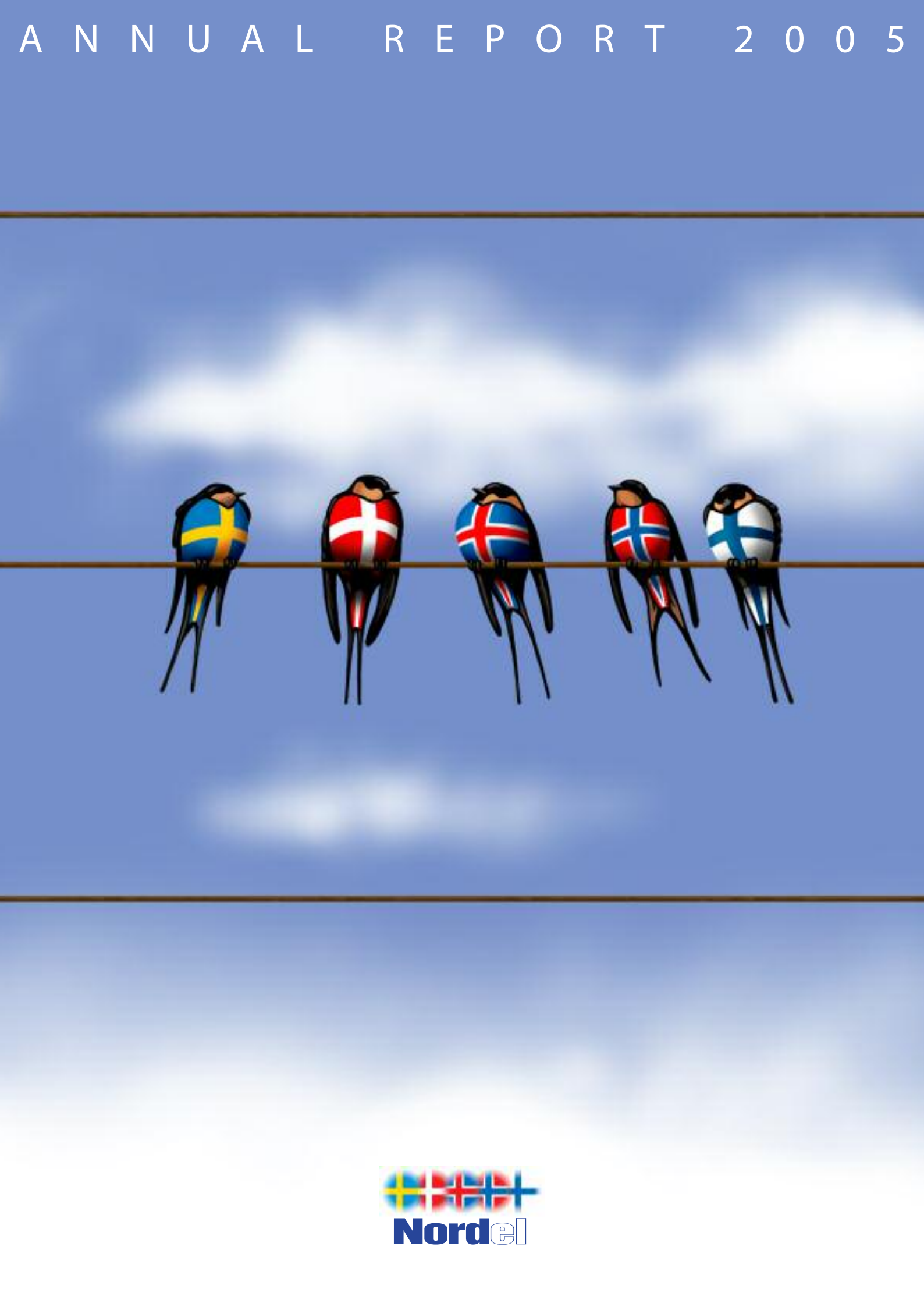
ANNUAL REPORT 2005



Nordel

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Svenska Kraftnät

ENERGINET.DK

LANDSNET

Statnett

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Nordel

Nordel is the collaboration organisation of the Transmission System Operators (TSOs) of Denmark, Finland, Iceland, Norway, and Sweden. Nordel's objective is to create and maintain the conditions for an efficient and harmonised Nordic electricity market, without regard for national borders.

Nordel is also a forum of contact between the TSOs and the market players of the Nordic countries. It is important for the evolution of an efficient electricity market that the TSOs meet the market players in order to exchange views.

Nordel's objectives are to:

- Act as one TSO and work towards a harmonised Nordic electricity market
- Be a driving force in the evolution of the Nordic and European electricity markets
- Be jointly responsible for implementing adopted measures with the purpose of, among other things, improving operational reliability.

This entails a range of duties within the following sectors:

- System development and network design rules, e.g. coordinating network investments and managing congestion
- System operation, operational reliability, security of supply, and information exchange
- Pricing principles for network and system services
- Balance management
- International collaboration
- Contacts with organisations and authorities, both in the Nordic area and in the rest of Europe
- Information about the Nordic electricity system and the electricity market.

Nordel's most superior decision-making body is its annual meeting. Here, representatives of the TSOs in the Nordic area meet each other. Nordel's annual meeting elects the Chairman of the organisation for a period of two years. The post of Chairman rotates between the countries. The Chairman selects the secretary of Nordel who is responsible for the secretariat and its costs. The organisation has no budget of its own.

Nordel's executive body is its Board, which consists of the leaders of the TSOs. The Nordel Board launches new projects, makes decisions relating to current matters, and expedites the decisions made at the Nordel annual meeting. The Nordel Board is also responsible for the organisation's external information activities.

A large part of Nordel's work is carried out by committees and work teams. Nordel's Operations, Planning, and Market Committees consist of the leaders of the corresponding sections of the TSOs. The work teams are staffed by these companies' specialists.

More information about Nordel, together with reports and statistics, is available at www.nordel.org. Under the menu item Publications/Rules and recommendations, the "Nordic Grid Code", technical recommendations, and the system operation agreements are all available.

Key figures for 2005

		Nordel	Danmark	Finland	Island	Norge	Sverige
Population	mill.	**24.6**	5.4	5.3	0.3	4.6	9.0
Total consumption	TWh	**402.7**	35.7	85.0	8.7	125.9	147.3
Maximum load[1]	GW	**60.6**	6.0	12.2	1.1	18.2	23.1
Electricity generation	TWh	**403.6**	34.4	67.9	8.7	137.9	154.7
Breakdown of electricity generation:							
Hydropower	%	**57**	0	20	81	99	46
Nuclear Power	%	**23**	-	33	-	-	45
Other thermal power	%	**18**	81	47	0	1	8
Wind power	%	**2**	19	0	-	0	1
Geothermal power	%	**-**	-	-	19	-	-

[1] Measured 3rd Wednesday in January - = Data are nonexistent 0 = Less than 0,5 %

Report of the Board

Nordel continues to develop the main grids and the electricity market

The Nordic electricity market is often an international example of a well functioning regional electricity market. Behind this lies extensive collaboration across national borders which has been going on since the 1960s, and which has made the Nordic electricity market what it is today. The more important factors underlying this positive trend include an extensive system operation agreement, a Nordic regulating power market, a joint power exchange for spot trading, an extensive exchange of information, a good collaboration during operational events, and a coordinated development of the national grids.

Even though the work of harmonising the Nordic electricity market has been successful in many respects, it is important that this collaboration continues to be intensified and developed.

During the autumn of 2004, the Nordic energy ministers asked Nordel to analyse a number of issues relating to continuing Nordic harmonisation. Among other things, this concerned how the system responsibility could be coordinated between the countries, how to manage network congestions, how investment in networks could be organised and financed, and how peak loads are managed by the Nordic countries.

Nordel presented the report "Enhancing Efficient Functioning of the Nordic Electricity Market" in March 2005. There it was pointed out that the electricity market could be further developed through the harmonisation of rules and conditions so that electricity consumers may more easily be able to gain access to the entire Nordic electricity market, even though the Nordic TSOs' roles and responsibilities are partly divergent from country to country. Nordel further pointed out the need to clarify the TSOs' basic duties so that their interfaces with the market and authorities become clear. It is also desirable that the same principles of financing the TSOs' network and system services be applied in all the countries.

The ministers backed the proposals presented in the report. The market players were also positively inclined towards the proposals which contribute towards creating an efficient and borderless Nordic electricity market.

During 2005, Nordel concentrated on implementing the proposals in the report and on investigating some issues further. Work has primarily focused on defining the system responsibility, clarifying the roles of the electricity market players, the TSOs and the authorities, reviewing how balance settlement can be harmonised, drafting joint rules to manage network congestions, planning for the expansion of the Nordic network, reviewing the financing of Nordic network investments, and augmenting the mechanisms that steer the market during strained power situations. The results of this work are described in Nordel's report "Status of Nordel's Work on Enhancing Efficient Functioning of the Nordic Electricity Market" which was submitted to the Nordic Council of Ministers in April 2006.

Increased rate of investment

To improve the conditions for electricity trading in the Nordic area and make the Nordic electricity network even more robust, Nordel proposed, during 2004, five major network development projects. Work on these is ongoing and investment decisions have already been made as regards four of the interconnectors. The work of identifying the need for new prioritized investment in the networks, based on a Nordic perspective, is now continuing.

Harmonisation important for the evolution of the electricity market

One objective of intensifying collaboration between the Nordic TSOs is reducing the disparities which constitute obstacles to the market players establishing themselves and functioning efficiently on the Nordic market. The task of harmonising rules and conditions for electricity consumers with a small or medium-sized level of consumption is a major challenge which primarily rests with the authorities of the Nordic countries, but Nordel also has a role to play here.

Cross-border collaboration

Over the past year, Nordel has enjoyed good collaboration with the Nordic countries' energy authorities, the electricity market players, and the Nordic Council of Ministers. Several working groups and seminars have been held with external participants. Additionally, there have been joint workgroups with the industry and authorities.

The vision of the EU is a single European electricity market. This can become a reality through regional electricity markets being able to interact with each other, even though the rules have not been completely harmonised. It is also important that the disparities which exist do not inhibit the function of the markets or make it difficult for new players to establish themselves. The issue regarding the challenges that lie ahead of the EU vision concerning regional markets is described in a feature article in this annual report.

Nordel shares the EU vision of a single European electricity market. The path to achieving this is via continued cross-border collaboration.

Members of the Board

Jan Magnusson
Svenska Kraftnät, Sweden, Chairman

Christina Simón
Svenska Kraftnät, Sweden, Secretary

Peder Østermark Andreasen
Energinet.dk, Denmark

Thordur Gudmundsson
Landsnet hf., Iceland

Odd Håkon Hoelsæter
Statnett SF, Norge

Timo Toivonen
Fingrid Oyj, Finland, Vice Chairman

Chairmen of the Committees

Peter Jørgensen
Energinet.dk, Denmark, Planning Committee

Håkon Borgen
Statnett SF, Norway, Operations Committee

Juha Kekkonen
Fingrid Oyj, Finland, Market Committee

The electricity market

Photo: Trond Isaksen

Harmonised rules a prerequisite for achieving a regional market

The objective for Nordel is further development of the Nordic electricity market in order to promote competition and to utilize joint electricity production resources efficiently. The electricity market must have as few obstacles as possible and a well functioning and efficient trade with the outside world.

Nordel cannot create a joint Nordic electricity market on its own, but it can contribute towards this evolution in several ways. Among other things, Nordel has studied the possibilities to harmonise rules and routines in many important sectors that the TSOs have an influence upon. The result of this work is described in more detail in the report "Status of Nordel's Work on Enhancing Efficient Functioning of the Nordic Electricity Market" which was submitted to the Nordic Council of Ministers in April 2006.

Work on the long-term evolution of the rules and market conditions within Europe is continuously being monitored by Nordel and ETSO (Association of European Transmission System Operators).

During the year, EU rules governing the trade in emission rights were adopted. Special quotas were introduced for carbon dioxide emissions from fossil-based production sources. This affected electricity prices throughout the Nordic area.

One important prerequisite for the functioning of the electricity market is that congestions in the electricity system are managed efficiently. During the past year, Nordel has been investigating this issue in particular. The objective is to manage the congestion where it physically arises. Structural congestions are removed through investment in networks where it is socio-economically defensible and/or through splitting into price areas. Temporary congestions are reduced or eliminated through counter trading. The issue of how congestions are to be managed prior to network investments being made is currently being discussed. Within Nordel, there are different views on how congestion on the Nordic electricity market should be managed in the short-term. Analyses of the different methods' advantages and disadvantages are currently ongoing, with the intention of coming up with the first results before the summer of 2006.

