IEADSM Task XVII: COUNTRY REPORT - FINLAND

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INTRODUCING THE FINNISH ELECTRICITY MARKET

The reform and deregulation of the Finnish electricity market started in 1995 simultaneously with the entry into force of the new Electricity Market Act (386/1995). The deregulation of the electricity market has taken place in stages, and the latest significant change took place in autumn 1998, when small-scale consumers were freed from the requirement to use hourly-metering equipment. Today, all electricity users are free to acquire their electricity from the supplier of their choice.

The reform of the electricity market removed obstacles to competition and unnecessary regulation in the sectors of the market where competition is possible, i.e. generation, sales and foreign trade. On the other hand, clear rules of the game were established for electrical power networks that are operated in a position of a natural monopoly in conjunction with the reform.

In compliance with the Act, the Energy Market Authority (former Electricity Market Authority) was established to supervise power network operations and to carry out other public tasks. /6/

Energy Production and Consumption in Finland

According to Statistics Finland's statistics on production of electricity and heat, electricity produced in Finland amounted to 78.6 TWh in 2006. The volume of electricity produced was 16 per cent higher than one year previously. District heat production totalled 33.6 TWh and increased by 3 per cent. In 2006, industrial heat production totalled of 63.3 TWh, which was 12 per cent more than in the year before.

Energy in Finland is generated using a highshare of renewables, mainly hydropower and biomass. Finland’s generating capacity is diverse. In the next chart there is presented production of electricity and heat by production mode in 2006. /19/

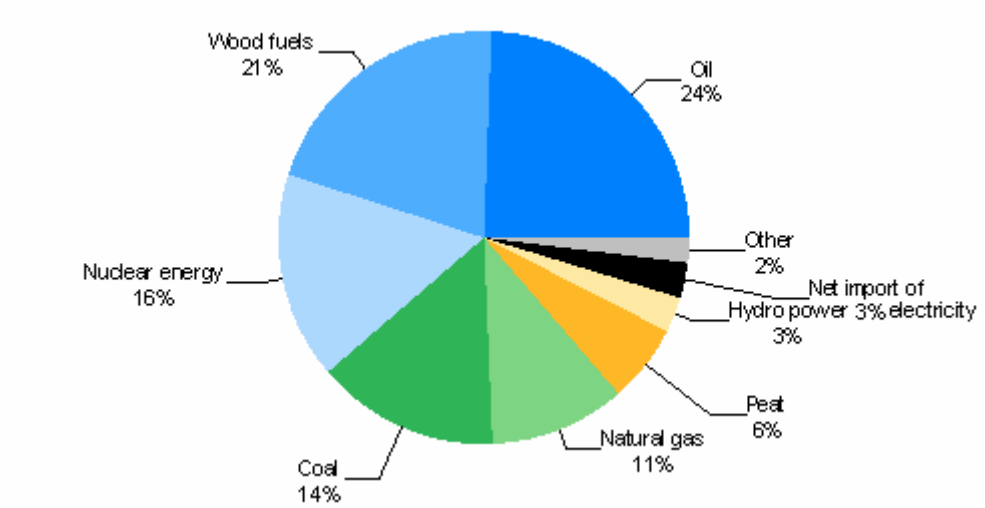
	Electricity	District heat	Industrial heat	Fuels used[1]
	TWh	TWh	TWh	PJ
Separate production of electricity				
Hydro power	11,3	-	-	-
Wind power	0,2	-	-	-
Nuclear power	22,0	-	-	-
Condensate power[2]	17,6	-	-	170,7
Total	51,0	-	-	170,7
Combined heat and power production[3]	27,6	25,9	50,3	461,9
Separate heat production[4]	-	7,7	13,0	84,5
Total	**78,6**	**33,6**	**63,3**	**717,0**

1) In calculating total primary energy used, hydro power and wind power are made commensurate with fuels according to directly obtained electricity (3.6 PJ/TWh). Total nuclear energy used is calculated at the efficiency ratio of 33 per cent from produced nuclear power (10.91 PJ/TWh).
2) Condensate power refers to separate production of electricity by fuels. It includes both the electricity produced at condensing power plants and the condensate electricity produced at energy and heat generation plants.
3) Combined heat and power production includes pure combined production.
4) Reduction heat produced in connection with condensate production and combined heat and power production were calculated in separate heat production.

