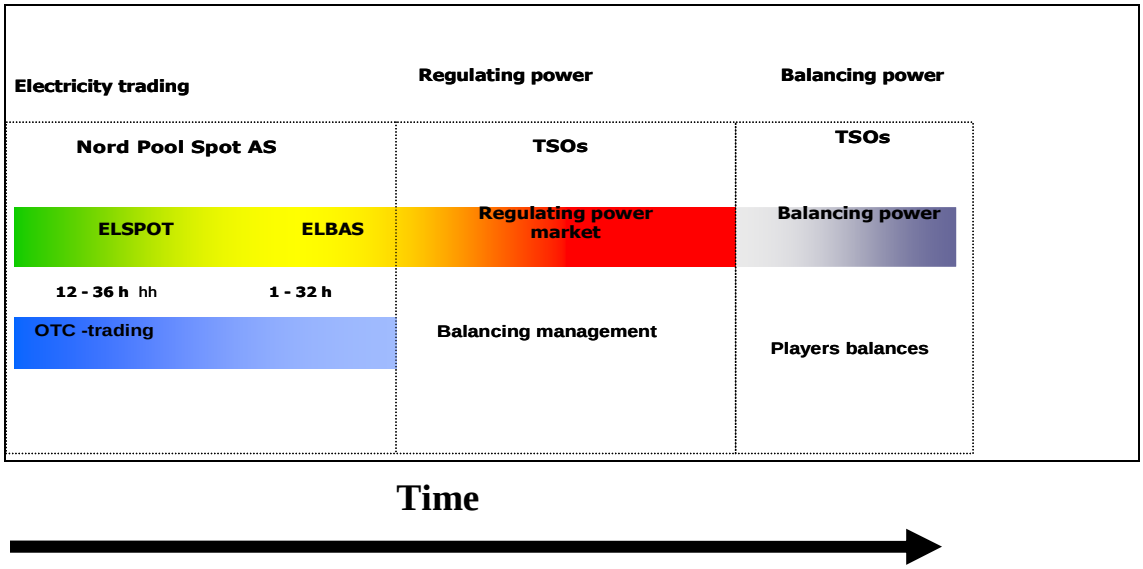

Figure 11. Timeframes for Nordic physical electricity markets

Market players can list their available generation/limited consumption volumes and accompanying price to the TSO's for the regulating market (common bid ladder for Nordic TSOs). This is a helpful tool for the TSOs, which have the overall responsibility to ensure the balance between supply and demand within the operational hour. The TSO's can then employ the right regulating object after taken into consideration location and capacities in the network.

6.1 Price development in the spot market

The Nord Pool system price[8] has varied considerably since 1996 (see figure 12). In 2009 the average system price was 35.02 €/MWh, compared to 44.73 €/MWh in 2008. The average price in 2007 was 27.93 €/MWh. The highest monthly spot price in 2009 was noted in January, when the average system price reached 41.41 €/MWh.

[8] The system price is calculated as the price that will be realized if there are no congestions between elspot areas.

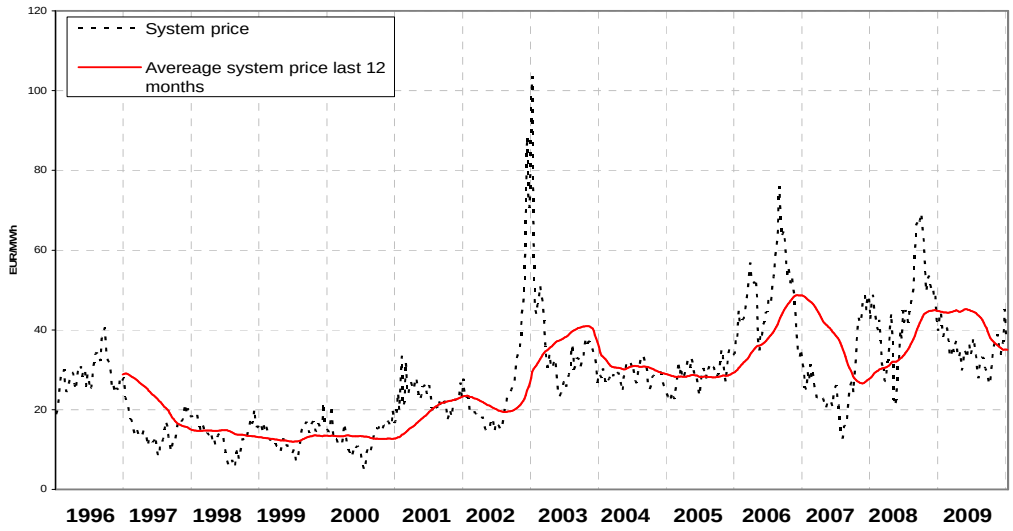

Figure 12. Development of monthly system price at Nord Pool Spot, 1996-2009
Source: Nord Pool

There are smaller price differences between the different Nord Pool spot areas in 2009 than in 2008, see table 3. Lower consumption in 2009 contributed to smaller price differences in 2009 then the year before. The highest average price during 2009 was in Eastern Denmark while South Norway had the lowest average price. The average price in South Norway was more than 6 € lower than the average price in Eastern Denmark.

As the table shows, prices were lower in the Nordic region in 2009 than in 2008. Lower consumption in 2009 contributed to that. There were also higher generation costs for thermal power plants for most of 2008 than 2009. Reduced export capacity out of South Norway led to lower prices in South Norway in 2008, but increased the demand for thermal power in other Nordic countries and thereby had a price increasing effect in these areas.

Table 3. Average price in the different Nord Pool spot areas, 2009
Source: Nord Pool Spot[9]

Spot prices €/MWh	2009	Change from 2008
Finland	36.98	-28 %
Western Denmark (DK1)	36.05	-36 %
South Norway (NO1)	33.74	-14 %
Middle Norway (NO2)	35.55	-31 %
North Norway (NO3)	35.54	-29 %
Sweden	37.01	-28 %
Eastern Denmark DK2)	39.88	-30 %

[9] NO2 and NO3 was a joint area until 19 November.

The price differences between the spot areas in 2009 shows that the price in Sweden (SE) was lower than the price in Finland (FI) in only 1 % of the hours in 2009 (see table 4). The price in the Danish spot area DK2 was higher than the price in the Norwegian spot area NO1 in 50 % of the hours in 2009. Sweden constituted a separate price area in only five hours in 2009. There was a common Nordic price for 25.0 % of the time in 2009. That is much more than in 2008, when there was a common Nordic price for 9.4 % of the time.

Table 4 Price differences between Nordic spot areas, 2009
Source: Nord Pool Spot

2009		NO1	NO2	NO3	SE	FI	DK1	DK2
		Less than						
NO1	Higher than		15 %	13 %	5 %	8 %	15 %	4 %
NO2		43 %		4 %	8 %	11 %	27 %	8 %
NO3		43 %	4 %		7 %	10 %	26 %	7 %
SE		44 %	23 %	22 %		4 %	25 %	1 %
FI		44 %	23 %	22 %	1 %		25 %	1 %
DK1		40 %	34 %	34 %	19 %	21 %		10 %
DK2		50 %	36 %	35 %	22 %	25 %	37 %	

A duration curve of the spot prices in the Nordic region – listing the amount of hours the price has been below a certain level – reveals that Eastern Denmark had higher prices than the other countries for several hours in 2009. But price differences were relatively small last year.

On the evening of Thursday 17 December, prices peaked at above €1400/MWh for two hours in Eastern Denmark, Sweden, Finland and Middle and North Norway. Low temperatures and low Swedish nuclear power generation contributed to these prices.

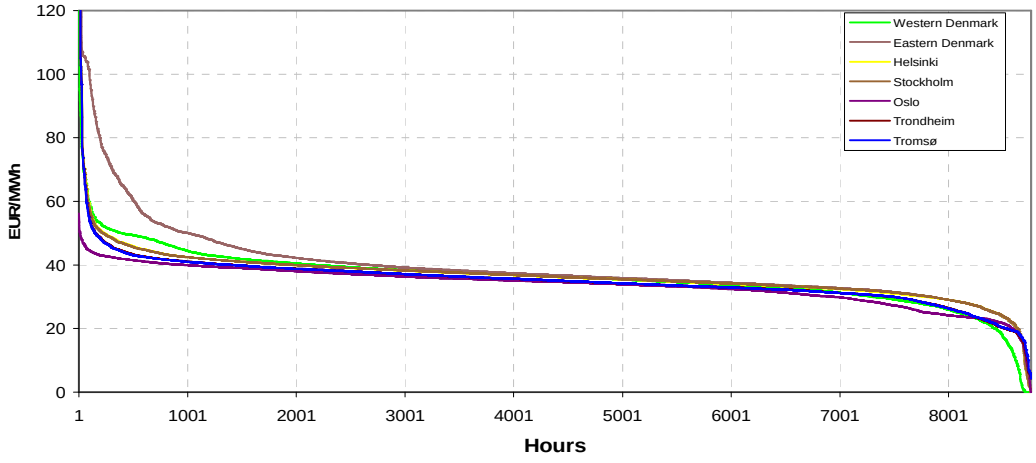

Figure 13. Duration curve of different spot prices, 2009
Source: Nord Pool Spot

As figure 14 illustrates there are considerable difference between a hydro dominated system and a system dominated by thermal power. In a hydro dominated system, it is easier to respond to demand changes. Therefore intraday prices will vary more in a system like the German, where thermal power dominates. Fluctuations in wind power generation also contribute to volatile prices in Germany.