The system responsibility and the distribution of roles among the electricity market players

Despite the high degree of harmonisation which already exists between the Nordic TSOs, there are differences concerning what exactly is included in the system responsibility and how this is defined. It is important to clarify the roles between authorities, the TSOs, and the market players in order to avoid distortion of the competition and risk exposure of the players on the electricity market. It is also important to define how the services

included in the system responsibility are to be financed. This is in order to prevent the TSOs' various areas of responsibility from subsidising each other and in order to send the right signals to the market.

The ideal situation would be when all the countries in Nordel define the system responsibility in the same way. Consequently, Nordel's legal team has analysed and compared Nordel's definition with existing legislation with the aim of finding out which changes will need to be made in each respective country. They have also proposed a joint definition.

According to Nordel, the principal functions of the system responsibility are:

- to safeguard the operational reliability of the power system
- to maintain the momentary balance between supply and demand
- to safeguard and maintain adequate transmission capacity in the long-term
- to work towards an electricity market that functions efficiently.

Harmonisation of the balance settlement

The market players, authorities, and Nordel are positively-inclined towards developing a Nordic retail market. This will contribute towards making it easier for new players to establish themselves on the electricity market, thus enhancing competition. Harmonisation of the balance settlement is one of the prerequisites needed for this development. For example, it has to bee agreed upon how the distribution of costs will be carried out between the balance and network services, the principles of pricing imbalances including the fee structure, and the number of imbalances to be settled.

A previous Nordel study described two possible alternatives regarding a harmonised model for balance settlement. Many players were of the opinion, however, that it was more important to preserve the national settlement model than to harmonise it with the other Nordic countries. A proposal has now been presented regarding a harmonised settlement model which will enable a single Nordic electricity market for consumers. The model must be firmly established with the players and authorities of each respective country so that a decision can be made before the end of 2006.

Harmonised rules for managing network congestions

In every power system, congestion arises when the technical transmission capacity of the lines falls short of the players' requirements for transmitting power. The Nordic countries have agreed that permanent structural congestion will be resolved through investing in network development when these are socio-economically justified. During the operational planning phase (prior to the next day), congestions are solved by splitting into price areas or through counter trading. The TSOs guarantee the trading capacity for the next calendar day through counter trading.

During 2004, the Nordel Market Committee completed a study into the possibilities of harmonising congestion management in the Nordic electricity market. Its recommendation was a limited increase in the counter trading for temporary congestion provided that a solution is found to the problem of moving internal congestions to the national borders. The majority of the market players supported this proposal in their referral responses and, during 2005, this work has continued.

Distribution of congestion revenues

Different ways of distributing congestion revenues have been investigated. An agreement has been signed by the Nordic TSOs concerning distribution. It will run until 31 August 2006 and is based on a distribution of revenues between the TSOs which is in relation to the investments being made in the five network developments that Nordel has prioritised.

Demand response – an important mechanism during strained power situations

Within Nordel, the feeling is that it will be necessary to utilize the potential of demand response in order for the electricity market to function well in strained power situations as well. Demand response is defined as a short-term change in electricity consumption as a reaction to the price of electricity and is a tool for balancing supply and demand. It can act as an alternative to investment in new production facilities.

The TSOs have now drafted a concrete plan of action for how demand response can be promoted in their respective countries. It is also important that both the authorities and players actively take part in this work.

Events in the individual countries - electricity market

Denmark

After many years - as a trial period - the Eastern Danish and North German electricity markets were successfully interconnected in autumn 2005, by setting up a new price area "Kontek". This price area replaces the previous auctions of trading capacity on the Kontek link between Eastern Denmark and Germany and entails that energy can be transmitted to areas with high prices so that the link can be better utilized. On the border between Jutland and Germany, on the other hand, it has not yet been possible to achieve an actual market coupling with E.ON Netz. Instead, a voluntary form of this has been introduced whereby the players have the possibility to put capacity purchased via the auctions at the disposal of Nord Pool Spot.

On 1 January 2005, special quotas for carbon dioxide emissions were introduced in Denmark. This contributed towards increases in the spot prices for electricity in the two Danish price areas during 2005. In Eastern Denmark, the price was at times also affected by the trading capacity being reduced for imports via the Öresund interconnector.

In Western Denmark, the players raised the price level on the spot market despite an abundance of production capacity in the area.

At the end of 2005, the Danish Competition Authority ruled that Elsam had abused its market power on the Western Danish electricity market by overcharging. The authority ruled that Elsam had to put a cap on its Nord Pool Spot prices.

On 28 and 29 November, the price of electricity in Eastern Denmark, during individual hours, hit historical highs. The reason for this was the strained power situation in Eastern Denmark caused by increased consumption, a failure at the Avedøre plant, no wind-power production, and a reduced trading capacity on the Öresund interconnector. Additionally, the liquidity of the new Kontek price area was very low.

In conjunction with a new system-responsibility ordinance, Nord Pool Spot has had, since the beginning of 2006, priority access to the capacity on the Kontek Link since the agreement between Vattenfall Europe Transmission and Energi E2 about utilizing 350 MW has been terminated.

Nord Pool Spot's share of the Danish electricity market rose during 2005. This increase was primarily seen as depending upon the bulk of the combined heat and power plants, as of 1 January 2005, selling their electricity output on the spot market.

Finland

The consumption fell by 2.5 % due to unusually warm weather and a six-week industrial strike in the paper industry. The industrial strike alone temporarily cut electricity consumption by approx. 3,000 MW.

The abundant hydropower production in the Nordic area and the trade in emission rights have reduced Finland's production of condensing power and increased imports.

At the end of the year, the Finnish government published an enquiry into the energy and climate strategy that will be dealt with by Parliament during 2006.

An enquiry into how peat-fuelled CHP generation can be safeguarded using a feed-in tariff was launched by the Ministry of Trade and Industry.

Iceland

At the beginning of 2005, Iceland's internal regulating power market started up and the electricity market was opened fully on 1 January 2006.

Construction of the 690 MW hydropower plant at Karahnjukar in Eastern Iceland is fully under way. This project includes approx. 70 km of tunnels and three dams of which the largest will be 193 metres high. The power plant will produce electricity for an aluminium plant at Reydarfjordur in Eastern Iceland, which is simultaneously undergoing construction. The aluminium plant is planned to have a capacity of 322,000 tonnes per annum. Both the power and aluminium plants are planned to go into service in April 2007.

Two geothermal power plants are also being constructed, totalling 180 MW and going into service in 2006. The reason for this is that an existing aluminium plant will increase its output by 90,000 tonnes. There is considerable interest among the aluminium plants of Iceland in boosting their output during the years ahead.

Norway

The summer and autumn were characterized by heavy precipitation and large inflows in Western and Northern Norway. Significant counter trading costs arose over long periods in the areas due to high production and transmission requirements exceeding the capacity limits. During

2005, electricity production amounted to 137.9 TWh. This is 27.4 TWh (24.8%) up on last year's output. International electricity exchanges resulted in net exports of 12.0 TWh. This is an increase of 23.5 TWh on 2004, when imports were 11.5 TWh.

The supply situation in Central Norway was strained during 2005 and became the object of political attention during the year. Electricity consumption has risen significantly in the region due to increased industrial consumption and will rise even more in 2008 when the gas terminal at Ormen Lange goes into service. Even though Statnett has already built and continues to build new interconnectors in the area, all analyses point to the risk of energy shortages from 2008.

To improve the supply situation in the region, two gas-powered facilities are being planned:

- The gas-powered plant at Skogn in Nord-Trøndelag where a concession has been awarded but a decision regarding construction has not yet been made.
- The gas-powered plant at Tjeldbergodden in Møre og Romsdal where the concession has been awarded but the Norwegian Pollution Control Authority has recommended that the government says no to the concession because the complete purification of carbon dioxide will not be possible from the time of commissioning.

At Kårstø in Rogaland, the construction of a gas-powered plant rated at 430 MW has commenced. The plant will go into service in 2007.

Effective 2005, Statnett has introduced a lower grid tariff for new electricity production in areas with major power deficits. This applies to Central Norway and the area around Bergen. This is in order to contribute to new electricity production being distributed to the areas with the greatest need. Thus, new electricity production can be better localised so that the need to build new power lines is reduced. In doing so, Statnett can reduce both its environmental footprint and its social costs. The change in the tariff will apply during 2006 also to Sunnhordland, south of Bergen. It will apply for 15 years from the time when the investment decision is made regarding the production facility and will be independent of the type of production source.

Sweden

On 1 July, Svenska Kraftnät assumed the system responsibility for the Swedish natural gas market in conjunction with that market becoming deregulated vis-à-vis companies. For gas, the rules and organisation have been developed for balance regulation and balance settlement in a similar way to the electricity market. At year-end, five balance responsible centre companies were active on the open Swedish natural gas market.

In 2003, Sweden's Parliament adopted a law governing power reserves, entailing that Svenska Kraftnät has a temporary responsibility to procure a power reserve of max. 2,000 MW during the winter period up until 2008. In order to discuss this issue, Svenska Kraftnät, the Swedish Energy Agency, and Swedenergy arranged a power seminar in November 2005.

Photo: Juhani Eskelinen

System responsibility and operation

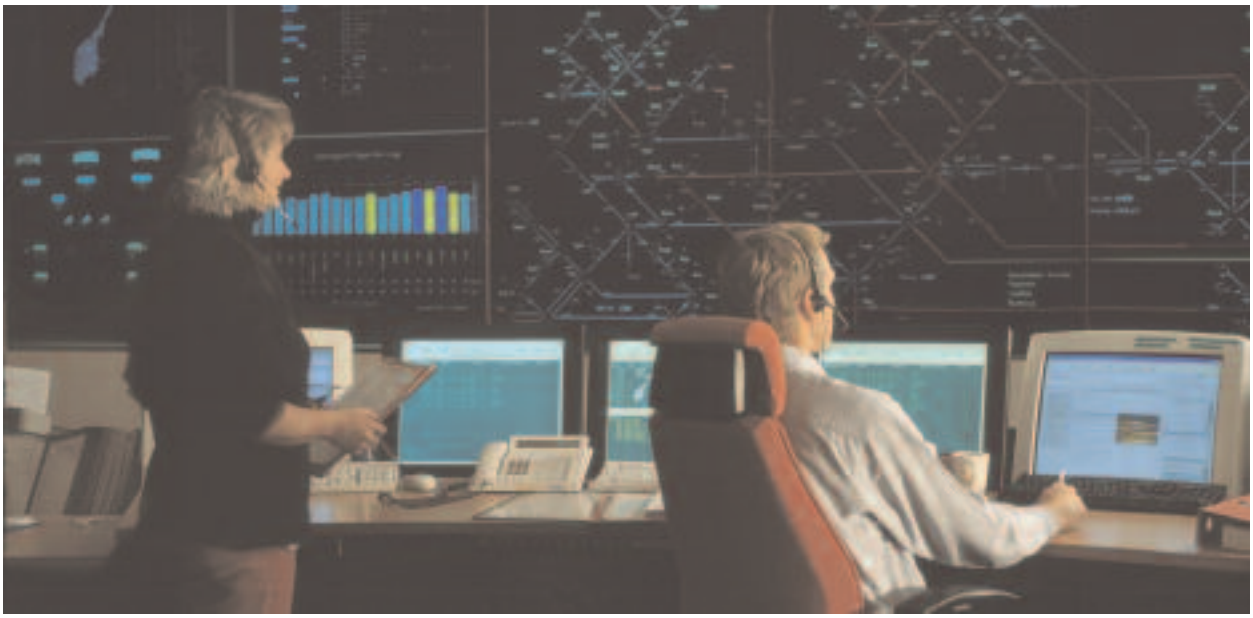


Photo: Trond Isaksen

An eventful operating year

During the year, the Nordic power system was characterized by well-filled reservoirs, entailing that transmissions on the Norwegian and Swedish grids were greater than normal. In Norway, reservoirs were 77 % full at year-end.

During recent years, the quality of frequency has gradually deteriorated, but this negative trend was halted during 2005.

Ahead of the winter period 2005/2006, the assessment of the power balance of the Nordic system, which is done by Nordel ahead of each winter season, showed a slightly weaker balance than last year and a generally more strained operating situation in the Nordic electricity system than previously. The work carried out within Nordel will not, of course, immediately impact upon the already weakened total power balance in the Nordic area. On the other hand, Nordic coordination of operations and the good collaboration occurring on a day-to-day basis mean that operational reliability continues to be high. This despite the fact that the Nordic grids were exposed to a number of major operational disturbances during the year, in most cases caused by extreme weather conditions.