Production by hydro power has decreased in last years. Due to the reduced amounts of produced hydro power, the volume of electricity produced with renewable energy sources has diminished in recent years. In 2006, the volume contracted by five per cent from the year before. However, the volume of electricity produced with black liquor from the forest industry increased by 17 per cent that produced with other wood-based fuels by 11 per cent from the previous year. /19/

Most of Finland's hydropower resource has already been used: there is potential for about 1 TWh/year more. National energy strategy foresees biomass as providing most of the increase in renewables. Wind energy potential is located mostly on coastal areas. There is a huge technical potential offshore, with ample shallow sites available. In the existing distribution network, the short-term potential on the coastal areas of Finland is more than 300 MW. Offshore, nearly 10,000 MW of windpower potential has been identified in the process of renewing regional plans in Finland. /14/

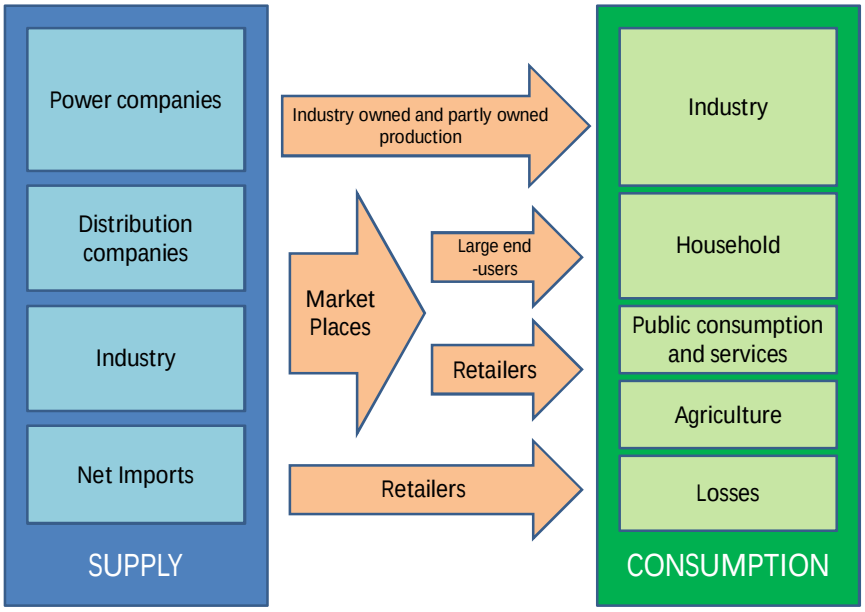
Consumption of electricity totalled 90 TWh in 2006. It's over six per cent more than in 2005. Energy consumption in 2006 is presented in next picture. /19/



Retail market

Electricity retail is mainly carried out by local supply companies. They sell electricity that they have generated or purchased from the wholesale market. Electricity sales are no longer subject to licence. The regionally exclusive right to sell electricity has been removed from electricity retailers. To safeguard the interests of small electricity users, the electricity retailer having a remarkable market power within the area of responsibility of a distribution net operator shall deliver electricity at a reasonable price to the consumers and to other electrciity users whose main fuse is maximum 3x63 A and annual consumption is maximum 100.000 kWh (obligation to deliver). The retailer's terms of retail sale and prices shall be publicly available to the customers encompassed by the retailer¹s obligation to deliver. The Energy Market Authority supervises electricity sales to customers encompassed by the obligation to deliver and the related prices. /6/

In next figure is presented the structure of Finnish electricity markets. /5/



Electricity exchange

Finland, Sweden, Norway and Denmark together make up the Nordic Power Exchange – Nord Pool, which increases the number of sources of electricity supply for large-scale users and retailers. Only members of the Nord Pool can trade in electricity at the power exchange. Among the members of the power exchange are electricity producers, electricity companies and industrial enterprises from Finland, Sweden, Norway and Denmark as well as some other countries.

The power exchange forms a market price for electricity, which is used as a reference price while drawing up electricity sales contracts. At the Nord Pool Power Exchange, actors trade in so-called spot electricity to be delivered during the next 24 hours. The actors can also trade in electricity derivatives. Finland forms a separate price area at the Nordic Power Exchange. /6/

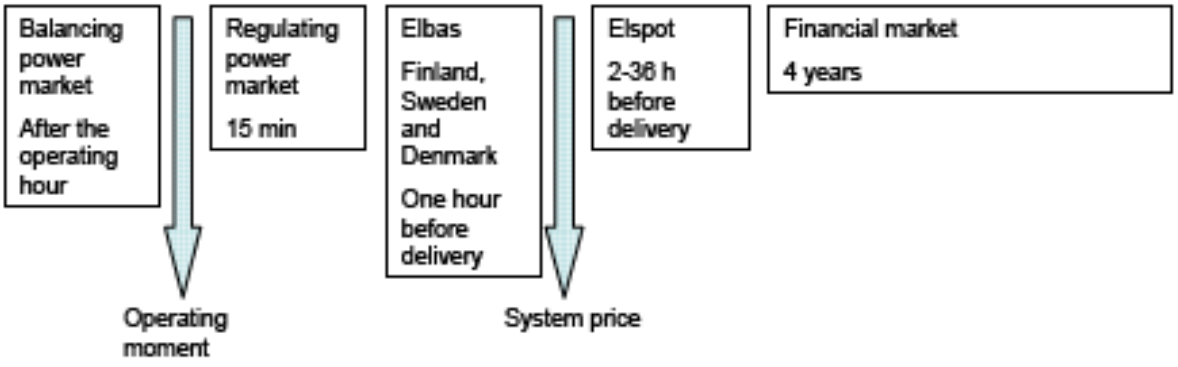
The balance between demand and supply of electricity during the peak hour has been deteriorating due to modest but stable increase in electricity consumption combined with the low level of generation investment activity. The generation capacity is expected to grow significantly only after the new Olkiluoto nuclear power plant unit has been completed at the end of 2010. The domestic generation capacity and electricity imports from the other Nordic countries and Russia were sufficient to cover consumption. /6/