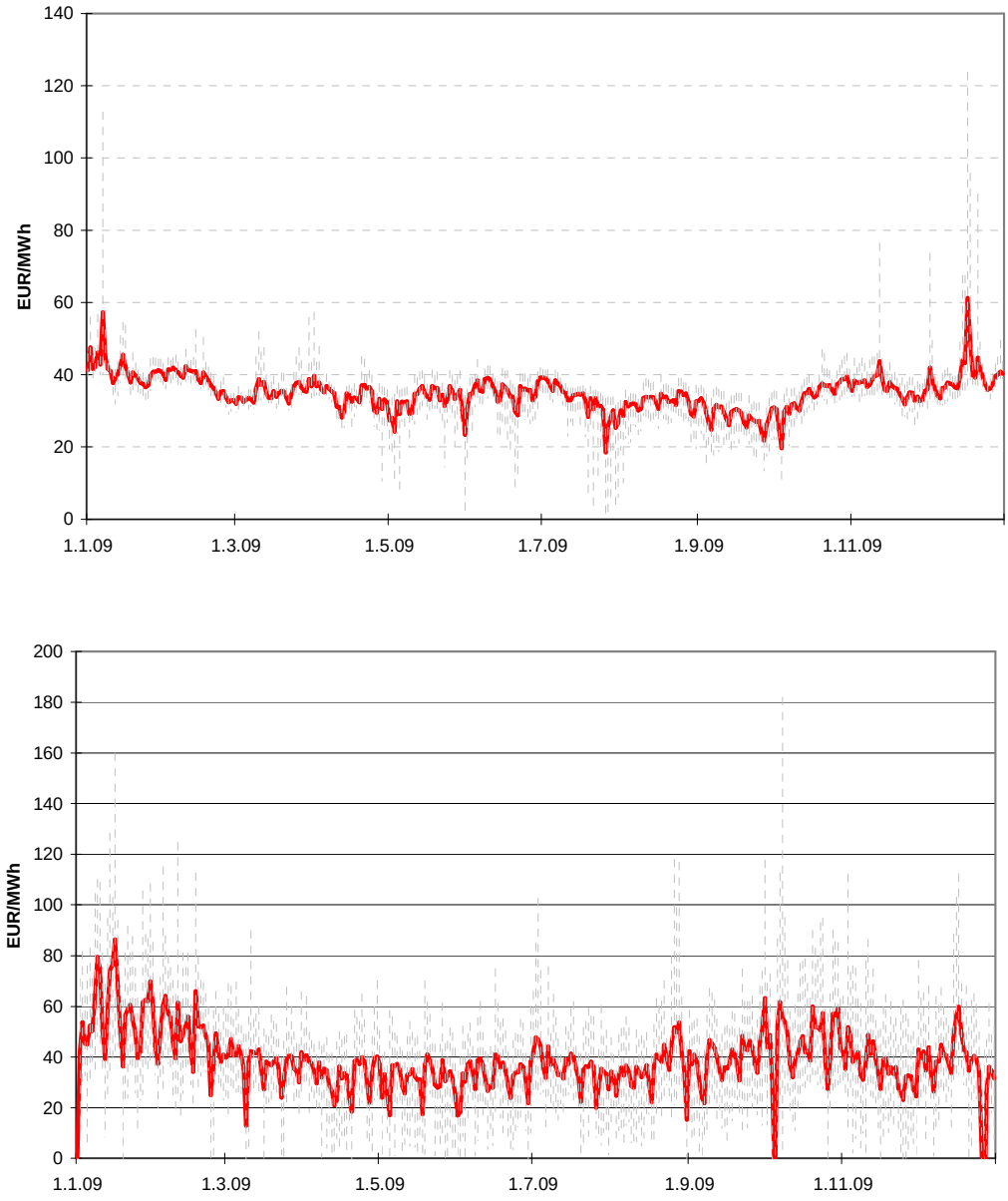

Figure 14. Comparison between the Nordic system price (upper figure, Nord Pool) and German wholesale price (lower figure, EEX). Note: Red curve = average price, grey curve = max/min price. Source: Nord Pool Spot and EEX

Figure 15 illustrates the Nord Pool system price together with the forward price for the forthcoming period until 2012. In 2009 the average system price was 35.02 €/MWh

compared to 44.73 €/MWh in 2008. Lower demand and decreasing prices of fossil fuels influenced the system price downwards in the first half of 2009. High precipitation levels in the third quarter of 2009 allowed the system price to fall further. In the last quarter of the year, low inflow levels and low Swedish nuclear power generation contributed to a system price increase. In week 39 the average system price was 26.27 €/MWh. By week 51 it had risen to 45.18 €/MWh.

The price expectations for the next three years were at the start of 2010 higher than the average price for 2009. The forward price follows an expected cycle of lower prices during the summer and higher prices during the winter.

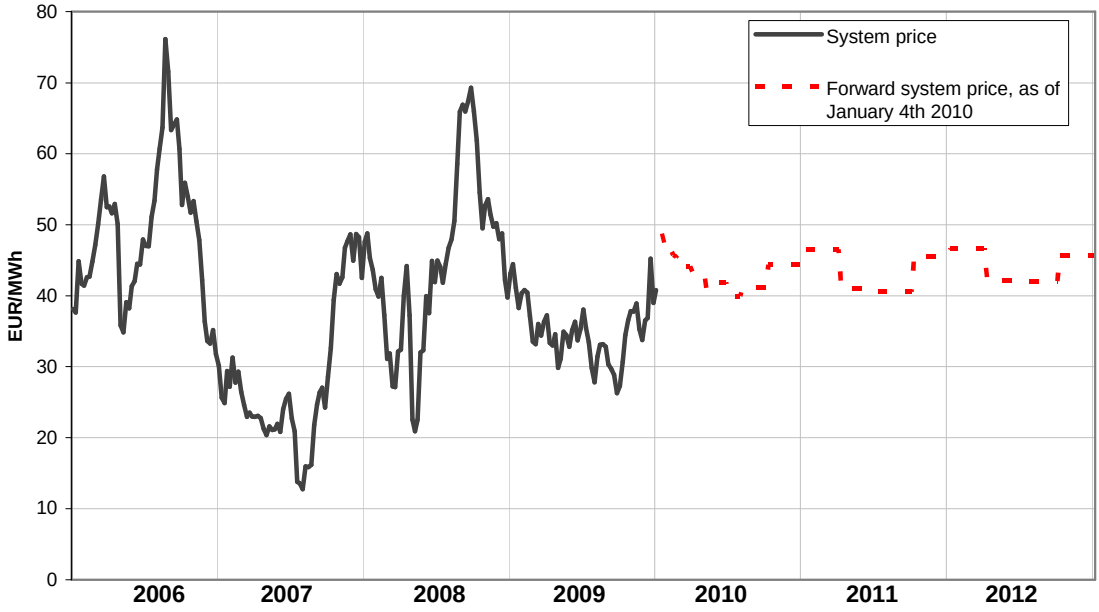

Figure 15. Weekly Nord Pool system and forward prices
Source: Nord Pool Spot

6.2 Conditions for generation

The two main sources of electricity generation in the Nordic region are hydropower and thermal power making inflow, reservoir levels and the price of CO_2 emissions important factors in the price formation of electricity.

Inflow and reservoir levels are of crucial importance for hydropower generation. Even though electricity in itself can not be stored, the water creating the electricity can be stored in reservoirs along the rivers. The main bulk of the inflow to the reservoirs occurs during the spring when the snow in the mountains melt and during rainy autumns.