The year began dramatically when hurricane Gudrun moved in over Eastern Denmark and Southern Sweden and left a total of 860,000 consumers without electricity. No damage to the grid was reported but 20,000 km of Sweden's local networks were damaged. Neighbouring countries helped in the relief efforts, as did countries in other parts of the world.

Fenno-Skan was down due to a cable fault between 24 January and 21 April 2005. The reason for this lengthy repair time was severe ice conditions.

During most of week 9, it was very cold for being March, entailing great strain on the Nordic joint operation. The situation was so strained that it became the object of a special analysis, subsequently resulting in improvement measures ahead of the coming winter.

Between 28 May and 26 October, the Skagerrak 3 interconnector between Jutland and Norway was out of service due to a transformer fault in Norway. This fault meant that the capacity of the interconnectors with Norway was reduced from 1,000 MW to 500 MW, which had a negative effect on both the power balance and the electricity market. After only three months in operation, the new transformer failed on 23 January 2006. As a preventative measure, Energinet.dk has ordered a new transformer for the station on the Danish side.

On 1 December, there was a major disturbance to the Nordic system when a total of 2,610 MW of generated output disappeared from the synchronous system and the frequency fell to 49.23 Hz, subsequently stabilizing at 49.72 Hz after about 30 seconds. This disturbance was caused by a fault in the switchyard at Porjus in Northern Sweden and by sequential faults in Norway

occurring in the wake of this. Proof that Nordic collaboration works well was provided in concrete terms here via the operational efforts of all the Nordic countries, which contributed towards the effects of this being relatively limited.

Important fields of activity during the year have included harmonising balance management and integrating Western Denmark into the regulating power market, collaborating on reserves, a new system for exchanging operating information in the future, a new system for coordinating outages, and joint Nordic training of operating staff.

Balance management in the Nordic area and a common regulating power market

In the work of harmonising balance management, a common Nordic regulating power market is important. On 1 January 2006, this became a reality when Western Denmark was integrated into the joint regulating collaboration.

An evaluation has been done by Nordel's Operations Committee to see whether operational reliability will be affected if the intra-day market, Elbas (balance adjustment), is used throughout the Nordic area. It has been proposed that Elbas should also be introduced in Norway and Western Denmark and that trading can be conducted, at the latest, up until one hour prior to the operational hour.

Coordinated Nordic reserves

A study is currently being conducted into whether a more coordinated Nordic approach to procuring reserves can be obtained. A workgroup has reviewed potential future solutions regarding the holding of reserves, both with regard to frequency controlled reserves and manual reserves. Today, Nordel does not take Nordic socio-economic aspects into account when distributing reserves within the Nordic area.

As regards the frequency controlled normal operation reserve, Nordel's rules dictate that each country must put its own resources at the disposal of the entire system in the event of frequency variations. There is only one limited opportunity for purchasing reserves from neighbouring countries. The models for holding reserves used in the individual countries vary as well. Work in this field has yielded the concept of a future Nordic market as a supplement to national solutions. This is planned to be introduced during 2007.

The need for manually activated reserves, seen from a Nordic perspective, has also been investigated during the year. At present, the requirement for these reserves is independent of whether a country imports or exports electricity or whether there is congestion in the system. Work on a future model for manual reserves takes this into account and paves the way for a part of the reserves being utilized jointly and located where it will be most beneficial. Much investigation work remains to be done in order to produce a coordinated Nordic model, but the Operations Committee is of the opinion that the preliminary proposals are so interesting that they will be developed further during 2006.

Increased operational collaboration between the Nordic countries

Because a functional electricity market places greater demands on collaboration between the TSOs, a lot of work has gone into developing tools for operation and boosting the expertise of operating staff.

A few years ago, a pilot version of a web-based information system, NOIS (Nordic Operational Information System), went into service. NOIS has primarily functioned as an aid for Nordic balance regulation. Experience has shown that a joint information system which provides operating environments with updated information is utterly crucial when planning the operation of the entire Nordic system. During the year, a requirement specification has thus been produced for a system which will contain more detailed operating information. It was completed in 2005 and an investment decision will be made during 2006.

A step towards increased operational collaboration is provided by the new NOPS (Nordic Outage Planning System) software. NOPS is a tool for coordinating outages of facilities within the Nordic area which impact upon other countries. The tool was commissioned during the summer of 2005.

The Operations Committee also launched an enquiry into coordinating the training of operating staff and creating increased understanding of one another's individual operating conditions.

Increased international focus

Collaboration is ongoing between Nordel's Operations Committee and its sister organisation in the UCTE (Union for the Coordination of Transmission of Electricity) and there is agreement that the future holds many challenges. Examples include the increasing amount of wind-power to be managed within the electricity system, the evolution of the "intra-day" market (Elbas), and short-term trading on the interconnectors between the UCTE and Nordel systems.





Events in the individual countries - system responsibility and operation

Denmark
On the Danish grid, there was a series of minor operational disturbances only a few of which impacted upon consumers.

A failure in the cable between the island of Bornholm and Sweden on 22 December meant that the electricity supply to Bornholm was interrupted for two hours. Repairing the cable took a long time. Until it returned to service on 9 February 2006, Østkraft supplied all the power to the island. Together with Østkraft, Energinet.dk is currently analysing Bornholm's security of supply.

To be able to safeguard the electricity supply, Energinet.dk signed agreements during the year concerning, among other things, the delivery of system services in the form of reserves and regulating power. The contractual parties are primarily the two major electricity producers Elsam Kraft and Energi E2, but a number of other minor producers and major consumers are also included in order to safeguard the electricity supply. Energinet.dk also has agreements with system-responsible TSOs in neighbouring countries regarding the delivery of system services.

Energinet.dk entered into a five-year agreement with Energi E2 regarding the delivery of various system services to the Eastern Danish electricity system by auxiliary facilities at Kyndby and the Madsnedø plant.

On 11 March, a reactor caught fire at the transformer station at Hovegaard north-west of Copenhagen. This event did not impact upon the electricity supply. An auxiliary inductor supplied by Svenska Kraftnät has replaced the ordinary inductor until a new one is installed.

A fault in the transformer station at the wind farm at Horns Rev caused the facility to be taken out of service on 14 March.

Finland
Operational reliability was very good and, with the exception of a disturbance on the Fenno-Skan Link, no significant disturbances occurred on the Finnish grid. The total number of disturbances was below average.

New long-term agreements between Fingrid and the market players to maintain operating reserves came into force on 1 January 2005. These agreements include approx. 600 MW of production capacity between 2005 and 2010 and approx. 1,000 MW of load reductions in industry between 2005 and 2015. In doing this, operational reliability will also be safeguarded after the new nuclear power plant at Olkiluoto goes into service.

In consultation with Teollisuuden Voima, Fingrid is building a new 100 MW gas turbine power plant at Olkiluoto. An investment decision was made in June and the power plant is expected to be completed by 2007. The power plant will supplement Fingrid's existing reserve capacity which is used to secure operational reliability during disturbances to the network or power plants.

Extensive work is ongoing to replace 400 kV aluminium pylons with steel ones, thus impacting upon the transmission capacity between Finland and Sweden. Due to the exceptionally warm and wet weather during the early part of the winter, only a limited number of aluminium pylons could be replaced and a significant proportion of the planned work was postponed until 2006. A precondition for being able to replace the pylons is the ground freezing. The disturbance on the Fenno-Skan Link also contributed to this work being postponed.

The transmission capacity between Finland and Russia was utilized almost to the full throughout the year. During the autumn, night-time imports were periodically less. Confidence in electricity imports from Russia fell when RAO UES Federal Grid Company periodically limited imports to Finland by almost 50 % during a cold period at the beginning of 2006. During the cold period a new peak load record was reached in Finland, around 14,800 MW on 20 January 2006.

Iceland
Landsnet is the TSO in Iceland, effective 1 January 2005. Landsvirkjun now owns 70 % of Landsnet, the other owners being Iceland State Electricity and Westfjord Power Company. Landsnet's system encompasses all transmission facilities with tensions of 66 kV and higher.

No serious disturbances have occurred on the Icelandic grid. During the year, however, three faults occurred in the bus bar at 220 kV stations, the reason for this being faults in relay systems and breakers. Operational disturbances also arose in Eastern Iceland in March due to ice on conductors and strong winds when several pylons in the 132 kV and 66 kV systems were destroyed. For the same reason, corresponding operational disturbances also occurred in the Westfjords in September.

Norway
During 2005, few faults leading to consumers being without power occurred at Statnett facilities.

Costs of counter trade were high during the year.

The 300 kV line between Nesflaten and Sauda suffered from a reduced transmission capacity until 22 February 2005 due to problems with jointing sleeves beeing rectified. Another main line in Western Norway, the 300 kV line between Blåfalli and Sauda, was disconnected for a total of 10 days in September due to being damaged by rock debris.

Sweden
The year-high for electricity consumption, 25,800 MW, occurred on the morning of 3 March during the cold snap during week 9. The Fenno-Skan cable and a unit at Ringhals were out of service at the time, but the situation was managed by interrupting maintenance work and starting up backup production and part of the power reserve for a couple of hours.

On Monday 30 May, the grid was under unusually heavy strain as a result of five nuclear reactors being out of service; four for overhaul and one due to an unplanned stoppage. Moreover, the planned restart of one reactor was delayed. The situation was rectified by interrupting maintenance work, and starting up oil-fired condensing production. On 31 May, the second and last reactor at the Barsebäck plant was shut down by Act of Parliament. That entailed a reduction in production of 600 MW in Southern Sweden.

According to the Power Reserve Act, Svenska Kraftnät is responsible for a power reserve of max. 2,000 MW being available each winter until February 2008. Due to previous procurements, agreements for 893 MW had existed already. The year's procurement of 871 MW for the power reserve, ahead of the coming winter, was a breakthrough increasing the proportion of power reductions. These totalled 503 MW and have thus more than tripled in comparison with previous years. This means that the power reserve for the winter of 2005-2006 was 1,994 MW. It is financed via a power reserve fee paid by the balance responsible companies.

Photo: Håkan Flank

Network development

Work carried out on the 119 km long 420 kV power line on the Icelandic west coast. Photo: Emil Thor

Nordel is investing in expanding the capacity of the grid

With the aim of improving the prerequisites for an efficient Nordic electricity market, Nordel has identified five network investments deemed especially important from a Nordic perspective. During the year, various possibilities have been analysed for financing and organising these investments. A bilateral financing model with earmarked congestion revenues has shown itself to be the best and simplest solution in the short-term. The system-responsible companies make investment decisions, implement, and finance the projects, entailing that no major structural or regulation-related changes need to be introduced. Today, the Nordic TSOs are investing € 1,000 million in five prioritized network projects.

During 2005, Nordel's Planning Committee worked with the five network projects and there was close collaboration between the involved TSOs, and with respect to the countries' different decision-making processes. During 2005, it was decided to launch four of the five projects:

- Nea-Järpströmmen. In February 2005, the Board of Svenska Kraftnät decided to construct the line and the agreement was signed regulating how the cost would be distributed between Svenska Kraftnät and Statnett. During the autumn of 2005, work was conducted on the impact assessments, the concession application, and on the choice of system solution for the transformer stations at Nea and Klæbu. Sights are set on submitting the concession application at the beginning of 2006. Commissioning is expected to occur in the autumn of 2009.
- Fenno-Skan 2. In February 2005, Svenska Kraftnät and Fingrid reached a decision about building a second DC interconnector between Sweden and Finland in order to augment transmission capacity. The project commenced during the year and the new interconnector will have a transmission capacity of 600-800 MW. The link will go into service by the autumn of 2010 at the latest.
- Sydlänken (Hallsberg – Skåne). On 25 November 2005, the Board of Svenska Kraftnät decided to construct the interconnector, with commissioning planned for 2011. However, no decision has as yet been made regarding the technical solution.

- Great Belt. The Board of Energinet.dk decided in December 2005 to construct a DC interconnector between Funen and Zealand. Final approval is expected during the autumn of 2006 and the expectations are that the cable will go into service in 2009. The interconnector is socio-economically viable as it will strengthen competition on the single electricity market and give Denmark a more robust and cost-effective electricity supply. The capacity will be 600 MW.
- Skagerrak 4. Analyses regarding the construction of this interconnector are still going on within Statnett and Energinet.dk. The supportive data for making a decision is expected to become available during 2006.