Nordic electricity market will integrate with Western Continental Europe during 2008. Capital expenditure in the Nordic grid will rise to 600-800 million euros per year The Nordic electricity exchange Nord Pool Spot and the German electricity exchange EEX will couple their spot markets during the summer. /11/

In practice, the wholesale market for electricity can encompass the Nordic countries and Germany, Belgium, Holland and France in one year. The total size of this market is almost four times as large as the Nordic market, and it accounts for one half of the entire electricity market in Europe. /11/

In the future, the TSOs will make their capacity available to the electricity exchanges, who allocate it to the market in the same process where they settle the energy trades. This procedure, called implicit auctioning and already applied in the Nordic countries, is hence expanded further to Europe. This ensures that all transmission capacity becomes available and that electricity always flows in the right direction in view of the market, i.e. from areas of lower price to areas of higher price. It is likely that sharp variations in electricity prices between different areas will level out. /11/

Next figure shows the time span for the operations in different markets in Nordic countries.



/5/.

DG, RES, DR and DSM

Prime driving force for renewable energy sources is target set by European Commission's. The European Commission will ask Finland to increase its renewable energy output by around a third to 38 percent and to reduce CO_2 emissions 20 % until 2020.

Use of RES in Finland

Renewable energy sources play an important role in the Finnish energy and climate strategies which are implemented partly through the Action Plan for Renewable Energy Sources. Enhancement of wood energy plays a key role in the plan. /1/

About a fifth of the energy consumed in Finland is still derived from wood. More than half of this is generated by burning the waste sludge from pulp mills, and a quarter comes from other forest-industry waste such as bark and sawdust. These days there is little traditional log burning, but energy is generated from wood chips, made from thinning material, felling waste and other wood of secondary importance. /20/

About 6% of Finland's energy is produced from peat harvested from the country's extensive bogs. This is in principle a renewable energy source, but the formation of a sufficiently thick peat layer takes thousands of years. Since wood chips and peat take up a lot of space, they are expensive to transport, so only local use is profitable — generally within a 50-kilometre radius. /20/

Modern wind turbines also operate in Finland, where of course windmills have existed since time immemorial. However, the nearest ocean with its storms is relatively far away, and the scope for effective wind power in Finland is quite limited. The wind blows hardest on the Baltic Sea and in the northern fells, but wind turbines in Finland's archipelagos or in Lapland are noisy blots on the landscape. The justification for wind power plants in Finland is that by building them Finns can remain at the cutting edge of development in this branch of technology. /20/

Installed wind power capacity is less than 1 % of total capacity so intermittent win power is not yet a problem for Finnish power system. But European commission has set the target to increase use of renewables to 20 % until year 2020, and this means about 38 % of total final consumption. Because almost all hydro energy potential is already used, reliable ways to increase use of RES is energy from wood-based fuels and wind power. Because energy from wood-based fuels depends primarily on the output of forests, which varies according to the market, huge amounts of wind power is needed to reach this target. And the target to installed wind power capacity is as high as 2000 – 3000 MW in 2020. So problems with intermittent wind power are reality in the future.

Distributed generation

The development of distributed generation capacity in Finland depends on the following four main issues:

1. Price of the produced electricity
2. Investment costs
3. Production costs
4. Support mechanisms

There is quite a common understanding that the electricity market price will increase during the following years. In addition to the market price there are other elements affecting the price for the production. Power distributions tariff structure for power production can decrease or increase the profitability. Also the sales prices to the end-users can be higher for distributed renewable power production.

In Finland the infrastructure is highly developed and the utilisation of district heat and the share of combined heat and power production in communities and in industry is high. In general the remarkable increase in the capacity of distributed generation is a challenge in Finland.