In 2009 the inflow was generally a little lower than in 2008, and significantly lower than in 2007 (see figure 16). The inflow level was 203.5 TWh to the Nordic water reservoirs in 2009 (week 1 – 53)

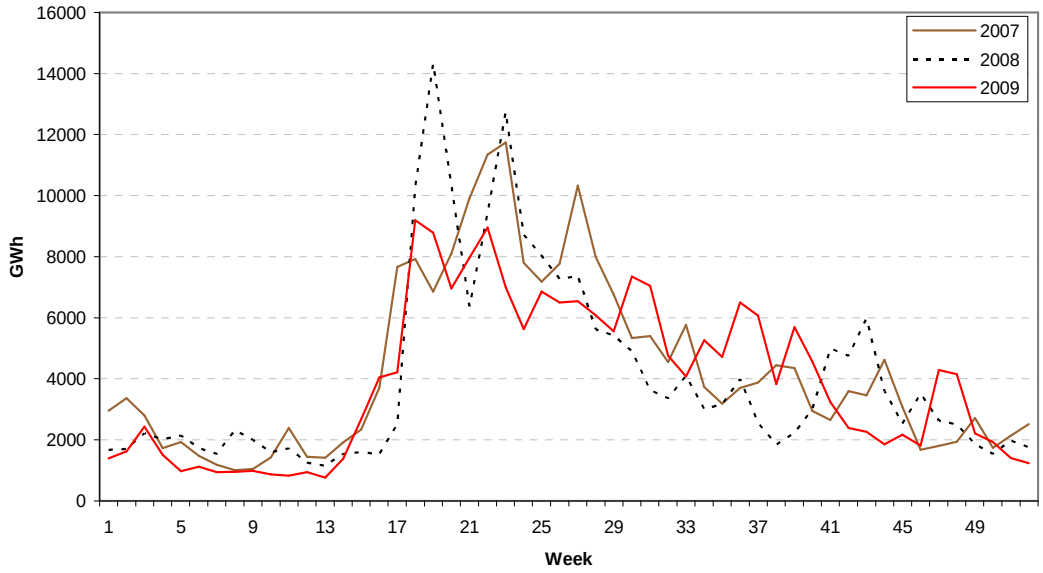

Figure 16. Effective inflow to the Nordic water reservoirs, 2007 – 2009
Source: Nord Pool Spot

Reservoir levels were mostly below the median level in the first half of 2009, see figure 17. In the second half of the year the reservoir levels rose above the median level. High water inflow in the third quarter of 2009 was one of the factors behind the strengthening of the reservoir level.

At the beginning of 2009, the total reservoir levels in the Nordic region were 62 % of the total capacity. In Norway the reservoirs have a capacity of 84.1 TWh, of which 81.9 TWh is accounted for in this data set. Swedish reservoirs have a capacity of 33.8 TWh, while the capacity in Finnish reservoirs is 5.5 TWh. The total Nordic reservoir capacity is 123.4 TWh. At the end of 2009, the reservoir levels in the Nordic region was about the same as that of the beginning of the year.

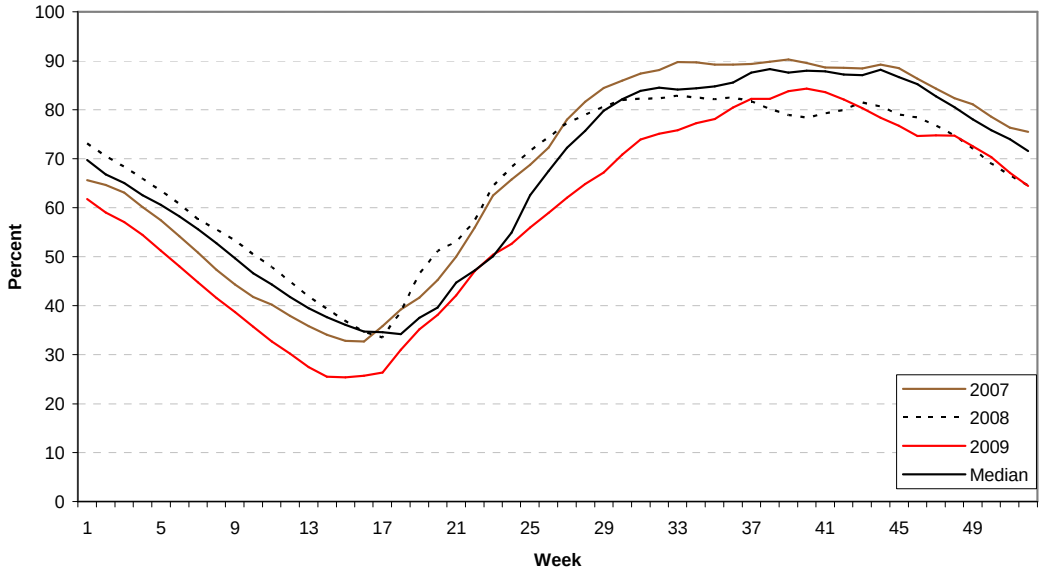

Figure 17. Reservoir levels in the Nordic region, 2007 – 2009
Source: Nord Pool Spot

The second largest generation technology in the Nordic region is thermal power. New costs were added to thermal power producers with the implementation of CO_2 quotas and tradable CO_2 allowances in 2005. This makes the price on CO_2 emissions an important factor influencing the price on electricity. Most of the thermal generation units within the Nordic region are located in Denmark and Finland.

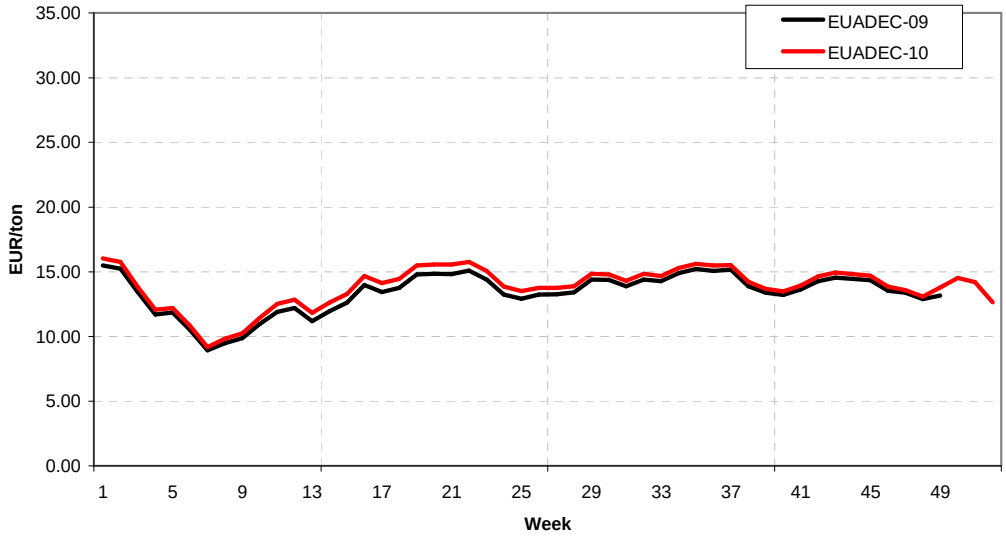

Figure 18. Price on CO_2 allowances on Nord Pool, 2009 and 2010
Source: Nord Pool Spot

Figure 18 shows the price of CO_2 allowances during 2009. The 2009 price of CO_2 allowances started at about 26 €/ton. The price decreased during the first seven weeks of the year to below 10 €/ton. At the end of 2009 allowances was traded at a price around 13 €/ton.

6.3 Volumes in the spot market

The volume traded through the spot market is often regarded to be a measure of liquidity in the spot market. With the exception of 2003 and last year, there has been a consecutive increase in volumes traded through the spot market since the formation of Nord Pool in 1993, see figure 19. The volumes in the spot market went up with an increasing speed from 2004 to 2007. This can to some extent be explained by the introduction of gross bidding. Particularly this has increased the volumes traded in Sweden from 40-45 % to approximately 90 %. The incentives for some of the larger vertically integrated companies to notify both buying and selling were strongly improved, as the total fees rebated netting from producers with both buying and selling orders.

The total volume traded at Nord Pool Spot in 2009 was about 76 % of the total Nordic electricity consumption – about the same percentage as the year before.. The total volume traded at Nord Pool Spot in 2008 was over 291 TWh.

