Ea Energy Analyses

The Nordic electricity market and how it can be improved

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Preface

This publication has been developed in dialogue with a number of stakeholders in the Nordic electricity market. These include Transmission System Operators (TSO), Energy authorities, regulators, generators, retailers, representatives for end-users and researchers.

The aim of this report is to give an understanding of how the Nordic electricity market works and of the main challenges for the future development and possible improvements. We have identified three main challenges:

Firstly, how can the Nordic electricity market be developed to better deal with large amounts of fluctuating renewable generation such as wind? This relates to the development of new resources for regulating power, and the challenge of having sufficient generation capacity available for situations with periods with little wind.

Secondly, will low acceptance of price spikes in strained situations lead to new regulations that undermine the function of the market?

Thirdly, will the market be able to motivate enough capacity in new power plants or has e.g. peak power plants to be subsidized?

The three challenges can commonly be mitigated if the real willingness of the consumers to perform demand response can be included in the function of the market. We discuss in the last chapter possible ways to improve the position of the consumer in the market. Such a perspective is important to identify the possible new steps that can be taken to advance the electricity market.

The work has been sponsored by the Electricity market group under the Nordic Council of Ministers.

Mikael Togeby
Project Manager

1 Executive summary

The Nordic electricity market is acknowledged worldwide as being successful. However, the market is not perfect. In this report we emphasise the consumer perspective of the electricity market – it seems clear that further development is required here.

Challenges to the Nordic electricity market include:

- Efficient involvement of the consumer in the market and consumer trust in the market.
- Efficient integration of large scale renewable energy – e.g. 15,000 MW wind power in 2020.
- Limited competition in peak load situations, in situations with little hydro availability and in situations with congestions in the transmission system.

This analysis recommends three areas as focus points for future market development:

- Ways to radically increase the volume of demand response.
- Ways to improve the system of default suppliers.
- Ways to improve the regulation of distribution companies.

The issues related to these three focus points differ from country to country, but the overarching issues are relevant in all market areas.

Demand response

Demand response refers to electricity demand that reacts to price signals from the market. This includes short term responses such as delaying demand a few hours, and long term responses, such as substituting electricity with another energy source – and in this way reducing demand for weeks or months.

Demand response has been highlighted by stakeholders as a feature missing in the current market. Some demand response does exist, but the amount could be much higher. With more demand response competition would be improved in situations where the market currently experiences price spikes due to limitations on the supply side. Increased levels of demand response will result in a more robust market functioning and price formation. This is crucial in situations with congestion in the transmission system, during months with drastically reduced hydro available in the system and during peak load.

If demand response is not sufficiently activated in the market in the future more regulatory interference may be necessary to ensure the security of supply in periods of scarcity. This can result in the market function being degraded.

Demand response can be provided by all types of consumers: Industrial, commercial and households. New meters and hourly settlement make it possible for households, e.g. with electric heating, heat pumps and, in the future, electric vehicles, to profitably adjust demand according to prices. New meters and hourly settlement will also enable retailers to develop new products that revolve around demand response and provide incentives for consumers to react to price signals from the market.

We recommend that the Nordic countries actively promote a dynamic development of demand response.

Default supplier

In theory, the consumers' free choice of supplier and of price-products should bring two benefits: Reduced costs and contracts that are better adapted to their needs and preferences. However, most consumers in Denmark and Finland remain on default supply, whilst in Sweden more than 20 % are on default supply despite the very high mark-up for this service compared to other market products. In Norway the share of consumers on default supply is only 2-3 %.

One reason for the high share on default supply is that it is difficult to be a rational buyer of electricity. For the ordinary consumer it is difficult to understand the dynamic of electricity prices and to act rationally in the market. For the smallest consumers the benefits provided by the market do not appear to be sufficient to stimulate any great interest in the market. This may require new thinking in the way competition is encouraged in the market as experiences from Sweden indicate that very small consumers may be exposed to profiteering from default suppliers. This has resulted in calls for price regulation of default supply as is currently the practice in Denmark. This is not desirable as it goes against market principles and price controls in Denmark have resulted in higher prices for consumers when compared to market prices.

We recommend that the Nordic countries focus on how competition in the retail market can be improved so that market benefits are passed on to small consumers without exposing them to unreasonably high price mark-ups from suppliers. This could be achieved through alternative market products and/or introducing competition for providing default supply.