Distributed generation is usually connected to the distribution network. Depending on the connection point and the power consumption and other production nearby, the distributed generation may decrease losses in the power grid. Transmission tariff in Finland favours distributed generation. /15/

Reserve requirements

Estimate for the operating reserve requirement due to wind power in the Nordic countries is studied. Results are presented in next table. The increase in reserve requirement due to wind power with different penetration levels, as % of gross demand. The increase in reserve requirement takes into account the better predictability of load variations. The range in Nordic figures assumes that the installed wind power capacity is more or less concentrated. /4/

	Increased use of reserves		Increased amount of reserves		
	TWh/a	€/MWh	%	MW	€/MWh
– Nordic 10% penetration	0,33	0,1–0,2	1,6–2,2	310–420	0,5–0,7
– Nordic 20% penetration	1,15	0,2–0,5	3,1–4,2	1200–1400	1,0–1,3
– Finland 10% penetration	0,28	0,2–0,5	3,9	160	
– Finland 20% penetration	0,81	0,3–0,8	7,2	570	

- The increase in reserve requirements corresponds to about 2% of installed wind power capacity at 10% penetration and 4% at 20% penetration respectively. For a single country this could be twice as much as for the Nordic region, due to better smoothing of wind power variations at the regional level. If new natural gas capacity was built for this purpose, and the investment costs would be allocated to wind power production, this would increase the cost of wind power by 0,7 €/MWh at 10% penetration and 1,3 €/MWh at 20% penetration.

- The increase in use of reserves would be about 0,33 TWh/a at 10% penetration and 1,15 TWh/a at 20% penetration The cost of increased use of reserves, at a price 5.15 €/MWh would be 0,1.0,2 €/MWh at 10% penetration and 0,2.0,5 €/MWh at 20% penetration. /4/

Reliability and balancing

Finnish transmission system operator Fingrid has the responsibility for the system reliability at the national level. From the operational point of view Fingrid takes care on the

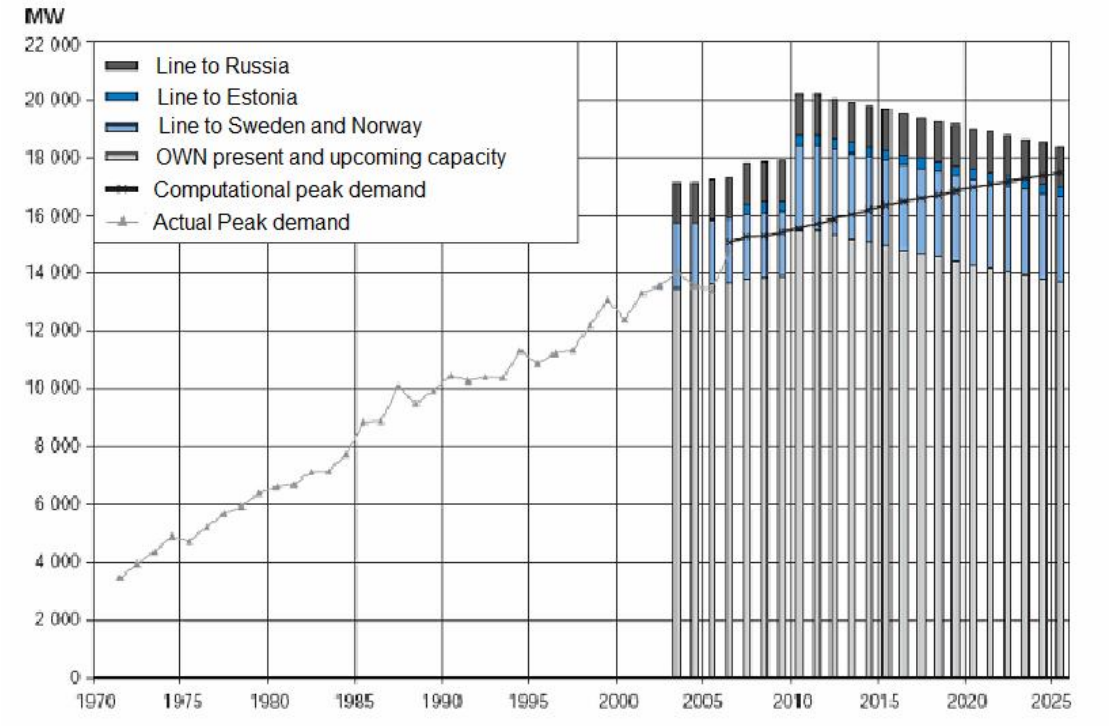
national balance during the operation hour. Each market player has responsibility on his own balance. So called balance responsible parties are adjusting their balances with system operator by selling or buying unbalances settled after operating day. The price of balance energy is in principle based on regulating power market price.

Fingrid is managing the system by operating regulating power market as a part of Nordic regulating power market and by buying ancillary services from the other actors with the market-based rules.