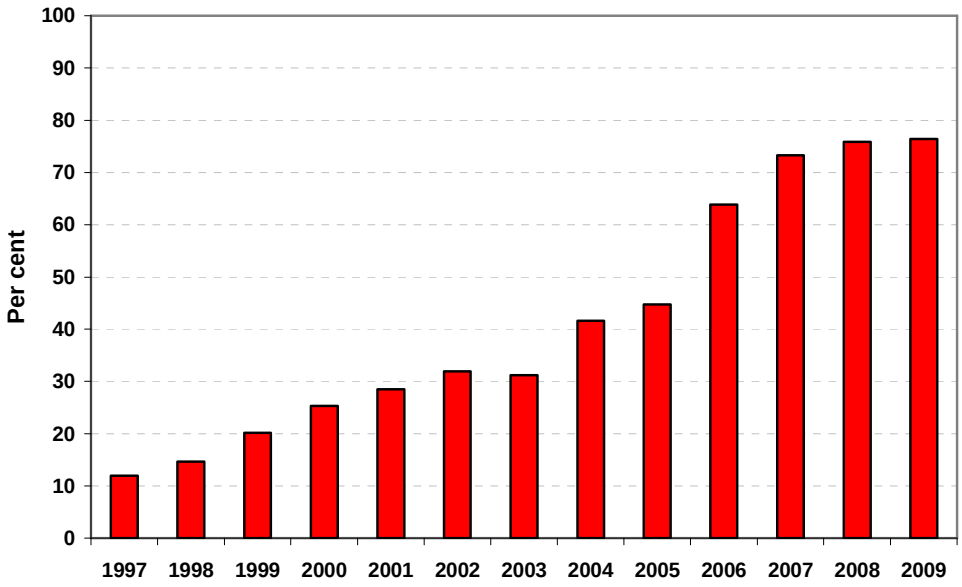

Figure 19. Volumes traded at Nord Pool Spot market as a percentage of total Nordic consumption, 1997 – 2009
Source: Nord Pool Spot

6.4 Cross-border power flows

Figure 20 shows the power exchange between the Nordic and the non-Nordic countries during 2009. The extent of the power exchange is highly influenced by the resource situation. In dry years the power flows north and west, while in wet years the power flows south and east. Likewise, changes in wind power generation influence the power flows, although with a time span of hours instead of months. This illustrates the flexibility of the Nordic power system; power is generated where it is cheapest and it is then transferred to more expensive areas and areas with not enough generation capacity.

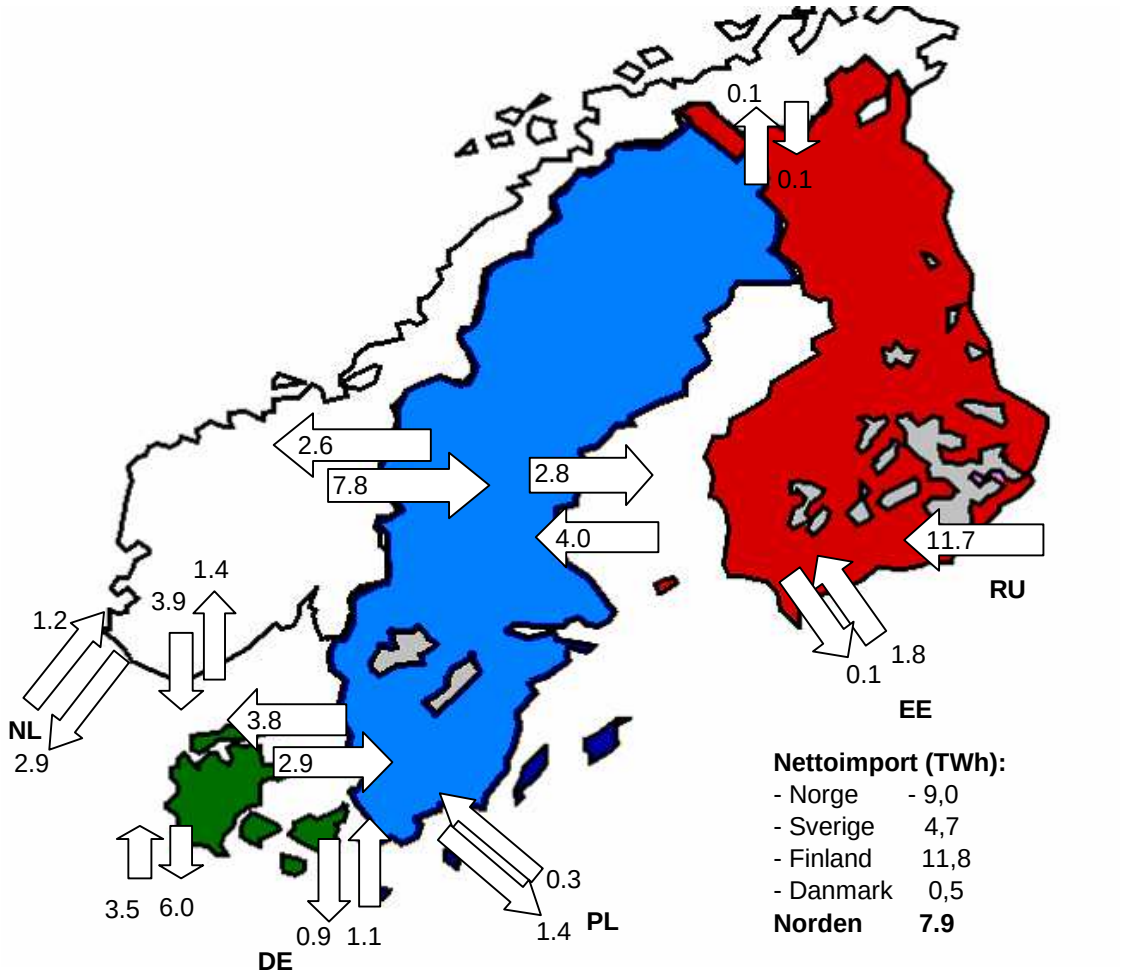

Figure 20. Power exchange, 2009
Source: Nord Pool Spot

The Nordic area has been a net importer of electricity for seven of the last 11 years. In 2003, 2004 and 2006 the net import was more than 10 TWh. The Nordic region was a net exporter in 1999, 2000, 2005 and last year. The biggest net export was 2.6 TWh in 2000. The import from Russia to Finland accounts for most of the total Nordic

electricity import. Due to technical restrictions Nordic export on this connection is not possible. The exchange between the Nordic countries and Central Europe (Germany and Poland) varies more with weather conditions.

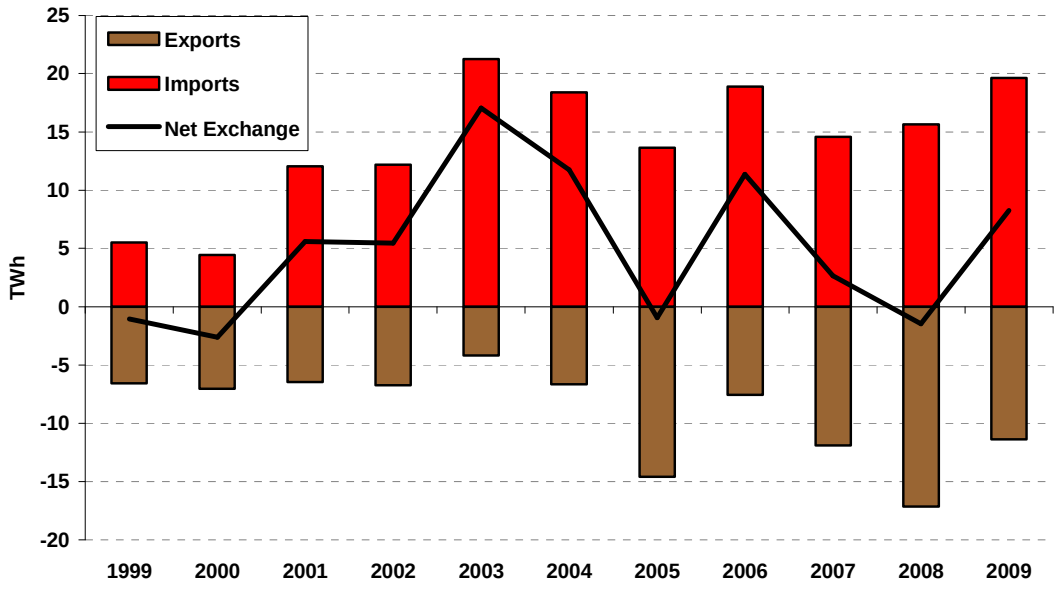

Figure 21. Nordic power exchange, 1999 – 2009
Source: Nord Pool Spot

In 2009, the net import of electricity to the Nordic power system was 7.9 TWh as opposed to a net export in 2008 of 1.8 TWh.

6.5 Balancing markets

A common Nordic balance management is an important part of the development of a common integrated end-user electricity market in the Nordic region. A proposal to harmonise important features of balance management was presented in February 2007. The proposal consisted of:

- Common principles for cost allocation between balance responsible parties and grid
- Two balances – one for production and one for consumption
- Common model for the settlement of imbalances - one price settlement for the consumption balance and two price settlement for the production balance
- Common fee structure
- Elbas available in all Nordic countries
- Common gate closure for final plans to the TSOs

The agreement for common Nordic balance management with one imbalance price for consumption and two imbalance prices for production was implemented in the Nordic countries during 2009. In Finland generation under 1 MW installed capacity are settled as consumption (against a one-price-settlement), and in Norway generation units under 3 MW are settled as consumption.

The purpose of the balance settlement is in all Nordic countries to settle imbalances resulting from electricity deliveries between parties in the electricity market. The system operators perform two types of balance settlement.