Work is currently ongoing within Nordel to devise a new Nordic network plan with proposals for further investments in the grids that will be of significance to the Nordic electricity market. The new network plan is expected to be completed during 2007.

Other projects

Other network development projects have also been analysed and, of the adopted and ongoing projects, those listed below are the most important:

- The NorNed Link between Norway and the Netherlands. During 2005, TenneT and Statnett started construction of the 580 km long NorNed cable between Norway and the Netherlands. Work is going according to schedule and the aim is to commission the link before the turn of the year 2007/2008.
- Estlink between Finland and Estonia. Nordic Energy Link AS decided in April to construct the 350 MW DC interconnector across the Gulf of Finland. It is the first interconnector linking the Baltics with the Nordic electricity system. The cable will be commissioned at the end of 2006.
- Konti-Skan 1 between Sweden and Denmark. Energinet.dk and Svenska Kraftnät are rebuilding the Konti-Skan 1 DC interconnector in order to boost the transmission capacity between Jutland and Sweden. Rebuilding will boost the capacity from 270 MW to 385 MW. The total capacity of Konti-Skan will thus be 740 MW. According to the schedule, the rebuilt interconnector should have gone into commercial service in October 2005 but has been delayed until July 2006.

On Skagerrak 1 and 2, Energinet.dk and Statnett are additionally planning to replace the control facilities in Denmark and Norway. This replacement, which is being done to increase the lifespan of the entire facility by 20 years, is expected to be completed in 2007.

Short and long term development

The Planning Committee has launched a long-term study to review the Nordic transmission system. The study will include scenarios for the power balance and the electricity market, within Nordel and the rest of Europe, and will demonstrate the potential future need to develop the transmission capacity in the Nordic countries.

Nordel has made a survey of the future power balance three years ahead. Additionally, collaboration has commenced with UCTE and ETSO regarding the power balance 10-years ahead. This work is expected to improve reports regarding the power balance in the future. The forecast for electricity consumption and opportunities for consumption flexibility as a reaction to price signals are important issues in this context. A statistical analysis has commenced in order to find out which opportunities there are for utilizing consumption flexibility. The first analysis is expected to be completed in the summer of 2006.

A new simulation model (SAMLAST) has been developed for the grid and Nordel is supporting its development. This will enable improved analyses of the power system and show, for example which consequences congestion could have on the market and operation of the system.

The Planning Committee is responsible for developing the Nordic Grid Code. Apart from updating and improving the current grid code, a new recommendation regarding the technical connection conditions of wind-power plants is also being developed. The development of new and larger wind-power plants as well as national aspirations to promote the expansion of renewable energy sources are giving rise to the need for such a recommendation. It is expected to be completed during 2006.

The Planning Committee is also responsible for developing the Nordic criteria for system adequacy. The project describes methods and tools for assessing this. While the project is under way, the Nordic authorities concerned will be involved in the process of developing the criteria. The project is expected to be completed at the end of 2006.

Events in the individual countries - network development

Denmark
During the year, Energinet.dk submitted the supportive data for the long-term energy strategy which the Danish government put before Parliament in June. Energinet.dk's contribution related to the future infrastructure of the electricity sector.

A broad political energy settlement from March 2004 means that two new wind-power plants will be built, rated at 200 MW each; one at Horns Rev in Western Jutland and one at Rødsand in Lolland. Energinet.dk will construct the onshore connections which will be completed in May and October 2009, respectively, when the new plants will go into service.

Energinet.dk is planning to rebuild the existing 400 kV line into a twin line between Kassø and Vejen in Southern Jutland. The processing of this matter by the authorities will probably be completed during 2006.

Finland
A new 400 kV line between Toivila and Vihtavuori in Central Finland went into service in December. The length of the line is 86 km.

The rebuild of the 400 kV station at Salo in Southwestern Finland was completed and a new 400/110 kV transformer went into service.

Development of the networks and stations required by the new nuclear power plant at Olkiluoto commenced during the year and the 400 kV network is being augmented by new 200 km lines.

Fingrid, in collaboration with its network customers, has carried out substantial surveys of the regional 110 kV networks over the entire country. The objective has been to systematically survey and coordinate the development requirements of the regional networks and the customers' own networks.

Iceland
During the year, construction work on power lines continued in connection with the new power plant at Karahnjukar and the aluminium plant in Eastern Iceland. The voltage will be 420 kV and the lines will each be 50 km long. During the year, work has also been carried out on the 119 km long 420 kV line which will enable the aluminium plant on the west coast of Iceland to boost its output during 2006.

Norway
During 2005, Statnett carried out extensive construction work in Central Norway. Two new stations are being built in the Molde area as well as an approx. 100 km long 420 kV line which will connect these with the grid in Viklandet in order to supply electricity to the Ormen Lange plant. These developments will be completed during 2006.

Sweden
Of the five major developments proposed by Nordel, three concern Sweden. These are the new interconnectors Nea-Järpströmmen, Fenno-Skan 2 and Sydlänken. Work on these projects is ongoing, as is the rebuilding programme concerning important stations on the grid, which Svenska Kraftnät initiated following the outage in September 2003. Svenska Kraftnät is also continuing to modernise the grid's telecom network by means of developments of the fibre-optic network.

During the autumn, the results of the first stage of the Stockholms Ström project were presented. Svenska Kraftnät is proposing a major rebuild of the electricity supply to Stockholm in order to improve both the security of supply and the environment. It is anticipated that around 150 km of power lines in the Stockholm area will be able to be decommissioned due to these measures. Investment is estimated to amount to approx. € 350 million, mainly for measures affecting the grid.

Poles are set in place on the west coast of Iceland. Photo: Emil Thor

Important events during the year

1 January

- Trading in emission rights commences within the EU.
- Landsnet in Iceland becomes the TSO with Thordur Gudmundsson as its Director General.
- Iceland launches its regulating power market.
- The obligation to buy relating to wind-power production is withdrawn in Denmark.
- Long-term agreements regarding operating reserves come into force in Finland.

6 January

The Danish state assumes ownership of Eltra, Elkraft System and Elkraft Transmission.

8-9 January

Hurricane Gudrun hits Denmark and Southern and Western Sweden. The grid copes well but thousands of homes are without electricity.

25 January

A fault in a breaker at the 420 kV substation at Tegneby in Norway reduced the trading capacity towards Sweden at Hasle for two weeks.

15 February

Fingrid makes an investment decision regarding Fenno-Skan 2, which augments the transmission capacity between Finland and Sweden.

17 February

Construction licence is granted for the new nuclear power plant, Olkiluoto 3, Finland's fifth.

18 February

Svenska Kraftnät decides to construct Fenno-Skan 2. A decision is also made to construct the Nea-Järpströmmen interconnector.

28 February

Nordel submits its report "Enhancing Efficient Functioning of the Nordic Electricity Market" dealing with improved Nordic collaboration on the electricity market. The report is a result of the meeting held in the summer of 2004 in Iceland at which the Nordic energy ministers requested proposals regarding how the Nordic electricity market could further be improved.

1 March

Peder Østermark Andreasen takes over as CEO of the four companies Eltra, Elkraft System, Elkraft Transmission, and Gastra, which jointly form the new company Energinet.dk.

19 April

Nordic Energy Link AS makes an investment decision to construct Estlink.

28 May

From 28 May until 26 October, the main transformer for Skagerrak 3 between Jutland and Norway is out of operation and the trading capacity is halved during this period from 1,000 to 500 MW.

31 May

The second and last reactor at Barsebäck nuclear power station is shut down by Act of Parliament.

1 June

DONG and Vattenfall enter into agreements regarding Vattenfall taking over considerable parts of Energi E2's and Elsam's power plants and wind-power plants. In return, DONG takes over Vattenfall's stock in Elsam and its stake in reactor 2 of the Avedøre plant.

14 June

Nordel holds its annual meeting at Reykholt, Iceland.

17 June

The Danish government presents its long-term energy plan Energy Strategy 2025.

23 June

The Danish Competition Authority terminates the agreement with Elsam which regulates that company's activities on the Western Danish electricity market.

1 July

Svenska Kraftnät assumes the system responsibility for the natural gas market in Sweden.

10-11 August

The Nordic energy ministers meet at Narsarsuaq in Greenland where they discuss, among other things, the evolution of the Nordic electricity market.

24 August

Energinet.dk - the new state-owned system-responsible national TSO for both electricity and gas in Denmark – is formally established with a retroactive start-up date of 1 January 2005.

8 November
A power seminar is arranged by Svenska Kraftnät, the Swedish Energy Agency and Swedenergy to discuss the responsibility for ensuring sufficient power resources after 2008.

25 November
Svenska Kraftnät decides that Sydlänken, an interconnector between Hallsberg and Skåne, is to be constructed.

28 November
Eastern Denmark experiences its highest ever electricity spot prices. During the early afternoon, the price hits DKK 13,500 per MWh.

30 November
The Danish Competition Authority rules that Elsam has abused its market power by overcharging. The authority rules that Elsam must put a cap on its Nord Pool Spot prices.

1 December
A disturbance on the 400 kV network was caused by a faulty breaker in the switchyard at Porjus in Northern Sweden. No consumption in Sweden was affected by this disturbance, but parts of Northern Norway were briefly without electricity.

8 December
The Board of Energinet.dk decides to construct a 600 MW DC cable across the Great Belt.

21 December
Landsnet purchases 93.5 % of Iceland's transmission network and pays, in among other ways, using stock in Landsnet.

1 January 2006
The electricity market in Iceland is opened fully.

Fingrid and Svenska Kraftnät cease keeping accounts of, as well as issuing, RECS certificates and relinquish their role as members of the Association of Issuing Bodies (AIB). Statnett and Energinet.dk, however, continue to take part in this collaboration.

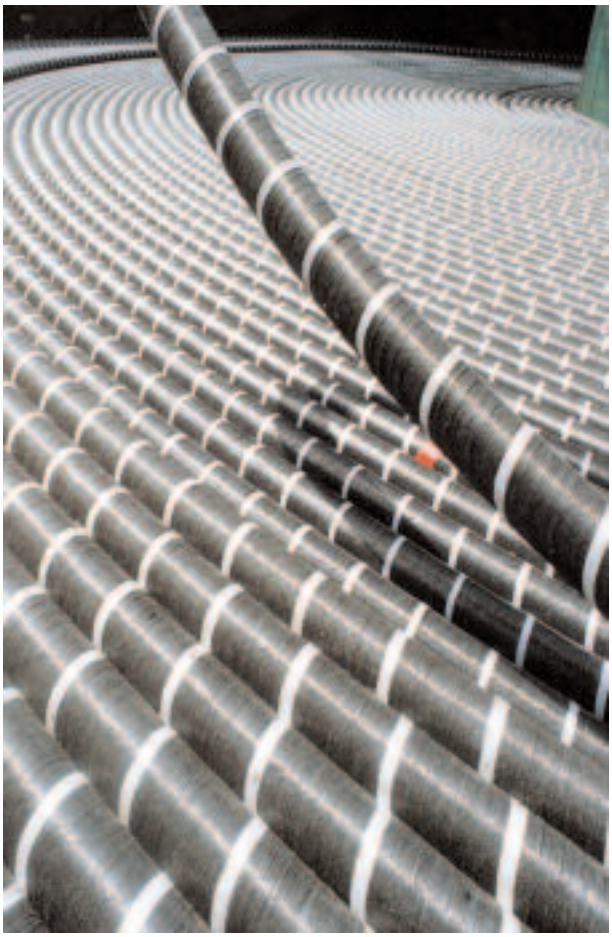


Photo: Trond Isaksen

Development and integration of regional electricity markets

In 2004, the European Commission presented its strategy document "Medium-term vision for the internal electricity market". The integrated internal electricity market is to be gradually achieved by establishing and further developing a number of regional markets. The Nordic region is put forward as a good example of an existing regional electricity market, even though there is scope for further harmonisation.

Intensive efforts are currently ongoing within the EU to create regional electricity markets. During 2005, the European Commission organised a number of mini-fora dealing with congestion management on regional markets. Congestion management within Northern Europe (the Nordic countries plus Poland and Germany) was discussed at the beginning of 2005 at one such meeting in Helsinki.

ERGEG (European regulators group for electricity and gas) presented in February 2006 its final report on the creation of regional electricity markets. Additionally, the European Commission also presented in February 2006 a preliminary report on its ongoing survey of the electricity and gas markets.

As a contribution towards continued European endeavours to develop and integrate regional electricity markets, Nordel comments in this article on the important prerequisites required for success in this work and how this work has been conducted within Nordel.