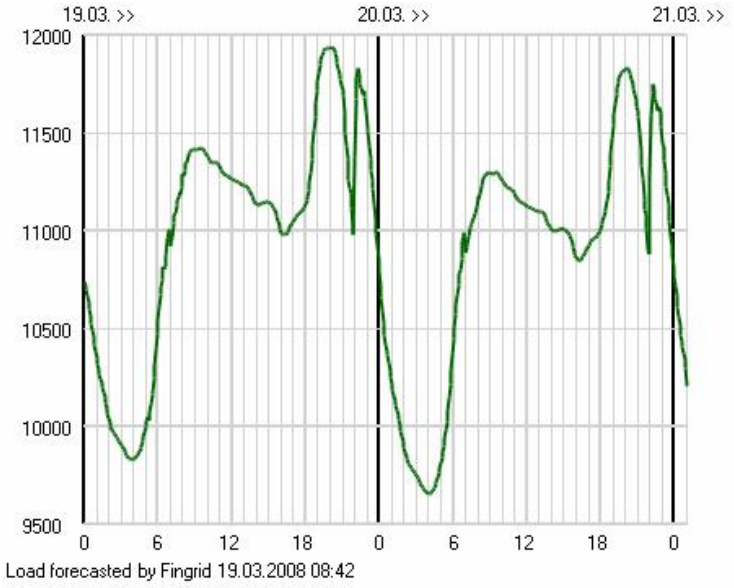
Two new temporary systems to improve security of electricity supply have been introduced through legislation in 2006 and 2007. Large peat condensing power plants over 120 MVA can get limited feed in tariff during years 2007 – 2010 due to security of supply reasons. Feed in tariff system is limited for total capacity of about 400 MW peat power and at maximum for 3,900 hours per year. Feed in tariff will depend on prices of coal and CO2-emissions and it is paid by the TSO to the peat power plants and charged from network users by the TSO. The system is overseen by the Energy Market Authority. /6/

Finland is electricity importer. In next picture is presented reason and need for demand response. As seen in picture, Finland's own capacity is going to decrease in upcoming years while estimated peak demand is going to increase.

Capacity in Finland (Own capacity and import) and actual and estimated peak demand (MW). /7/



Electricity consumption forecast in Finland is based on the measurement data of Fingrid's real time operation control system, temperature history and forecasts. The forecast for the next day is completed before 10 am. The forecast is updated as the need arises. On the horizontal axis are presented the hours of the day and on the vertical axis the consumption of electricity (MW). /10/



Electricity demand is estimated to face fastest growth in the metal industry and in the service sector. Electricity consumption will face a significant boost in efficiency, but economic growth and an increase in the consumption of goods and products will compensate for this impact. In this estimate, the consumption of electric heating is lower than the estimate published by the Finnish Energy Industries Federation in 2004. Estimating the future demand for electricity is challenging, involving significant elements of uncertainty. These include the trends in the world market and the development of the operating environment of industry in Finland. /13/

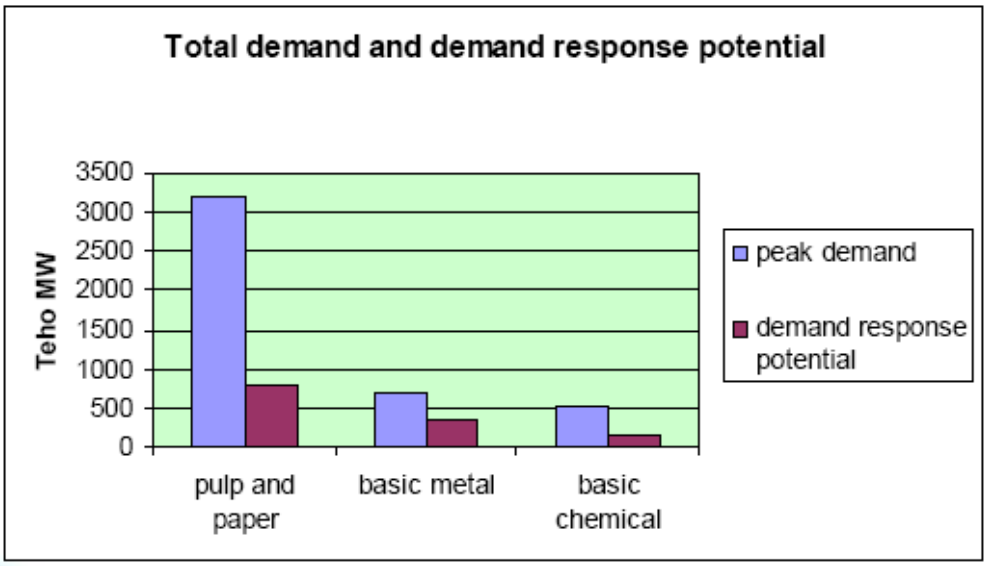
Forecasted consumption and demand in Nordic countries is presented in next picture. /17/

	Energy 2006 TWh/a	Energy 2010 TWh/a	Growth %/a	All time peak MWh/h	Peak 2010/11 MWh/h Cold
Denmark	36.4	39	1.7	6 480	7 200 1)
Finland	90.0	95	1.3	14 900	16 000 1)
Norway	122.6	135	2.4	23 050	24 000 1)
Sweden	146.4	153	1.1	27 300	28 500 1)
Nordel	395.4	422	1.6	69 000	75 600 2)