The first is the balance settlement between the countries. Balance power between two countries is priced and settled in the Nordic balancing market (regulation power market), Since 2002, bids from market participants with available regulating capacity are entered into a common price list in the common Nordic Operational Information System (NOIS), which serves as a common merit order for the TSOs balance settlement for balancing the national and the Nordic system. This is a so-called TSO-TSO market with a common merit order.

The second balance settlement is inside the countries. This is a settlement between the system operators and the balance responsible parties. This settlement is governed by national balance agreements. These agreements describe how the balance responsible parties can participate in the regulation power market.

There are currently efforts among the TSOs to reach common procedures for balance settlement between the TSO and the balance responsible parties – Nordic Balance Settlement (NBS). Procedures for a common balance settlement will form an important part of the joint efforts towards a common Nordic retail market, and the TSOs are cooperating with NordREG on this.

The total volume of the Nordic balancing market was app. 4.2 TWh in 2009, see table 5. Among the different Nordic price areas NO1 had the largest volume with 1.5 TWh while Sweden had the second largest volume with 1.3 TWh.

Table 5. Volume of Nordic balancing market 2009
Source: Nord Pool Spot

	NO1	NO2	NO3[10]	Sweden	Finland	DK2[11]	DK1[12]	Total
GWh	1537.6	324.4	253.0	1294.4	278.6	138.4	413.3	4239.8
TWh	1.5	0.3	0.3	1.3	0.3	0.1	0.4	4.2

The total weekly balancing in the Nordic region is illustrated below in figure 22.

[10] Until 13 April there was no NO3
[11] Sealand
[12] Jutland and Funen

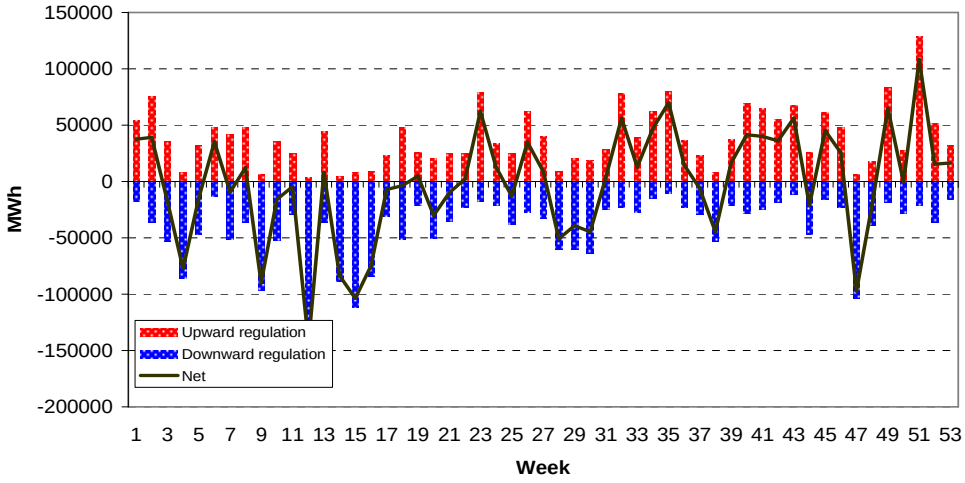

Figure 22. Weekly regulating volumes for the whole of Nordic area. Source: Nord Pool Spot

The largest downward regulation was in week 15 while the largest upward regulation was in week 51.

The balancing volume of an average week in the whole Nordic region is shown in figure 23.

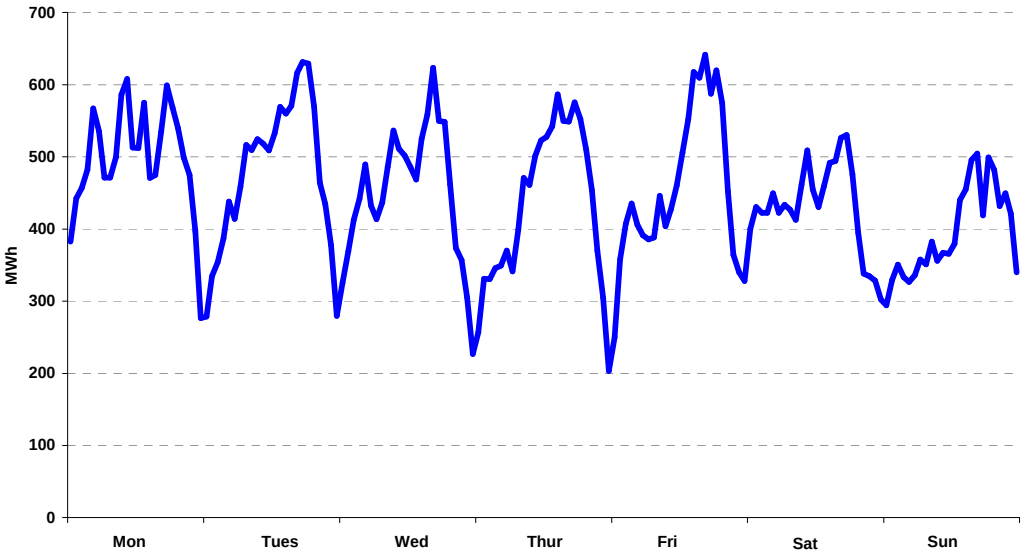

Figure 23. Weekly regulating volumes for the whole Nordic area. MWh, absolute values Source: Nord Pool Spot

6.6 Main players

Vattenfall AB is by far the largest electricity generator in the Nordic region. The company is owned by the Swedish state. In 2009, Vattenfall generated 67.0 TWh in the Nordic countries. Vattenfall has 38.8 % of the total Swedish generation capacity and 16.8 % of the total Nordic generation capacity.

Fortum Oy is majority owned by the Finnish state. In 2009, Fortum generated 46.2 TWh of electricity in the Nordic region. Fortum has 29.7 % of the total Finnish generation capacity. When adding the Swedish division Fortum holds 11.3 % of the total Nordic generation capacity.

E.ON Sverige AB is owned by the Germany Company E.ON. In 2009, E.ON generated 30.7 TWh in the Nordic region. E.ON Sverige AB has 18.1 % of the total Swedish generation capacity and around 6.7 % of the total Nordic generation capacity.

Statkraft is by far the largest of the Norwegian generators with more than 30 % of the total Norwegian generation capacity in a normal hydrological year. The market share becomes even higher if Statkraft's ownership in other Norwegian generation capacity is taken into account. The yearly amount of electricity generated by Statkraft varies heavily because of the large share of hydropower in Statkraft's generation portfolio. Statkraft generated 49.8 TWh in the Nordic region in 2009.

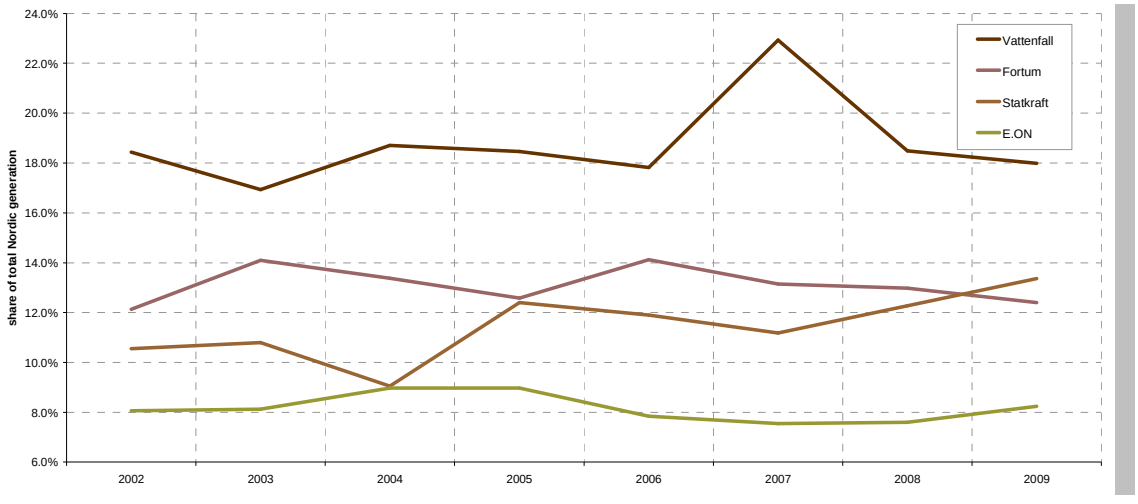

Figure 24. Share of total Nordic electricity generation by the four largest generators, 2002-2009
Source: Swedenergy, Nordel and regulatory authorities

6.7 Wholesale power market: Conclusions

The Nordic wholesale power market is a well functioning electricity market.

Trade at Nord Pool has increased steadily since it was established in 1993. The volume traded at Nord Pool in 2009 was about the same share of total consumption as that of 2008. Although trading at Nord Pool is voluntary, significantly more power is traded on the power exchange than bilaterally.