A long development process

Nordel was established in 1963 as the collaboration organisation of the major Nordic electricity companies. The principles and rules for operating the pan-Nordic electricity system and augmenting the transmission links between the countries have constituted key issues for Nordel.

Iceland is not physically connected to the other Nordic countries but still participates in Nordel collaboration. As of 2006, all electricity consumers in Iceland now have the opportunity to choose their electricity supplier. A separate TSO, Landsnet, started its operations in 2005.

As early as the 1960s, an important issue for Nordel was establishing trading principles that would lead to the Nordic power plants being utilized cost-effectively. Within the individual countries too, there was extensive trading in order to optimise production. Joint operation between the power systems of Sweden and Finland started back in 1959 when the first major transmission line between Northern Finland and Northern Sweden went into service. Two further jointly operated transmission lines subsequently went into service between Sweden and Norway in 1964. Negotiations were entered into between Sweden and Denmark and in 1965, a DC interconnector went into service between Western Sweden and Jutland, in further contact with the Hamburg area. The principles governing the exchange of temporary power within and between the countries led to variable

Nord Pool's products

On Nord Pool's auction-based **spot market, Elspot**, physical hourly contracts are traded which cover the day ahead. The Nordic area is normally divided into six different bidding areas which obtain a common price or different area prices depending on whether or not the transmission capacity between the areas is sufficient. This means that trading in energy and transmission capacity occurs simultaneously. In this manner, power will always flow into the area that has the greatest willingness to pay. Auction markets with congestion management corresponding to the management practiced by Elspot are defined by the EU as implicit auctions with market splitting.

Within Nord Pool, there is also an **adjustment market (Elbas)** for Finland, Sweden, and Eastern Denmark. Nordel has now recommended that Elbas should also be launched in Norway and Western Denmark. Elbas is a market for continuous trading in physical hourly contracts. It opens after Elspot and then continues until the hour prior to the operational hour. In this way, the players get the opportunity to adjust their trade when unexpected events occur after the spot market has closed.

On Nord Pool's **financial market**, financial contracts are traded for different periods of time, from the current year and up to three years in advance. The financial market also includes options and contracts for differences which entail that differences between area prices and system prices can be hedged. Nord Pool also offers the possibility of clearing bilateral financial contracts.

production costs being minimised and an environment conducive to power trading becoming established in the Nordic area.

The world's first international power exchange, Nord Pool, was created in 1996 when the Norwegian power exchange, which had been established in 1993, was extended to include Sweden. Nord Pool was later extended to include Finland (1998), Western Denmark (1999), and Eastern Denmark (2000). The products offered by Nord Pool are spot trading, financial trading, and adjustment trading after spot trading has closed. These products are described in the fact file below.

The electricity spot trade's share of the total electricity consumption in the Nordic area was 44% during 2005, while the financial trade (including cleared bilateral contracts) was 5.5 times greater than the total electricity consumption. In total, over 400 players trade on Nord Pool, either directly or via a trading representative.

The interaction between adjacent markets

The Nordic electricity market is interconnected with Germany, Poland, and Russia via transmission links, see the map below.

The total trade between the Nordic area and its adjacent markets amounted to 28 TWh during 2005. In order to utilize the various links, different principles apply. These are described in the fact file below.

Additionally, two new links between the Nordic area and its adjacent markets have been decided upon and are under construction. These are:

Estlink between Finland and Estonia, which goes into service at the end of 2006. The European Commission has approved the exemptions from the ordinance on

Transmission lines between the Nordic and the neighbouring countries.

cross-border electricity trading regulation and the electricity market directive that were granted to the project by the Finnish and Estonian energy market authorities. Among other things, these exemptions mean that the owners can dispose existing capacity and that the project may be financed under commercial terms and conditions in accordance with the principle of "use it or loose it". At a meeting in February 2006, the Prime Ministers of the three Baltic States declared their intention to make common efforts necessary measures to fully integrate the Baltic electricity market and to harmonise it with Nordic market rules by 2009. The objective is that Estlink will subsequently be accessible to all market players.

NorNed, between Norway and the Netherlands, was finally adopted by the two countries' TSOs Statnett and TenneT when they obtained licence from each respective country's energy market authority in December 2004. The cable will be 580 km long and will be the longest submarine cable in the world when it goes into service at the turn of the year 2007/2008. The agreement between Statnett and TenneT is based on the principle of all expenses and revenues being shared equally. The capacity of the interconnector will be put at the disposal for a market coupling between the spot markets of the two power exchanges APX and Nord Pool. This will be the first market coupling between Nord Pool and another power exchange. This market coupling will ensure that the flow of power across the interconnector will always be in the right direction.

Important prerequisites

The European energy regulators (ERGEG) presented in February 2006 their final report on creating regional energy markets. This report describes the key areas for enabling regional energy markets to develop further, which will also affect the evolution of the Nordic electricity market. These areas are commented below. The report emphasizes, for instance, how important market compatibility is and goes on to identify a number of areas which should be prioritised so that regional energy markets may be created.

Good conditions for power trading are absolutely crucial when it comes to creating regional energy markets because it is the trade in power which is the very motor and driving force behind the market developing and integrating. A well functioning regional energy

Principles for utilizing the interconnectors

Fingrid has an annual routine whereby the coming year's trading capacity on the import interconnectors from **Russia** can be reserved by a certain date. Fingrid confirms these reservations upon receiving confirmation of them from the Russian TSO. Fingrid publishes, on its website, the names of the companies that have reservations and how large these are.

SwePol Link connects **Sweden and Poland** and is owned by SwePol Link AB, which has a long-term agreement with Vattenfall and which also publishes a tariff for an one-year subscription of 50 MW. Svenska Kraftnät owns 51 %, Vattenfall 16 % and Polskie Sieci Elektroenergetyczne 33 %.

Baltic Cable between **Sweden and Germany** is owned by Baltic Cable AB, which in turn is two thirds owned by Statkraft and one third owned by E.ON Sweden. The owners have priority access to the interconnector. Baltic Cable publishes a tariff specifying the terms and conditions for day and hour subscriptions when free capacity exists.

The capacity between **Western Denmark and Germany** is provided via annual, monthly and daily auctions. The daily auctions relate to any remaining capacity (including any capacity from annual or monthly auctions which a player chooses not to utilize for a specific hour). The auctions are organised by the auction office at E.ON Netz on behalf of Energinet.dk and E.ON Netz.

The capacity of Kontek between **Eastern Denmark and Germany** is provided in accordance with a new principle which came into effect in October 2005. Nord Pool then opened a new bidding area "Kontek" which relates to Vattenfall Europe Transmission's area in Germany. At the same time, the capacity auctions organised by Energinet.dk ceased. Effective January 2006, all capacity on Kontek is provided via Nord Pool's spot market. This new principle means that for the first time there is partial interlinking of the Nordic and German markets using the same mechanism for congestion management as the one used on the Nordic market.

market pre-requires that the physical and financial markets work and that there is trust in the price formation. The conditions for trading depend on how the TSOs organise their system, balance and transmission services. It is also important that all players have equal access to information and that no company has the possibility of abusing market power; that there is real competition in the market. For the market to be effective, it is also important that the price elasticity of demand is directly able to influence the price of electricity by means of, for instance, consumers with high levels of consumption participating directly in power trading. When different markets are integrated, it is important that there is reciprocity between these markets and smoothly functioning routines for joint planning and operation.

One important part of the conditions for power trading is the rules governing **balance regulation and the settlement of imbalances**. Since September 2002, there has been a common regulating power market in the synchronous Nordic power system and, on 1 January 2006, Western Denmark was included in the Nordic regulating power collaboration. One prerequisite for implementing a regulating measure in another subsystem is that there is free transmission capacity in the relevant operating situation. The prerequisites for joint Nordic balance settlement are currently being studied by Nordel and NordREG (Nordic energy regulators).

Equal access to information has been a key issue in the development of the Nordic exchange-based trade. On Nord Pool's website, prices, volumes, capacities, power flows, and other market data are easily accessible to all players on the electricity market. All players wishing to trade on Nord Pool have to sign an agreement specifying the player's duty to provide information to the market. Information about changed circumstances relating to transmission facilities is also reported in the same way directly to the market.

To achieve an efficient electricity market, it is crucial that market-based solutions are applied for **congestion management**. The principles applied in the Nordic area entails simultaneous trading in both energy and transmission capacity. This consequently enables the available transmission capacity to be utilized optimally and the power flow across an interconnector to always be in the right direction, according to the price signal. When utilizing the various interconnectors between the Nordic area and its adjacent areas, different rules apply and on many occasions, the power flow on a link has been in

Photo: Trond Isaksen

the wrong direction, i.e. from a high price area to a low price one. A market coupling between Nord Pool and the APX power exchange in the Netherlands will mean that the power flow between the exchanges is always in the right direction.

To ensure the dynamic development of the electricity market, it is crucial that **investments be made in new transmission links** when these are socio-economically justifiable. Investments in interconnectors bring an extra challenge as they involve several TSOs as well as several regulators. In the spring of 2004, Nordel agreed on an investment programme encompassing five projects in order to augment the Nordic transmission network by 2010. The total investment cost is estimated at € 1,000 million. The basis for the decision was a joint analysis and evaluation of the benefit provided by different network augmentations. The evaluation was carried out using six different criteria as a departure point.

Nordel intends to further develop periodic collaboration concerning system development plans in order to ensure an efficient market and an operationally reliable electricity system. The next step for these analyses is to establish the forms of a joint analysis and evaluation of new links, between the Nordic area and its adjacent countries as well as internally within the Nordic area. As a basis for the analyses, Nordel is developing joint scenarios where new links are analysed and evaluated. The links that have so far been implemented are all the result of bilateral collaboration.

Extensive work is being carried out to develop the Nordic market even further. In the winter of 2005, Nordel presented a report on those tasks within the system responsibility that are market-related and may have an effect on the functioning of the electricity market. In the report "Enhancing Efficient Functioning of the Nordic Electricity Market" proposals were put forward regarding how the Nordic electricity market could be further strengthened.

The vision that the Nordic energy ministers have agreed for the Nordic electricity market is: "A borderless Nordic market trading effectively with the outside world." At a meeting in August 2005 in Greenland, the ministers decided to give Nordel and the Nordic energy market authorities the task of reviewing the regulations. The ministers pointed out that a borderless Nordic electricity market pre-requires the continued harmonisation of the regulations and that open markets and equal market conditions are crucial for enabling the vision to be achieved.

Structural issues of significance

In February 2006, the European Commission provided details of a preliminary report from the inquiry into the electricity and gas markets of Europe. The report highlights the distortions of competition in the markets and specifies five main barriers to a fully functioning internal energy market:

- Vertical integration i.e. when companies conducting competitive operations as well as monopolistic operations make it difficult for new players to enter the market.
- Lack of market integration in Europe is reducing the level of competition which cross-border trade can bring about.
- Lack of transparency hinders competition on equal terms and undermines confidence in the power trade.
- Complex price information and limited trust in the price formation.
- High levels of market concentration provides scope for exercising market power and makes it difficult for new players.

In the Commission's report, market concentration is the major problem and it is emphasized that future merger cases has to be meticulous scrutinized. Each merger case is to be assessed according to its specific characteristics but the inquiry into the electricity and gas markets contributes towards identifying the most relevant criteria and the most efficient remedies. It is pointed out that the major challenge when creating an inner market for electricity lies in formulating an energy policy and a proactive competition policy which will result in an actual combination of concrete steps aimed at further integrating national and regional electricity markets and measures that reduce market concentration. Increased market integration also increases companies' driving forces vis-à-vis mergers and acquisitions. If these driving forces are not managed, it is uncertain whether an efficient electricity market can really be achieved as this presupposes real competition.

According to the Commission, the inquiry points out that a real breakthrough towards effective competition will not be possible unless the root causes of market malfunctioning are addressed. The final report from the enquiry will be published at the end of 2006.

The Swedish Energy Markets Inspectorate has also analysed, commissioned by the Swedish Government, the functioning of the electricity market with the emphasis on competition and price formation. In its

Photo: Trond Isaksen

March 2006 report, it points out that competition on the Nordic electricity market, from a European perspective, is relatively good but that it should be improved. The Inspectorate's assessment is that the increased level of concentration due to mergers and acquisitions has now reached such a level that even when there is a single Nordic market, the market concentration is no longer unproblematic. The competitive situation on a single German-Nordic electricity market should also be monitored.