DR and DSM

The DR potential in Finnish large scale industry was assessed in 2005. The objective was to get an overview of DR potential available in the large-scale forest, chemical and metal industry and to find out the most important factors affecting the potential. These sectors use 33 TWh of electricity or 73 % of total industry Field tests on market price signals show that automation is necessary to guarantee the small end-users' response. If the end-user demands are to be traded, intermediaries (aggregators) are necessary to facilitate the transactions. /16/

DR potential assessment in Finnish large scale industry showed that the available technical DR potential in the forest, chemical and metal industry is about 1280 MW, which is equal to about 9 % of the maximum demand in Finland. The volume to be activated is dependent on the DR duration and the anticipated income from the activation. The potential has its maximum for a utilization time of 1-3 hours. A price level of 300 €/MWh would usually be sufficient to activate the most of the potential during 3 hours according to the survey. The potential and the related barriers have been described in the study of Hannu Pihala/VTT Processes: Demand Response Potential Assessment in Finnish Large-Scale Industry, 2005. Technical potential of DR in large-scale industry in Finland is presented in next table.



Fingrid has signed contracts with process industry's large customers on disconnectable loads:

- Metal industry (steel works and furnaces)
- Forest industry (groundwood plants and mechanical pulping plants)
- Chemical industry (electrolyses)

The unit size of disconnectable load varies between 15 - 60 MW and the needed amount of disconnectable loads are contracted with a competitive bidding procedure on yearly bases. Additional loads can be obtained from reserve owners on weekly basis. The DR

potential in Nordic Countries was estimated in the background survey “Demand Response in Nordic Countries”. Results are presented in next table. /8/

	Denmark	*Finland*	*Norway*	*Sweden*	*TOTAL*
Contracted by TSOs	25	365	1,300	385	2,075
Observed other response	20	140	800	700	1,660
Additional economic and technical potential in the short and medium term	800	2,400	4,600	3,000	10,800
A pessimistic estimate of the total potential	*At least 500*	*At least 2,500*	*At least 5,000*	*At least 4,000*	*At least 12,000*

The studies have shown that there are some barriers related to production processes and some barriers related to human or organisational factors. /8/

The production process related barriers for DR:

- To stop and to restart process equipment (DR action) can increase production costs and lead to faults in equipment.
- Equipment restarting after DR action is not always certain, in the case of failure a whole production line can come to a standstill.
- During winter time there is a risk of freezing because of cold weather and decrease of heat produced from the production equipment.
- Production processes are integrated (e.g. DR action in a production process can also stop heat production or fuel production to a power plant).
- There is no or too little intermediate storage in production lines in order to carry out DR actions.
- Unbundling of processes and electricity management

Barriers related to human or organisational factors:

- Difficult to motivate persons responsible for production to participate on DR (DR actions can result to equipment faults).
- Things like DR actions that happen seldom are not very comfortable.
- If DR action means reduction in production, usually fixed costs remain (labour etc.); persons in production should be able to do something else like maintenance work.
- Decisions concerning production timing and the amount of production can be done far away from the production site e.g. abroad.
- Disappearing of incentives related to the old wholesale tariff structure

/8/

One of the main drivers for demand peaks during cold weather is electric heating. Hourly recording meters and end-user tariffs with clear price signals or remote demand control are crucial for reducing the power system peak demand. The temperature dependency of total Nordic electricity demand, which is mainly due to electric space heating, is at least 600 MW/°C. Therefore, the electric heating constitutes a major potential for increasing DR.

Financial market

In principle, financial products tailored to hedge the risk of price peaks might also promote DR. However, for the time being there are no standard financial products at Nord Pool ASA. The main concern is about the liquidity of such products. Such financial products can hardly compete with direct DR in most of the Nordic market.

Day-ahead market

The volume of DR in the day-ahead market is still relatively small except in Norway. The Nord Pool Spot has a flexible hourly bid for one hour and the block bid with the minimum duration of 4 hours. Neither of these seem to be attractive for end-users. There is no major customer wish for better products, although a block bid duration of 2 - 3 hours might be more suitable for big industries. The day-ahead market has not experienced frequent price spikes, which has limited the potential profits of DR from this market.

Regulating power market

In the regulating power market, the costs for demand participation may be higher due to the short notice time compared to day-ahead market. On the other hand, price spikes in the regulating power market are more frequent. If DR resources bid in the regulating power market, the useful information about the demand resources becomes visible to TSO. /8/

Nordel, Organization for the Nordic Transmission System Operators**,** has seen demand side flexibility and demand response to high prices as a necessity for proper functioning of the market mechanism. Therefore, all the measures activating demand response have a high priority. Demand response is a complex issue. The TSOs have a role of a catalyst in enhancing demand response. Active contribution of the authorities and market players is also needed.