During 2009 average spot prices at Nord Pool were lower than prices in 2008. The highest monthly spot price during 2009 was noted in January when the average system price reached 41 €/MWh. Lower demand and generation costs for thermal power plants for most of 2009 contributed to lower prices in 2009 than the year before.

7 Retail markets

Unlike the integrated Nordic wholesale power market, the retail markets in the Nordic region are to a large extent still national in scope. There are several reasons for this. One reason is the lack of a common balance settlement within the Nordic region. Another is technical differences for instance in switching models and message formats.

In May 2009 NordREG published a joint report about the creation of a well-functioning Nordic end-user market for electricity.[13] It suggests that no later than 2015, suppliers in the Nordic countries should be able to offer electricity to consumers in any Nordic country on equal terms.

7.1 Development of retail prices

The retail prices for a house using electrical heating (20.000 kWh/year) in the Nordic countries in 2009 (exclusive Denmark[14]) are shown below, see figure 25.

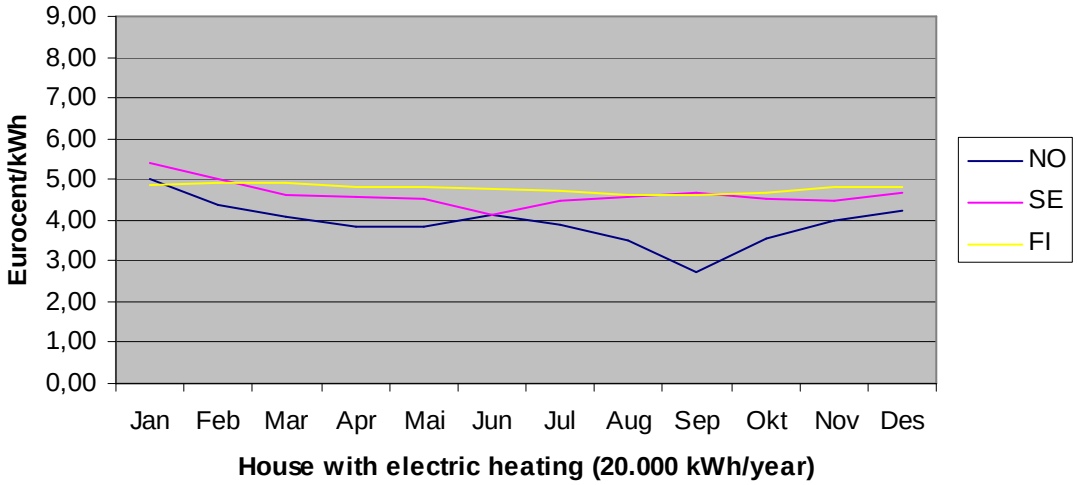

Figure 25. Retail prices (excl. taxes, VAT, distribution tariffs etc.) in the Nordic region, 2009
Source: Regulatory authorities

Retail prices in Finland were reasonably stable throughout the year. In Norway prices fell gradually from January to September and then rose again towards the end of the

[13] The report "Market Design – Common Nordic end-user market" can be downloaded from: https://www.nordicenergyregulators.org/Publications/

[14] The Danish retail market differs considerably from the markets in the other Nordic countries e.g. regarding average consumption pr. Consumer. The supply obligation product - a quarterly product supplied by companies granted a concession - covers approx. 90-95% of the Danish consumers (households and small businesses and enterprises). The prices for this product apply for one quarter and are under supervision by The Danish Regulatory Authority (DERA).

year to a level still lower than January. Swedish prices showed much of the same trend – a fall from January to June followed by a gradually rise towards the end of the year.

In 2009 the quarterly average prices (excl. VAT and subscription payment) for the Danish supply obligation product showed the same price trends as Norway and Sweden with quarterly prices at respectively 7,2 eurocents/kWh (Q1); 4,5 eurocents /kWh (Q2); 4,1 eurocents /kWh (Q3) and 4,5 eurocents /kWh (Q4).

7.2 Supplier switching

Active customers are essential for a well-functioning electricity market, and the share of consumers having switched electricity supplier illustrates consumer awareness and activity in the market.

In the Nordic markets consumer behaviour towards switching electricity supplier have shown great variation in previous years with Finnish and Danish consumers as the least active and Norwegian and Swedish consumers as the most active.

However, in 2009 switching rates seem much more uniform in the Nordic Countries and with significantly rising switching rates in both Finland and Denmark.

Consumers propensity to switch depends on many factors like:

- Transparency about the price differences
- Information – i.e. prices, switching procedures, suppliers etc.
- Economic incentives – i.e. the possibility to save money or a big consumption
- Active marketing activities by suppliers etc.

The collection of information about switching and definitions of key figures describing switching activity differ among the Nordic countries, which makes precise comparisons difficult.

In Denmark, the Association of the Danish Energy Companies collects information on switching activity on a quarterly basis. In 2009 approximately 17 % of the large consumers and all time high of more than 6 % of the small consumers changed their electricity supplier in 2009. For the small customers that are more than double the switching rate of previous years. The switching rate for the large customers is also higher having risen from 14 % in 2008.

In Finland electric energy can easily be put out to competitive tender through the web portal www.sahkonhinta.fi maintained by the Energy Market Authority. In 2009 8,1 % of the Finnish electricity users switched their electricity suppliers in 2009 which is almost a doubling from the 4.4 % switching rate in 2008.

At the time of liberalization of the Norwegian electricity market, most customers continued to stay with their local supplier with a standard variable contract (where

prices can be changed on 2 weeks notice). Since the liberalization of the market NVE has closely monitored the market development in the Norwegian retail market. At the end of 2009, 30 % of the household consumers and 37 % of the industry customers had another supplier than the incumbent supplier. Since 1997 there has been almost 2.48 million supplier switches in the household market and at least half the Norwegian households have switched at least once. Furthermore, there can be detected a tendency of consumers switching away from the standard variable contract to spot related contracts. During the year 2009 the average share of household consumers with standard variable contract and the share with spot contract were 42 and 52 %. Only 26 % of the industrial customers had standard variable contract. In Norway an estimated 195 000 households consumers (about 8 %) and 25 000 (about 8 %) industry customers switched supplier during 2009.

Approximately 11 % of the Swedish household consumers switched electricity supplier in 2009. This is an increase of about 31 % comparing to last year. It is an increasing number of consumers with a low annual consumption that are switching from one supplier to another. The increased number of switches depends, among other, on consumer's consciousness and tendency to reduce cost during recessions.

7.3 Main players

The number of electricity suppliers in Denmark is around to 55 – trading companies with supply obligation companies and trading companies without such obligation. The 33 supply obligation companies have each been granted a concession for a specific geographic region where they supply households and small businesses having not concluded an individual contract. Approx. 90-95 % of the Danish households and small businesses are supply obligation customers. The rest of the trading companies supply the rest of the market i.e. small customers which have used the liberalised market and changed supplier, larger businesses and enterprises. Among the largest trading companies in Denmark are DONG Energy A/S, Energi Danmark A/S and Scanenergi A/S.

The number of electricity suppliers in Sweden has fallen since the deregulation of the electricity market. In 1996 there were over 220 suppliers in Sweden. By 2009, this figure has fallen to 120. About 100 of these companies operate throughout the country. The decline in the numbers of electricity suppliers is mainly due to mergers and acquisitions.

In Finland the number of retail suppliers of electricity has remained at a relatively high level since the opening up of the market in the late 1990's. To serve Finland's circa 3.1 million electricity customers, there are currently more than 70 retail suppliers of which approximately 35-40 suppliers are also giving price offers to customers located outside their traditional supply area. In the Finnish electricity retail market there are less than five electricity retailer suppliers with a larger than 5 % of share of retail market. The combined market share of the three largest suppliers in the retail market for small and medium-sized customers has been about 35-40 %.

In Norway the number of active suppliers varies over time. In week 23 there were 31 suppliers with offers in all grid areas in Norway and a total of 96 suppliers in the whole country[15]. Some of these nation-wide suppliers are former incumbent suppliers while others are independent suppliers established after liberalization.

7.4 Retail markets: Conclusions

Even though the work of integrating the Nordic retail markets has begun there are still four separate markets. Therefore, comparisons between the markets should be done with caution.

Active customers are essential for a well-functioning electricity market. The share of customers switching electricity supplier differs between the Nordic countries; from approx. 6 % in Denmark to approx. 8 % in Norway and Finland and 11 % in Sweden. This is however a much smaller variation than has been seen in previous years.

[15] Data collected from the National price comparison site. All suppliers offering at least one of the three main contract types in Norway are obliged to register on this comparison site.

8 Market indicators for the Nordic electricity markets

The Nordic electricity markets have been liberalized so that ordinary market mechanisms have become increasingly influential on the market. Well functioning markets help ensure that society's resources are used as efficiently as possible and that the goods and services supplied to consumers are no more expensive than necessary. In this way well functioning markets promote welfare and growth. Well functioning markets are characterized by effective competition between suppliers, and good market information for consumers which enables them to make rational decisions.