The five barriers to a well functioning market

In the Nordic area, too, there are **problems with vertical integration**. Two factors have, however, reduced the problem. One of these factors is that all of the Nordic countries have established independent TSOs which are not parts of vertically integrated groups of companies. One consequence of this is that the Nordic TSOs not only focus on the electricity system's operational reliability and ensuring there is no discrimination but also on the functioning of the market and on promoting competition. The way in which the TSO establishes rules and designs the electricity market's various processes can be crucial for the dynamic evolution and the confidence in the market and price formation. Such a widening of the definition of the system responsibility should be of significance to the development of the market in other countries as well.

The second factor that has reduced the problem in the Nordic area is the evolution of the financial market. The financial market enables risk management for the various electricity market players as producers and retailers. If there is no smoothly functioning financial market, then risk management will occur via bilateral agreements between the various stages of the power value chain. Companies which are vertically integrated will gain, in such situations, a competitive advantage by being able to coordinate their production and sales. On the Nordic electricity market, however, it can be observed that the vertically integrated companies are increasingly conducting their production and retail activities as independent businesses. The managements of these compa-

nies have gradually realized that they will not obtain a better overall economy if they have other internal prices between production and retail than the exchange price of electricity. Instead, the production and retail businesses are now instructed to optimise operations on the basis of spot prices and the risk management opportunities that the financial markets offer.

In the Nordic area, there is also **incomplete market integration**. During the wet year of 2005, the Nordic area was a single price area for only 32 % of the time due to congestions between different areas. Often, however, there is only one area within the Nordic area that has a separate price while the others have a joint price. One explanation as to why more congestion arose during 2005 than during 2004 is that the increased level of exports to Germany resulted in an increased level of power transmissions through the Nordic area. When there is congestion, market concentration within the different price areas increases in comparison with when there is a single Nordic market. On the other hand, the simultaneous trade in energy and transmission capacity means that the competitive pressure which can be obtained from cross-border trade is fully utilized. Neither is there any difference between dominant and new players as regards the possibility of gaining access to limited transmission capacity.

If a market coupling is used between Nord Pool and the power exchanges of adjacent countries when there is limited transmission capacity, the situation will be better than with current management. A market coupling between Nord Pool and APX in the Netherlands will arise when the new NorNed link goes into service at the turn of the year 2007/2008. It would also be beneficial to have a market coupling between Nord Pool and EEX in Germany for the transmission capacities between the Nordic area and Germany. When the existing long-term power agreements between Polish producers and PSE terminate, it will also be of interest to have a market coupling between Nord Pool and the Polish power exchange Gielda Energii regarding the transmission capacity on the SwePol Link.

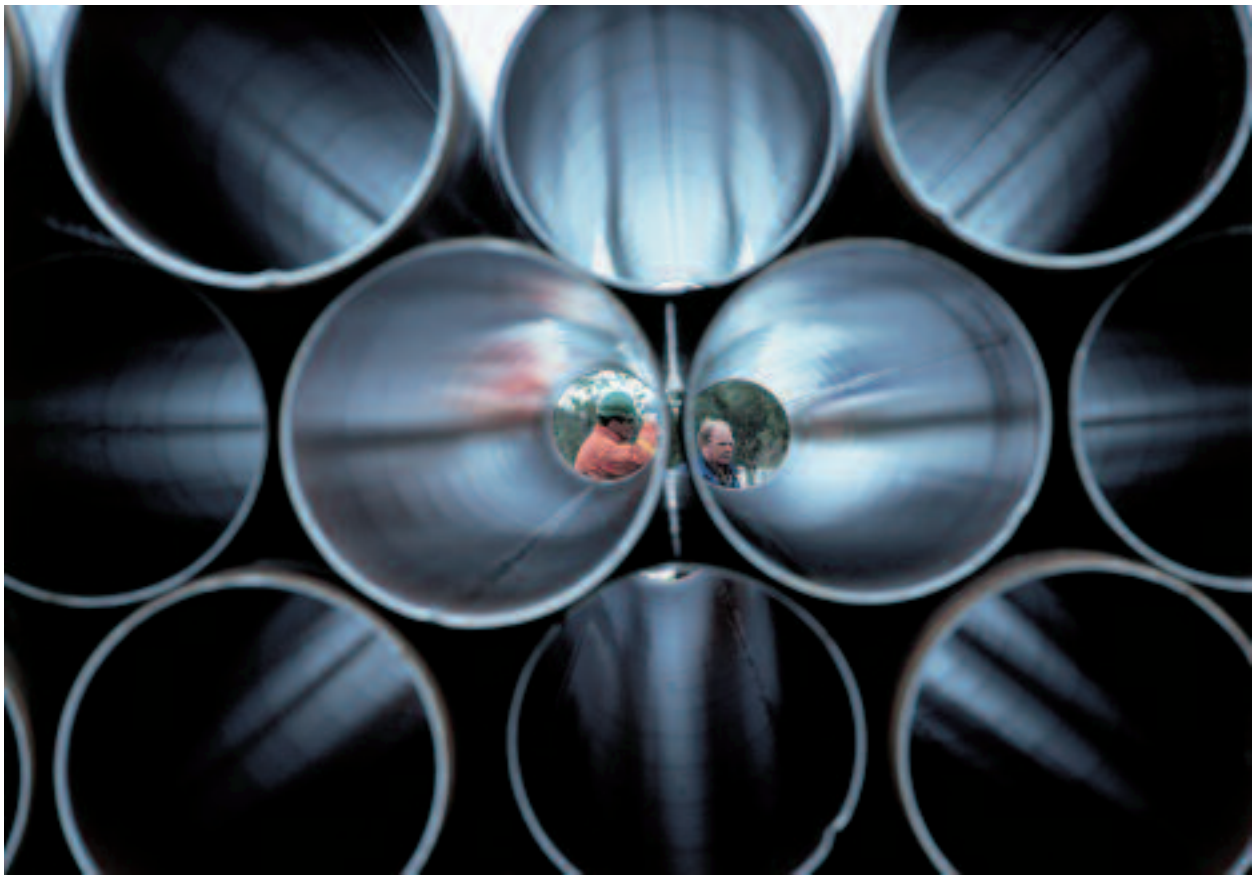
The European Commission emphasizes that improved **transparency** will reduce the players' risks and the obstacles to new players entering the market, as well as increasing both confidence in the wholesale market and in the price formation. That the players have equal access to information has been of great significance in the evolution of the Nordic electricity market.

Within the Nordic area, Nord Pool publishes its market information on its website, www.nordpool.com. A player may not conduct trade if he is aware of events included in the duty to inform and which have not yet been communicated to all players on the market. Information about changed circumstances relating to transmission facilities is also reported in the same way directly to the market.

As an example of complex pricing, the European Commission points out that analysts cannot yet agree on the extent to which the new emissions trading scheme has affected electricity prices or what role increases in fuel prices have had for the price development. In order for competitive markets to emerge, according to the Commission, it is a problem that regulated and free market prices co-exist on certain national markets. It is further pointed out that a number of member states are considering special measures to reduce electricity costs for large energy-intensive users, although state aid rules limit the scope of such measures.

It is important for the evolution of the market that there is trust in the **price formation**. In the Nordic area, too, the development and mechanisms of the electricity price have been under discussion. The Energy Markets Inspectorate in Sweden has analysed the functioning of the electricity market with the emphasis on the competition and the price formation. In its March 2006 report, it assesses that the price formation in the electricity market works well technically. The price increases of recent years can primarily be explained by increased fuel prices and the new emissions trading scheme. However, it is stressed that the consequence has been an extensive financial redistribution whereby the electricity user suffers increased costs and the electricity producer enjoys greater profits. The Inspectorate emphasizes that if this redistribution is a political problem that should be rectified, then political solutions should be chosen which will reduce it without impairing the efficiency of the wholesale market. Furthermore, it is stressed that the competitiveness of energy-intensive industry is not just a Swedish or Nordic issue, but also a European one.

The Commission states that the majority of wholesale markets have remained national, with a high **market concentration** i.e. few producers, allowing scope for the exercise of market power. With only a few exceptions, it is the case in each member state that the three largest producers have a joint market share exceeding 75 %. To this is added the fact that the largest companies



A glimpse of the world of natural gas. Photo: Søren Svendsen

also have subsidiaries in other markets and that there is growing consolidation on the European level.

The continuing process

The mini-fora arranged within the different areas of Europe have been an effective way of working. In the report by the ERGEG, it is proposed, for instance, that this work should continue as it has proven to be a good platform through which different players can meet and discuss joint issues. Several countries are potentially included in more than one regional market which indicates that there is everything to gain from coordinating resources.

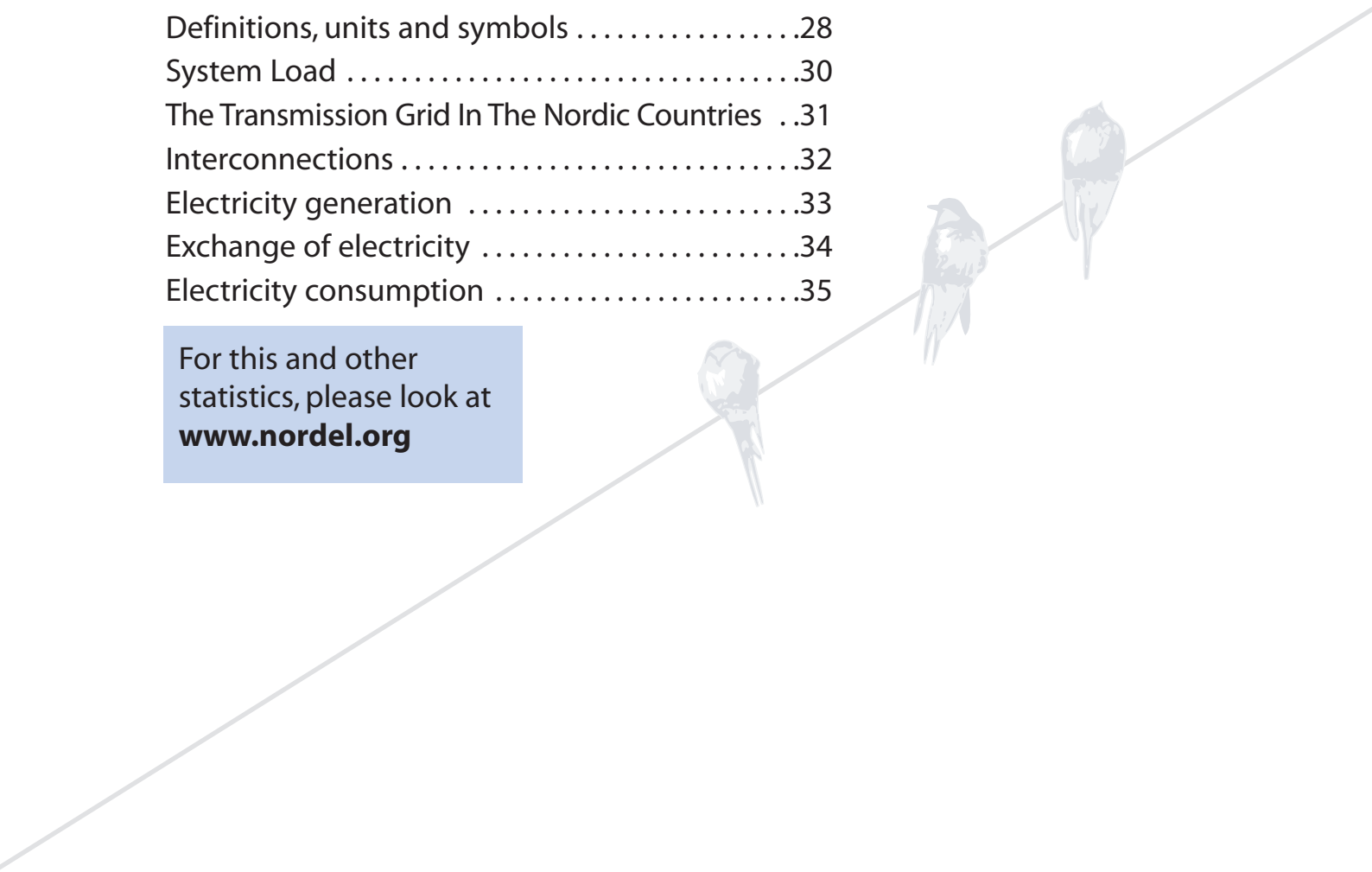
The EU's ongoing inquiry into the electricity and gas markets indicates that the current market concentration is a major problem. This means that a proactive competition policy is required and that the EU's Competition Directorate-General and the national competition authorities also play crucial roles in the continuing process of developing and integrating regional energy markets.