Demand response is an already existing resource for balancing and market clearing. To some extent it is a complement to investments in new power generation and will have an effect on the market price. Currently, the TSOs have reserved about 2500 MW disconnectable loads to be used as manually activated operational reserves and peak load resources in the Nordic market. These cannot be utilized for market purposes in normal situations, but the corresponding amount of generation resources are then available to the market. In severe peak load situations the TSOs can use the operational reserves to a limited extent. /9/

In addition to the disconnectable loads reserved by the Nordic TSOs there is a substantial potential of demand response resources in the market. The TSOs have made concrete actions plans for enhancing activation of the potential demand response. The actions of the TSOs can be grouped in three different categories:

- Measures to enhance demand bidding for operational reserves and regulating market i.e. measures that are within the system responsibility of the TSOs.
- Initiate and finance studies and research & development projects, which are of common interest for market design and power system planning.
- Communication and information measures to encourage market players and other stakeholders to take measures within their responsibility.

/9/

Currently, there is quite a good understanding of the potential demand response resources in the energy-intensive and other major industry. The focus in the further actions will be more on the activation of the demand response resources in the middle-size end-user group and households with electric heating. The removing of the barriers for demand response in these end-user groups is of vital importance.

In addition to demand response by the end-users other similar operational options to avoid forced load shedding can be found on the generation side (for example reduction of heat production in combined heat and power plants, use of local stand-by generators, use of overload capacity in power stations). The TSOs shall also investigate whether there is technical preparedness for utilization of these options and willingness to commercial solutions. The outcome of the activation measures should also be monitored. Nordel has made a proposal for systematic monitoring of the realised demand response /9/

Analysis of the future physical balances is important information for the market players to assess their future opportunities and for the authorities to monitor the balance between demand and supply and to start the tendering process according to the Electricity Market Directive. The Directive requires monitoring of the national balances. Thus, there is a risk that the national balances are not compatible with the prospects in the whole Nordic market. /9/

Nordel analyses systematically the Nordic power and energy balances in different regions taking into account also the transmission capacities. Power balance for the coming winter is released yearly in each autumn and power and energy balances three years ahead are released yearly in connection with the Nordel annual meeting.

Demand response will contribute to maintaining the balance between demand and supply during peak load hours. Nordel has studied concrete possibilities to develop a systematic monitoring of the realised demand response. Awareness of the realised demand response and the potential demand response resources will improve the quality of the balance analysis. /9/

POLICIES AND REGULATIONS

The aim of the Government’s energy policy is to promote a diverse energy production structure and to try to increase self sufficiency. The Government also promotes the use of renewable energy sources and energy efficiency, for instance, through taxes and investment subsidies. The aim of the EU is an internal electricity market. End consumers in all member states should be able to freely choose their electricity supplier. Finland has, like many other countries, signed the Kyoto protocol where countries commit to reducing

the amount of greenhouse gas emissions. The EU emissions trading scheme is one way to reach this target. The emissions trading system started operating at the beginning of 2005. The Government's proposal to Parliament on the Emissions trading Act states that: "The purpose of the Act is to promote lower greenhouse gas emissions cost-effectively and economically." /5/

Taxes

The central basis for energy taxation has been the reduction of carbon dioxide emissions and ensuring the competitiveness of indigenous energy sources.Energy taxes are excise tax and they are collected on traffic and heating fuels as well as electricity. In addition, precautionary stock fee is paid. The excise tax is divided into a basic tax and an additional tax, that is determined based on the carbon content In Finland, electricity consumption is taxed and the fuels used in electricity production are tax-free. /5/

As a result of emissions trading, the following needs for the development of energy taxation has arisen: the rise in electricity price and the competitiveness requirements it sets, decreased used of indigenous fuels due to weakened competitiveness of peat and **t**he regional and employment problems it causes, as well as the wood supply problems for industries that use wood remains as raw material caused by increased use of wood in energy. /5/

Subsidies promoting RES

Subsidies provide absolute certainty regarding lower investment costs. Tax exemptions help to bridge gap with fossil and nuclear competitors. Nevertheless in the case of wind energy, available support is not enough to plug the gap. The existing support systems have allowed a substantial increase to be achieved in the use of biomass for electricity production and district heating. Political changes and some uncertainty about future energy support programmes have resulted in new renewable energy investments being withheld. /2/

Finland has taken the following measures to encourage use of RES-E:

- Tax subsidies: RES-E has been made exempt from the energy tax paid by end users.
- Discretionary investment subsidies: New investments are eligible for subsidies up to 30% (40% for wind).
- Guaranteed access to the grid for all electricity users and electricity-producing plants, including RES-E generators (Electricity Market Act – 386/1995).

Biofuels benefit from tax exemptions under certain conditions. Biogas used as motor fuel, for instance, is exempt from excise duty. Taxes imposed on heat, are calculated on the basis of the net carbon emissions of the input fuels and are zero for renewable energy sources. Further encouragement of RES-H takes the form of direct biomass investment support. /12/

Through subsidies and energy tax exemptions, Finland encourages investment in RES. Solid biomass and large-scale hydropower dominates the market, and bio-waste is also increasing its share. Additional support in the form of feed-in tariffs based on purchase obligations or green certificates is being considered for onshore wind power.