One of the objectives of NordREG is to monitor/evaluate the development of the electricity markets in the Nordic area. To monitor developments in the market and to develop methods of quantitatively evaluation of the market, NordREG has developed a set market indicators. The indicators have been selected on the criteria's that they should be based on of hard reliable data and data should be immediately available. The indicators are based and calculated using comparable data from all Nordic countries.

8.1 Competition in the Nordic retail markets

In the following section competition in the Nordic retail market will be described by a set of market indicators developed by NordREG.

8.1.1 Number of suppliers

In a perfectly competitive industry there will be a large number of sellers. According to competition theory, the number of sellers could on the one hand be an indicator of economies of scale and scope and the existence of switch cost, and on the other hand an indicator of price taker behavior and utilization of market power in general.

It is difficult to determine the number of suppliers that is needed for competition to be efficient. The optimal number of competitors would basically depend on the characteristics of the production costs and the market. For example, in a market with no entry and exit barriers, no cost of switching, only one supplier would be necessary, as the threat of entry would be sufficient to keep prices in line with marginal cost. Thus the number of suppliers should be considered in relation with indicators of entry barriers, cost of production and switching costs. Scaling is a problem with this indicator. It is hard to determine where to draw the line between the number of suppliers that indicates imperfect competition and what number of suppliers indicates more efficient competition.

It should also be mentioned that not all suppliers are active in all regions of a national market, thus leading to different competitive situations in the regions. A large number of suppliers could as such actually indicate a large degree of market segmentation. Particular if there is cross ownership between the different suppliers.

Only suppliers covering the whole of the individual countries are counted. NordREG considered selecting eg. the capital region to work as a proxy, but concluded that selecting the whole country would still be more representative. When presenting this indicator in the Nordic Market Report, the total number of suppliers and the percentage share of the suppliers covering the whole market will be elaborated.

When presenting the number of suppliers' indicator, the following scale will apply:

Number of suppliers	Score
>10	5
>8	4
>5	3
>3	2
>0	1

The scale has been chosen in order to measure the indicators' impact on competition and in order to enable comparisons between the different indicators. The scale 1-5 has on the one hand been chosen in order to differentiate and on the other hand not to pretend an accuracy which is not available.

The scores on the number of suppliers indicator are shown in table 6. All of the nordic countries score a 5 on the indicator showing that the customers in every market have a wide range of suppliers to choose among, i.e. conditions for competition on the supply side are basically favorable.

Table 6. Number of suppliers indicator, 2009.

	Denmark	**Finland**	**Norway**	**Sweden**
Score	**5**	**5**	**5**	**5**
Share of suppliers covering the whole market	26%	34%	32 %	83%

8.1.2 Switching rate

Perfect competition also means that consumers should be fully aware of their alternatives. The question is whether they are. The supplier switching rate is an indicator of consumer awareness.

Switching supplier is defined as the action through which a consumer changes supplier. The switching rate measures the consumer awareness and activity which is crucial to a

well functioning market. High switching rates could be interpreted as a sign of adequate consumer information, and vice versa.

The switching rate also reflects a number of other aspects in the retail market, such as general prevailing options among general public, innovativeness of contract offering, marketing activity and overall dynamics.

Though a low switching rate could indicate low consumer awareness, it is not necessarily so. No hinders to switching together with perfect consumer information would imply that the consumers switch supplier as soon as there is a better offer available. That again means that the switching rate could be low because of hinders to the switching or low price spread. If the former is the case, the switching rate would be low due to entry barriers on the demand side. If the latter is the case, low switching rate could be misinterpreted as imperfect consumer information when in fact the market could be working perfectly well. The indicator should thus be considered in relation with the price spread.

An insignificant budget impact of switching supplier could also explain a situation of low switching rate. The less the share of what the consumer will gain from switching supplier makes of his or her budget, the less is his or her incentive to make the switch.

The indicator will be calculated as number of household switching contracts per year as a percentage share of the total number of household consumers and presented in the following manner:

Switching rate, %	Score
>12	5
>9	4
>7	3
>3	2
>0	1

The scores on the indicator are shown below in table 7.

Table 7. Switching rate, 2009

	Denmark	Finland	Norway	Sweden
Score	**2**	**3**	**3**	**4**
Share of consumers who have switched supplier	6,1%	8,1%	8,1%	11,4%

The indicator suggests that Swedish customers are aware on the market and the possibilities it provides them – and that they are willing to use these possibilities.

Norwegian and Finnish consumers seems to be not quite as active in the market as the Swedish suggesting that initiatives, e.g. improved customer information, to improve consumer awareness and willingness to actively engage in the free market could be considered.

Danish consumers are the least active on the free market suggestion that the market liberalization have not been fully appreciated by the Danish consumers. The indicator score also points to a need for further initiatives to boost consumer propensity to use the free market.

On assessing the indicator scores, it should also be taken into account that among other things, structural differences between the Nordic markets influence the results. In Denmark for instance the average consumption for a household is significantly lower than in the other three countries[16] which lower the economic benefits of switching supplier.

8.1.3 Price differences in the retail market (Price spread)

The theoretical optimum of a fully competitive market is a market where no player is able to influence the price of the product in the market or any prices in the factor markets thereof. In practice this would mean that the market share of any player is so small that changes in supply by any individual actor would not alter the supply and demand balance.

Price takers thus believe or act as if they can sell or buy as much or as little as they want without affecting the price.

A low spread is regarded as an indication of a high level of competition as a competitive market tends to minimize price differences between homogenous products. The price spread indicator will illustrate that a consumer can save money by switching the supplier. With a homogenous product[17] like electricity consumers should always choose the lowest price on comparable products. The price spread is included among the indicators to reflect the price taking behavior in the market, as if the law of one price would apply and the difference between different suppliers' prices would be negligible.

Choosing the same product in each country is problematic. Even though a product is available in each country the use of that product varies and may not be representative for the individual market. However, comparing price spreads of the most commonly

[16] First and foremost as a result of electric heating not being a major heating source in Denmark.
[17] Electricity in itself is a homogenous product. In recent years certain attributes has been inscribed to the product, such as green attributes for electricity generated from renewable energy sources. If green attributes are important for the consumers, the products are no longer homogenous but heterogeneous. And the consumers may not necessarily choose the product with the lowest price.

used product in the free market in each country will constitute a coherent measure as an indicator for the competition in each national market.

The price spread will be calculated as the ratio between the lowest and highest price at the retail market, offered for the most commonly used product in each country. The supply obligation products are excluded. The aim is to measure price competition on the most used product in different markets; hence the product itself has less importance.

The price of the most commonly used product will be defined as the price of the offer for this product to an average consumption household. The capital regions will be used as a geographical proxy.

Observations defined as typical outliers could cause a problem when calculating the price spread as the ratio between the highest and lowest price. NordREG believes that the prices observed are actual prices for actual products. Thus there should be no general problem of outliers. However, this is first and foremost an empirical question, that will be dealt with if outliers appear.

When calculating the price spread it is also a question of whether to base the calculation on one or more observations. The more observations, the more robust the indicator might be. However, NordREG find the question best be answered and a decision taken, when there has been an opportunity to scrutinize the actual data collected for the indicator.

The price spread indicator will be presented in the following manner:

Price spread, %	Score
<10	5
>10, <20	4
>20, <30	3
>30, <50	2
>50	1

The scores on the indicator are shown in table 8 below.

Table 8. Price spread for product most commonly used on each national market, 2009

	Denmark	Finland	Norway	Sweden
Score	**5**	**5**	**5**	**5**
Price spread on most commenly used product	7,9%	7,3 %	4,3 %	7,7 %

The price spread indicator for the Nordic countries shows markets with a good price competition.

According to the indicator, the most fierce price competition is in Norway, where price spread is 4,3 %. The price spreads in Denmark, Finland and Sweden are reasonable similar – between 7,3 % and 7,9 % - which also points towards competitive markets with active price competition.

8.1.4 Concentration in whole sale markets (HHI)

In addition to indicators associated directly with the retail market NordREG has incorporated a component that illustrates the characteristics of the wholesale market. The key argument for this is that without a well-functioning wholesale market the development of competitive retail market is not feasible. If the wholesale market is not competitive, the actors in the wholesale market can discriminate between actors in the retail market, thus constraining the competition in the retail market.

It should be noted however that there are strong structural reasons for expecting a relatively high concentration on the supply/production side at the outset. Electricity production facilities come at a very heavy price, establishing facilities are highly regulated through environmental regulation, licensing arrangements etc. which all makes heavy barriers to entry.

Furthermore the pricing in the retail market is often derived from the wholesale market and thus it is often not possible to distinguish entirely between the two markets. It is difficult to imagine a well functioning retail market without a well functioning wholesale market, but the reverse is in use in several markets around the world.