The system-responsible TSOs will continue their joint efforts to harmonise and develop the market design, both within Nordel and internationally through ETSO and other organisations. It is clear that the governments and authorities of the different countries will have an increasingly important role to play in the harmonisation work since legal provisions will have to be coordinated between the countries.

Author: Björn Hagman, Hagman Energy AB at the request of the Market Committee of Nordel.
Editors: Liasion Group of Nordel

Statistics

For this and other statistics, please look at **www.nordel.org**



Definitions, units and symbols

Units and symbols

kW	kilowatt
MW	megawatt = 1,000 kW
GW	gigawatt = 1,000 MW
J	joule
kJ	kilojoule
PJ	petajoule = 10^{15} J
kWh	kilowatt-hour = 3,600 kJ
MWh	megawatt-hour = 1,000 kWh
GWh	gigawatt-hour = 1,000 MWh
TWh	terawatt-hour = 1,000 GWh
~	Alternating current (AC)
=	Direct current (DC)
–	Data are nonexistent
..	Data are too uncertain
0	Less than 0.5 of the unit given

Calculation of the electricity consumption

Electricity generation
\+ Imports
\- Exports

= Total consumption
\- Occasional power to electric boilers

= Gross consumption
\- Losses, pumped storage power etc.

= Net consumption

Gross electricity consumption

The sum of domestic generation and imports minus exports and occasional power to electric boilers; usually expressed in GWh.

Gross system load corrected vs. temperature

Electricity consumption at normal temperatures corrected for yearly temperature variations.

Electricity generation (net electricity generation)

The output of a power plant, excluding the plant's own consumption; usually expressed in GWh. Registration of generation is referred to where the power plant is physically located.

Exchange of electricity

The monthly sums (in GWh) of the physically registered MWh values for each connection between the individual countries, per hour of exchange.

Installed capacity (net capacity)

The sum of the rated capacities of the individual power plant units (expressed in MW), excluding the power plant's own consumption of electricity (exclusive heat production).

Generation of condensing power

Generation at a conventional steam power plant where the energy of the steam is used solely for electricity generation and where the steam is condensed to water after the turbine.

Net electricity consumption

The sum of the energy used by consumers of electricity; usually expressed in GWh.

Transmission capacity

The power (in MW) that a highvoltage line can transmit under normal conditions, taking into account any limitations that may be imposed on the rated capacity.

Pumped storage power

The electricity used for pumping water up to a reservoir, for the generation of electricity later on; expressed in GWh.

Losses

The difference between gross consumption and net consumption plus pumped storage power; usually expressed in GWh.

Occasional power to electric boilers

Expressed in GWh, this refers to the supply of electricity to electric boilers on special conditions for the generation of steam or hot water, which may alternatively be generated using oil or some other fuel.

Total consumption

The sum of electricity generation and net imports, expressed in GWh.

Combined heat and power (CHP) generation

Generation at a steam power plant where some of the energy of the steam is used for electricity generation and some for another purpose, e.g. for district heating or as process steam for industry. Previously known as backpressure generation.

Biofuel

Wood waste, industrial wood fuels, black liquor and pitch oil, wood fuels as wood waste or saw dust, biogas, straw, animal wastes and litter, bio oil.

Other renewable power

Wind power, waste and geothermal power.

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System load

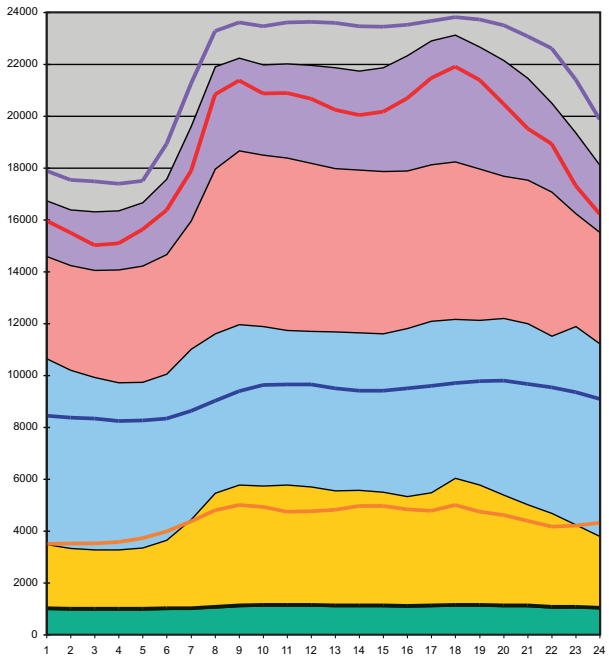
S5 Maximum system load for each country in 2005 [1)]

	MWh/h	Date/time
Denmark - West	3,698	05.11.29 05.00 - 06.00 pm
Denmark - East	2,619	05.01.25 05.00 - 06.00 pm
Finland	13,500	05.01.28 07.00 - 08.00 pm
Iceland	1,162	05.01.18 08.00 - 09.00 am
Norway	21,401	05.03.02 08.00 - 09.00 am
Sweden	25,800	05.03.03 08.00 - 09.00 am

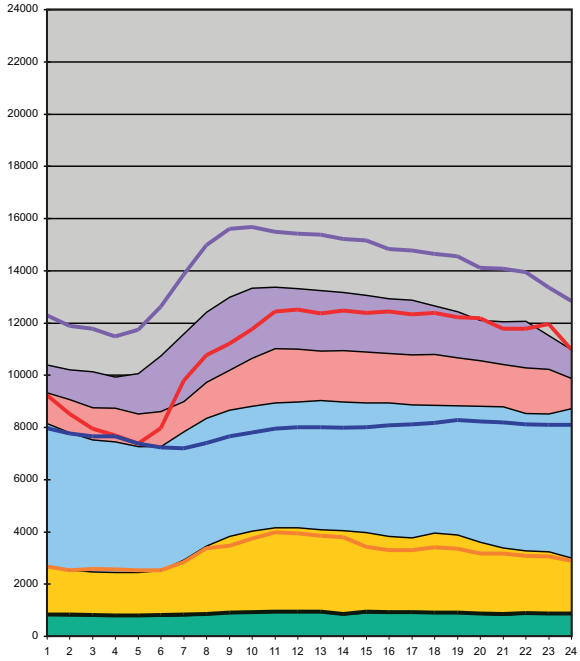
[1)] The system load is not corrected vs. temperatures and is local time

System load 3rd Wednesday in January and in July 2005

Average 24-hour load
3rd Wednesday in January (05.01.19) MWh/h



Average 24-hour load
3rd Wednesday in July (05.07.20) MWh/h



Sweden **Norway** **Finland** **Denmark** **Iceland**

Prod-Sweden **Prod-Norway** **Prod-Finland** **Prod-Denmark** **Prod-Iceland**

Maximum system load 3rd Wednesday in January and in July 2005

	3rd Wednesday in Jan 2005 5:00 - 6:00 PM - MWh/h	3rd Wednesday in July 2005 12:00 - 01:00 PM - MWh/h
Denmark	6,033	4,081
Finland	12,167	9,026
Iceland	1,106	911
Norway	18,238	10,931
Sweden	23,127	13,236
Nordel	60,671	38,185

All hours are local time

The Transmission Grid In The Nordic Countries

Interconnections

S6 Existing interconnections between the Nordel countries

Countries/Stations	Rated voltage/kV	Transmission capacity as per design rules[1] MW		Total length of line km	Of which cable km
Denmark West - Norway		**From Denmark**	**To Denmark**		
Tjele-Kristiansand	250/350=	1,000	1,000	240/pol	127/pol
Denmark East - Sweden		**From Sweden**	**To Sweden**		
Teglstrupgård - Mörarp 1 and 2	132~	1,350	1,750	23	10
Gørløsegård - Söderåsen	400~			70	8
Hovegård - Söderåsen	400~			91	8
Hasle (Bornholm) - Borrby	60~	60	60	48	43
Denmark West - Sweden					
Vester Hassing - Göteborg	250=	290	270	176	88
Vester Hassing - Lindome	285=	380	360	149	87
Finland - Norway		**From Finland**	**To Finland**		
Ivalo - Varangerbotn	220~	100	100	228	-
Finland - Sweden		**From Sweden**	**To Sweden**		
Ossauskoski - Kalix	220~	1,600[2]	1,200[2]	93	-
Petäjäskoski - Letsi	400~			230	-
Keminmaa - Svartbyn	400~			134	-
Rauma - Forsmark	400=	550	550	235	200
Tingsbacka (Åland) - Senneby	110~	80	80	81	60
Norway - Sweden		**From Sweden**	**To Sweden**		
Sildvik - Tornehamn	132~	1,000[4]	1,300[3,4]	39	-
Ofoten - Ritsem	400~			58	-
Røssåga - Ajaure	220~			117	-
Nea - Järpströmmen	275~			100	-
Linnvasselv, transformator	220/66~	50	50	.	-
Lutufallet - Höljes	132~	40	20	18	-
Eidskog - Charlottenberg	132~	100	100	13	-
Hasle - Borgvik	400~	2,150[4]	2,150[4,5]	106	-
Halden - Skogssäter	400~			135	-

[1] Maximum permissible transmission.

[2] In certain situations, the transmission capacity can be lower than the limit given here.

[3] Thermal limit. Stability problems and generation in nearby power plants may lower the limit.

[4] The transmission capacity can in certain situations be lower, owing to bottlenecks in the Norwegian and Swedish network.

[5] Requires a network protection system during operation (generated tripping).

Interconnections

S7 Existing interconnections between the Nordel countries and other countries

Countries/Stations	Rated voltage/kV	Transmission capacity/MW		Total length of line/km	Of which cable/km
Denmark West - Germany		**From Nordel**	**To Nordel**		
Kassø - Audorf	2 x 400~	1,200	800[3]	107	-
Kassø - Flensburg	220~			40	-
Ensted - Flensburg	220~			34	-
Ensted - Flensburg	150~	150	150	26	5
Denmark East - Germany					
Bjæverskov - Rostock	400=	600	600	166	166
Finland - Russia		**From Nordel**	**To Nordel**		
Imatra - GES 10	110~	-	100	20	-
Yllikkälä - Viborg [2]	2 x 400~	-	1,400	2 x 67	-
Kymi - Viborg [2]	400~			132	
Nellimö - Kaitakoski	110~	-	60	50	-
Norway - Russia		**From Nordel**	**To Nordel**		
Kirkenes - Boris Gleb	154~	50	50	10	-
Sweden - Germany		**From Nordel**	**To Nordel**		
Västra Kärrstorp - Herrenwyk	450=	600[1]	600[1]	269	257
Sweden - Poland		**From Nordel**	**To Nordel**		
Stärnö - Slupsk	450=	600	600	256	256

[1] The transmission capacity is currently limited to 460 MW from Nordel and 390 MW to Nordel due to limitaion in the German network.

[2] Back to Back HVDC (+85 kV =) in Viborg and synchronous operation of NWPP power plant.

[3] The transmission capacity to the north is limited to 800 MW due to internal restrictions in Denmark West.