Finland does not use feed-in tariffs, fixed premiums, green certificate systems or tendering procedures. From the European countries, Finland, Malta and Slovenia are the only ones (2006) that use only tax incentives to promote wind energy and other renewable electricity. Finland has no obligations or binding recommendations for the power companies to promote RE. The Finnish politicians and companies give all the responsibility of the climate change to consumers. The consumers are responsible to change their living habits with no support from the government. /12/

Grid Access for Electricity Produced from Renewable Sources

The Electricity Market Act (385/1995) guarantees grid access for all electricity users and electricity generating plants, including those generating electricity from renewable energy.

The law was described in detail in the report submitted in 2003. In spite of the operational environment created by the Electricity Market Act, it has been noted, especially in connection with small generating plants that their access to the grid and their transmission charges are such that the realization of investments in small plants has been slowed down. The profitability of projects has suffered as a result. The Electricity Market Act has been amended to improve the situation. The changes entered into force on 1 February 2008. The amendment is designed to facilitate the access of small electricity producers to the distribution grid and promote combined heat and energy production and the use of biofuels and renewable energy sources. /18/

The amendment was effected by adding a special provision to the Electricity Market Act regarding network service charges for the production of electricity. This stipulates that distribution system operators may not include grid reinforcement costs in the connection fee for small-scale electricity production. It further provides that transmission payments chargeable on the production of electricity in the grid must cover a smaller portion of the grid costs than the transmission payments chargeable on electricity consumption. At the same time it establishes a common framework for electricity production transmission payments in electricity distribution networks.

Furthermore, a government decree sets out detailed rules governing transmission charges for the production of electricity and the way these are defined on the distribution network, as well as threshold values to be imposed on transmission charges for electricity production which are proportionate to the amount of energy supplied. These must be complied with by distribution system operators. /18/

Nordic Grid Code

The Nordic Grid Code forms the basis for Nordic TSO co-operation. The purpose of the Grid Code is to achieve uniform and co-ordinated Nordic operation and planning between the TSOs in order to establish favorable conditions for the development of a well-functioning and effectively integrated Nordic electricity market. An essential objective of the Grid Code is to set a common basis for satisfactory operational reliability and quality of supply in the coherent Nordic electric power system.

The Grid Code governs technical co-operation between the TSOs in the interconnected Nordic countries. It concerns the operation and planning of the electric power system of

the TSOs and the market participants' access to the grid. The Code lays down fundamental common requirements and procedures that govern the operation and development of the electric power system. /17/

The Nordic Grid Code is made up of:

- Concise introduction to the Nordic power system and general provisions for co-operation
- Planning Code
- Operational Code (System Operation Agreement)
- Connection Code
- Data Exchange Code (Data Exchange Agreement) /17/

Nordic Grid Code can be found from the Nordel www-site:

http://www.nordel.org/content/Default.asp?PageID=218.

RESEARCH AND DEVELOPMENT

The most notable project entirety in Finland promoting DG and RES has been technology programme DENSY. In the Finnish national technology programme for distributed energy systems DENSY local small-sized energy production technology was developed. The programme exceededits original budget and ended up with a total funding volume of 60 million euros.

During the DENSY technology programme, Tekes has funded a total of 123 enterprise and research projects in developing distributed energy systems. The program had a budget of 56,7 million Euros with a share of 31,7 million from Tekes. The rest was funded by the participating companies and research institutions.

During the programme period, the need for versatile energy production has continued to grow, while a number of technological challenges were overcome. The programme has also noticeably improved the co-operation and networking between research institutions and companies. When the programme was inaugurated in 2003, the starting point was the liberation of the energy market. Finland was one of the pioneering countries in liberating the market. The need for new energy production solutions was already acute, and the European markets were predicted to grow about 15% annually, less developed markets up to 50% annually. /3/

Distributed energy systems comprise as well small scale production units for power, heatng and cooling as related services. The segment covers a wide variety of energy technologies and fuels, associated by small-scale and customer on-site location. R&D funded by DENSY related to production, integration, automation, manufacturing and IT technology as well as system solutions and business model development.

DENSY aimed at strengthening the knowledge-base and business excellence of Finnish companies and research centers. By 2010 Finnish companies, esp. SMEs, develop and market products and services on a global competitive market. Finnish technology, know-how and companies are widely recognized in Europe and referred to globally. The Finnish innovation environment has reached global excellence. Finnish products and services are leaders in several global niche-markets. /3/

Completely Final report of this DENSY program can be found in English from: http://akseli.tekes.fi/opencms/opencms/OhjelmaPortaali/ohjelmat/DENSY/en/etusivu.html.

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