In the economic theory of industrial organisation a basic assumption is that the potential to abuse market power is related to the firm's market share. It is assumed that the more concentrated the market is the likelier it is that market is not well functioning. In the prolonging this implicates that an increase in markets concentration can lead to higher prices and lower consumer welfare.

The Herfindahl-Hirschman index (HHI) serves as indicator of market concentration and thus price taker behaviour of the wholesale market. The index however is not a very good indicator of the competitive character of a market since it merely points out the structural dominance of the market.

The HHI should be calculated for several market areas in order to reflect the Nordic electricity markets: The whole Nordic market as one, national markets and other subdivisions hereof (e.g. Sweden-Finland) subject to specific evaluations when numeric figures have been calculated.

NordREG has calculated the indicator for each national generation market and complemented this by weighing it with the time fragment the entire Nordic market shares a common price in the set of indicators.

The indicator both illustrates the concentration of the national generation market and the share of pan-Nordic sourcing. As the calculation of HHI for each country is based on market shares in the wholesale market, a market that in reality is a Nordic market, bottlenecks within the Nordic market is taken in to account.

The indicator will be presented according to the following scale:

HHI	Score
< 1000	5
>1000 <1100	4
>1100 < 1500	3
> 1500 < 2200	2
> 2200	1

The scores of the indicators are shown below in table 9.

Table 9. Concentration index for the Nordic whole sale markets, 2009

	Denmark	Finland	Norway	Sweden
Score	**1**	**3**	**3**	**2**
HHI-index	2570	1253	1136	2109

The concentration indicator show, that on the Danish and – to a lesser degree – the Swedish wholesale markets there are high concentration among the suppliers which could be a cause for concern, while the Finnish and Norwegian markets are moderately concentrated.

However, concentration in a market does not in itself constitute a problem regarding competition. Whether or not competition on a highly concentrated market is hampered requires further analysis of the behavior of the market participants etc.

8.2 Market indicators for the Nordic electricity markets: Conclusions

Overall, based on the indicators the retail markets for electricity in the Nordic countries seem competitive with a wide range of competing suppliers for consumers to choose from on markets with active price competition. The indicators also shows, that each of the Nordic countries have stronger and weaker positions, suggesting that improvements

are possible on each market – but also underlining the differences between the markets and hence the different requirements of each market if competition should be enhanced.

In that respect the indicators highlight areas of interest regarding further initiatives and actions to enhance competition on each market.

9 Ongoing NordREG work

The market report has so far provided a general presentation of the recent development of the Nordic electricity market based on NordREG's running electricity market monitoring. But NordREG also makes deeper analyses on market issues and proposes changes to facilitate market development and market integration.

Some of NordREG's most important projects are presented in this chapter based on conclusions drawn in NordREG's reports published in 2009. The descriptions below are organised according to NordREG's strategic priorities:

- A truly common Nordic retail market with free choice of supplier
- A well-functioning Nordic wholesale market with competitive prices
- Reliable supply
- Efficient regulation of TSOs

9.1 A truly common Nordic retail market with free choice of supplier

The work during 2009 was addressed by the interrelated working issues of the report "Market design – Common Nordic end-user market" and a corresponding letter to the Nordic Council of Ministers regarding "Process towards a common Nordic retail market".

NordREG's work towards a common Nordic retail market is of great importance to the Nordic electricity customers. Harmonisation of the regulation and processes related to supplier switching and agreeing on a common Nordic balance management would facilitate the work towards an integrated Nordic retail market lowering obstacles for the suppliers to operate in various Nordic countries and thus increase competition in the retail market. Possibility to choose between suppliers from all Nordic countries would most likely increase customer activity furthering innovation of new products, services and contracts. NordREG suggest in its latest published report[18] that in 2015 suppliers in the Nordic countries should be able to offer electricity to customers in any Nordic country on equal terms. Increased activity of suppliers and customers would mean a more competitive Nordic retail market leading to more effective retail market to the benefit of the customers.

In the letter to the Nordic Council of Ministers NordREG emphasise the importance of the process towards a common Nordic retail market for electricity. To obtain involvement from all relevant stakeholders, NordREG call for political support from the Nordic Council of Ministers..

[18] "Market Design – Common Nordic End-user market", NordREG 2009

The Nordic Ministers for Energy october 2009 expressed their strong support to the views opresented by NordREG in the report and backed NordREGs continued work towards a common end-user market targeted to realization in 2015**.**

9.2 A *well-functioning Nordic wholesale market with competitive prices*

The Nordic Energy Ministers have a vision of a further integration of the Nordic electricity market. The vision was originally formulated at the ministers meeting in Akureyri in 2004. This has been supported by a process where Nordel, NordREG and also Nordenergi have been invited to contribute for the future.

While there is political support for the vision of one Nordic electricity market, there is not a common legal framework in all areas for the further integration of the Nordic market. The integration process that has been going on the last 15 years has implied that the Nordic wholesale market in many respects already functions as a common Nordic market. But there are still several issues where further development of the market model and increased harmonization are needed to establish a truly common and efficient Nordic wholesale market.

The following objectives relevant to the wholesale market are regarded as strategic issues by NordREG:

- to develop a common balance management and settlement system,
- to promote competitive market structures,
- to ensure smooth interaction with other European regions,
- to ensure a well functioning power exchange,
- to ensure adequate level of transparency in the market,
- to promote market-based or legal environment of security of supply,
- to ensure harmonized procedures for handling extreme situations,
- to regulate and monitor the TSOs with focus on efficiency and Nordic harmonization and
- to promote adequate transmission capacity and efficient market based congestion management methods.

All these issues are to some extent interrelated, and have been taken into account in NordREGs work on wholesale and transmission issues in 2009. The main activities in 2008 have, however, been the further development of a common balance settlement system, congestion management, peak-load issues and co-operation related to regulation of Nord Pool Spot.

In March 2009, NordREG published a report with NordREG's evaluation and conclusions related to Nordel's guidelines for peak load arrangements. NordREG agrees with Nordel that the market should be designed to solve peak load problems through proper incentives to market players. NordREG presumes that the relevant authorities in each

country will take decisions on the need for any peak load arrangement to ensure security of supply. NordREG proposes that such decisions should be taken after consultation with parties in other Nordic countries, and involving also regulators and TSOs.

In NordREG's view there are basically three principles that should be guiding any decision to introduce peak load arrangements in the Nordic countries:

- Firstly, the peak load arrangements should be introduced only in situations when security of supply cannot be met without these arrangements. Since the decision to introduce peak load arrangements might be of a political/legal nature, the length of such arrangement cannot be fixed. However, there should be a regular evaluation by the competent authority of any need or prolonged need for peak load arrangements and its effects of price formation in the Nordic market.

- Secondly, when peak load arrangements are introduced they should be designed to minimize the adverse effects on price formation in the Nordic market. Furthermore, if there are to be peak load arrangements, there might be a need for how to distinguish these peak load reserves from other reserves at the disposal of the TSOs. However, this issue needs further discussions and development.

- Thirdly, Nordic consultation should be carried out where the views of all relevant authorities and stakeholders in the market affected are invited. It is recommended that the governments consult with their Nordic counterparties before submitting legal proposals on peak load arrangements affecting Nordic price formation. These consultations should also be with regulators and TSOs who are involved in the design of the actual peak load arrangements.

9.3 Reliable supply

Another of NordREG's priorities is to contribute to reliable supply of electricity in the Nordic region.

The priority has two dimensions:

- **To promote market-based or legal environment for security of supply**

- **To ensure harmonised procedures for handling extreme situations**

The roles of national regulatory authorities of the Nordic countries in relation to security of supply issues are very different. Other public authorities, too, have important responsibilities and in certain cases the responsibilities assigned to regulatory authorities are minor. In 2007 NordREG conducted a review of the roles and responsibilities as well as of the legislation relevant to the issue.

9.4 Efficient regulation of TSO

TSOs play a crucial role in the efficient operation of the market, especially the wholesale market. Therefore the strategic priorities of “efficient regulation of TSOs” and of “a well-functioning Nordic wholesale market with competitive prices” are closely linked.

Congestion management is an issue of vital importance in the Nordic market. NordREG has investigated to what extent the Congestion Management Guidelines have been implemented in the Nordic market. In the report issues requiring Nordic approach in the implementation of the guidelines have been identified. Furthermore, some clarifications from the Nordic perspective in implementation are discussed and also issues irrelevant for the Nordic interconnections are identified and reasons omitting these issues in Nordic interconnections are given.

NordREG
Nordic Energy Regulators

c/o Norwegian Water Resources and Energy Directorate
P.O. Box 5091, Majorstua
N-0301 Oslo
Norway

Telephone: +47 22 95 95 95
Telefax: +47 22 95 90 00
E-mail: nve@nve.no
Internet: www.nordicenergyregulators.org