Electricity generation

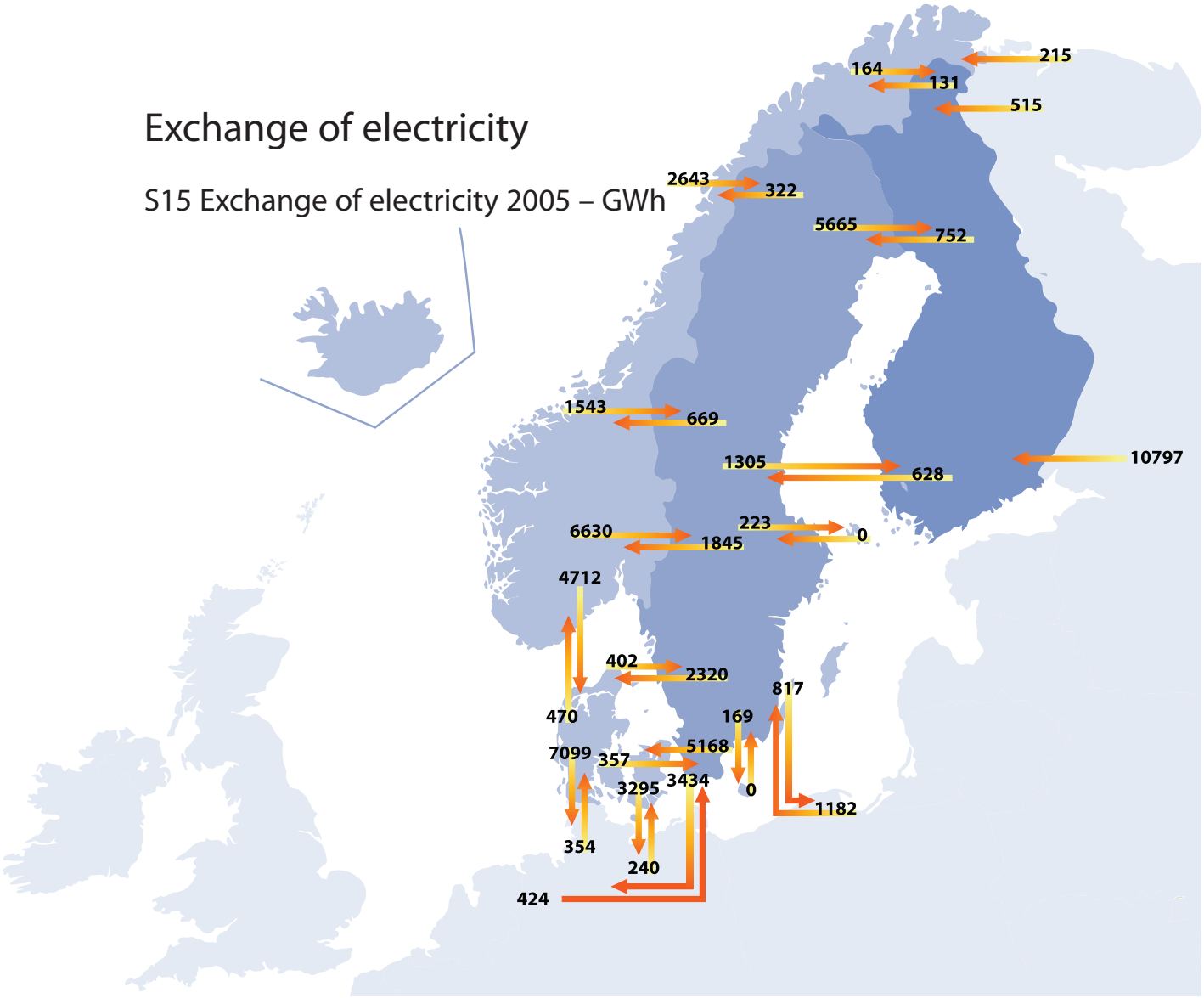
S11 Electricity generation 2005, GWh

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
Total generation	34,353	67,862	8,679	137,948[2]	154,729	**403,571**
Nuclear power	.	22,334	.	.	69,461	**91,795**
Other thermal power	27,715	31,764	8	976	12,195	**72,658**
- Condensing power		5,680	.	0	513	**6,193**
- CHP, district heating	25,886[1]	14,446	.	89	6,315	**46,736**
- CHP, industry	1,829	11,623	.	531	5,336	**19,319**
- gas turbines, etc.	0	15	8	356	31	**410**
Hydro power	23	13,597	7,013	136,465	72,143	**229,241**
Windpower	6,615	167	.	507	930	**8,219**
Geothermal power	.	.	1,658	.	.	**1,658**
Total generation 2004	38,370	82,155	8,621	110,545[2]	148,758	**388,176**
Change as against 2004	-10,5 %	-17,4 %	0,7 %	24,8 %	4,0 %	**4,0 %**

[1] Includes condensing production [2] Gross production

Exchange of electricity

S15 Exchange of electricity 2005 – GWh



S16 Exchange of electricity 2005 – GWh

From: To:	Denmark	Finland	Norway	Sweden	Other countries[1]	∑ From
Denmark	-	-	470	759	10,394	**11,623**
Finland	-	-	131	1,394	.	**1,525**
Norway	4,712	164	.	10,816	.	**15,692**
Sweden	7,692	7,193	2,836	.	4,251	**21,972**
Other countries [1]	594	11,312	215	1,606	.	**13,727**
∑ To	**12,998**	**18,669**	**3,652**	**14,575**	**14,645**	**64,539**
						Nordel
Total to	12,998	18,669	3,652	14,575		**49,894**
Total from	11,623	1,525	15,692	21,972		**50,812**
Net imports	1,375	17,144	-12,040	-7,397		**-918**
Net imports/total consumption	3,8 %	20,2 %	-9,6 %	-5,0 %		**-0,2 %**

[1] Germany, Russia and Poland.

Electricity consumption

S20 Electricity consumption 2005, GWh

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
Total consumption	35,728	85,006	8,679	125,908	147,332	**402,653**
Occasional power to electric boilers	.	51	173	4,062	1,937	**6,223**
Gross system load corrected vs. temperature	36,016	85,804	8,453	125,395	148,786	**404,454**
Gross consumption	35,728	84,955	8,506	121,846	145,395	**396,430**
Losses, pumped storage power	2,266	3,182	434	11,244	12,053	**29,179**
Net consumption [1)]	33,462	81,773	8,072	110,602	133,342	**367,251**
- housing	9,800	20,580	763	35,157	41,600	**107,900**
- industry (incl. energy sector)	9,800	45,699	6,127	48,855	59,500	**169,981**
- trade and services (incl. transport)	11,000	14,624	778	24,870	26,000	**77,272**
- other (incl. agriculture)	2,862	870	404	1,720	6,242	**12,098**
Population (million)	5,400	5,255	0,300	4,621	9,047	**24,623**
Gross consumption per capita, kWh	6,616	16,176	28,930	27,247	16,285	**16,353**
Gross consumption 2004	35,495	87,125	8,621	122,040	146,720	**400,001**
Change as against 2004, %	0.7 %	-2.4 %	0.7 %	3.2 %	0.4 %	**0.7 %**

[1)] Estimated net consumption.

Organisation

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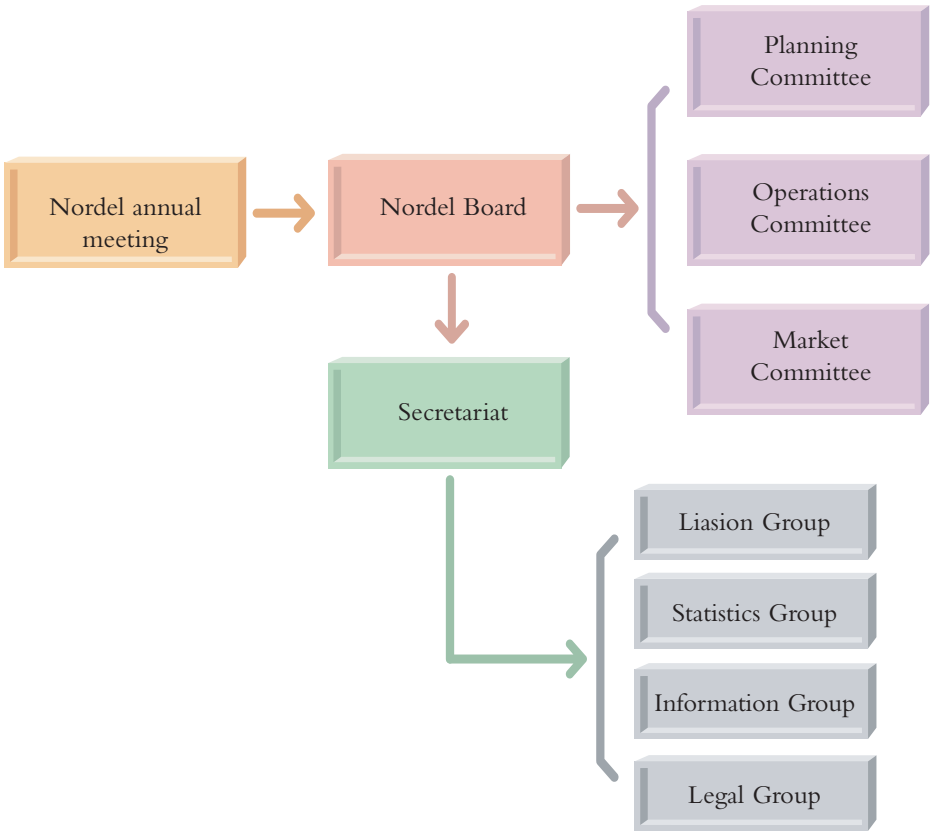
The Nordel annual meeting for 2005 was held in the old school at Reykholt in Iceland. Reykholt is home to one of Iceland's most important ancient monuments - Snorralaug - a hot spring used in the time of Snorri Sturluson. Snorri Sturluson (1179-1241) was one of the most famous ancient writers of Nordic literature. Gustav Vigeland's statue of Snorri stands outside the old school. Foto: Emil Thor


Nordel annual meeting
Nordel Board
Planning Committee
Operations Committee
Market Committee
Secretariat
Liasion Group
Statistics Group
Information Group
Legal Group

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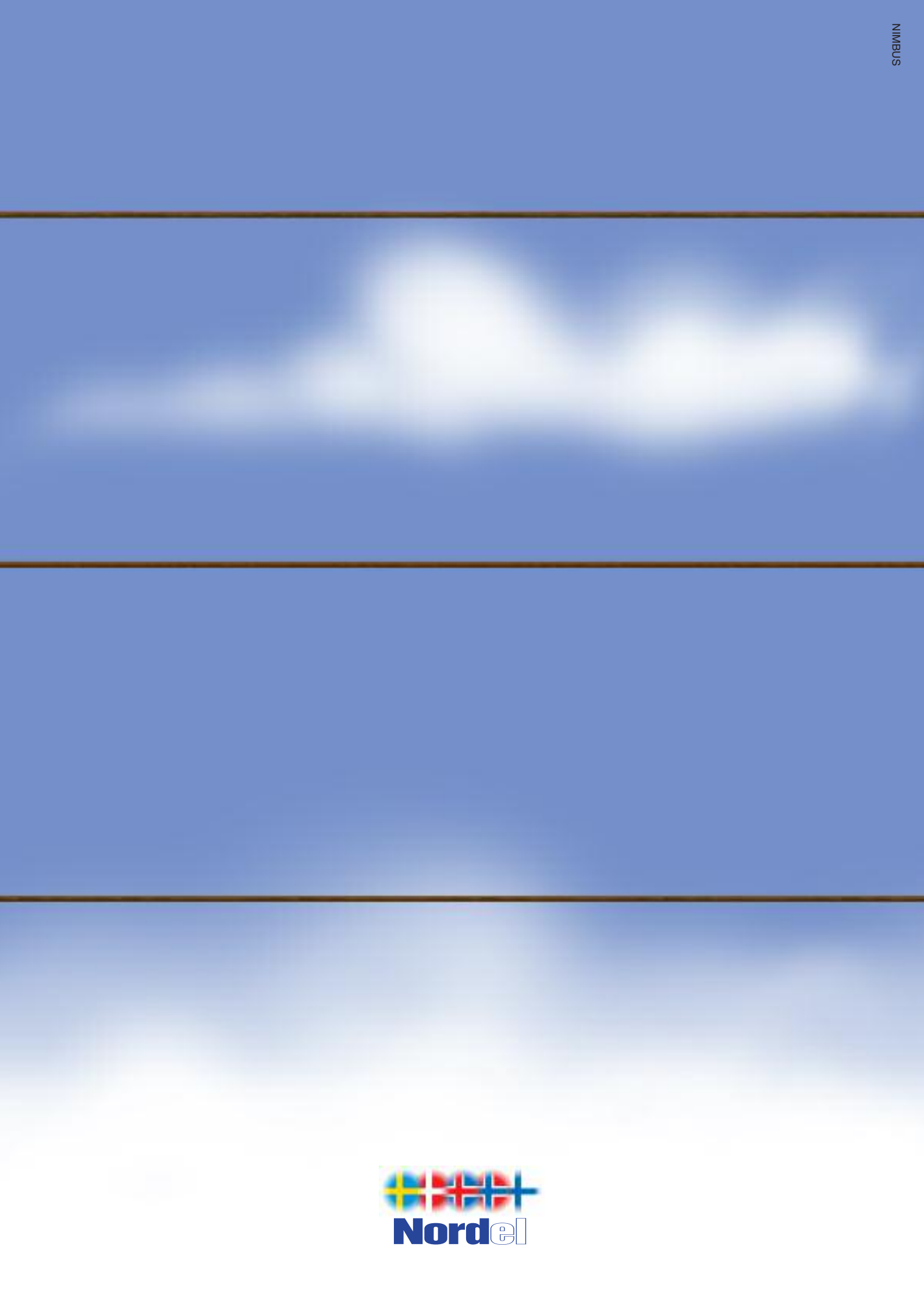
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