Regulation of grid companies

Distribution and transmission companies are natural monopolies and must be regulated. The stakeholder interviews indicate that while there is general confidence in the basic functioning of the market, there is some scepticism towards the formation of network tariffs and the regulation of grid companies.

The overall objective for regulation of grid companies is to create incentives for efficiency at reasonable prices for the consumer. There are, however, substantial differences in network tariffs between distributors in each of the Nordic countries and the number of distribution companies in each country is high. These factors both indicate that current regulation has not succeeded in promoting higher efficiency in the distribution sector as intended.

On top of this, the regulation of grid companies is now challenged with a multitude of new situations: Integration of wind power, need for balanced smart grid development and efficient demand response. How should the intelligent regulation be designed in order to send the correct signals to grid companies? If demand response is successful, local grids may avoid overload if local control systems are applied. Over investments as well as under investments in local grids can be costly for the overall system.

Regulation of capital intensive monopoly business is difficult. It is even more difficult in situations where dramatic changes in “Best Available Technology” are foreseen.

We recommend that the Nordic countries conduct an analysis of how the existing regulation of grid companies could be altered in order to most efficiently meet the above mentioned challenges.

2 Introduction

Electricity is a commodity with a highly seasonal, inelastic demand. This combined with weather dependent generation and limited options for storage make electricity prone to short term price volatility.

Historically the electricity sector consisted of government-regulated monopolies that operated in a geographically defined market. The price of electricity was regulated and suppliers operated in protected markets in exchange for a reliable supply of electricity. Generators had assured rates of return. Investment risks were allocated to end users in exchange for constant prices.

The deregulation – or re-regulation – of the electricity sector was driven by the pursuit of greater economic efficiency as monopoly systems in several countries resulted in overinvestment, especially in generating capacity. In theory, electricity markets provide generators with incentives to reduce costs and increase productivity and thereby induce expectations of lower electricity prices to consumers. Electricity markets, however, also send strong price signals in times of scarcity. This leads to periods with price peaks and, in situations with abundant supply, very low prices.

Despite deregulation of the power sector, electricity prices remain a politically important issue. Government regulation and policy continues to play a major role in influencing investments in the electricity supply sector and market development. Transmission and distribution are natural monopolies requiring strong regulation. Electricity is also a good source of fiscal income for governments due to the long-term inelasticity of demand and the political preference for taxation of consumption rather than income. These issues influence the cost of electricity for consumers in the Nordic region.

The primary focus of Nordic electricity market development has been creating a competitive and efficient wholesale market with strong interconnection between the Nordic countries to facilitate trade. This has been successful with more than 70 % of electricity consumption in the Nordic region now traded on the spot market.

It could be time now, to shift the focus of market development now towards the consumer. The current consensus is that if the Nordic market is to continue its success the position of the consumer must be strengthened and market benefits passed through to households, businesses and industry.

The development of a common Nordic retail market is seen by some stakeholders as a key step towards achieving this goal. Greater consumer participation will provide the basis for further efficiency gains through demand response and better utilisation of renewable resources. There are, however, challenges to integrating consumers into the electricity market. This report considers some of these challenges identified through a stakeholder analysis.

PART I: STRENGTHENING THE NORDIC ELECTRICITY MARKET MODEL

3 Stakeholder analysis

A simple questionnaire on future challenges for the common Nordic electricity market was sent to a number of stakeholders in Denmark, Finland, Norway and Sweden including regulators, energy company associations, TSO's, consumer organisations and academics. The questionnaire consisted of 6 questions regarding the future development of the Nordic electricity market. Each question had a list of potential solutions that the respondent could rank from 1 to 5 in importance or relevance for addressing the question.

The questionnaire was a forerunner to an interview with each stakeholder. Interviews were held both in person and telephonically.

This form of questionnaire was chosen as it is quite simple and does not require excessive time from respondents. This was considered an advantage as it was more probable that stakeholders would be inclined to complete the questionnaire if it was simple and did not require written answers. On the other hand the multiple choice character of the questionnaire may have influenced and limited the respondents in their answers. However, we believe that the high response rate in combination with the follow-up interviews has provided the project with sufficient information from a wide range of stakeholders to identify pressing issues in the Nordic electricity market.

Summary of responses

The lack of demand response is seen as the biggest challenge facing the electricity market today. Demand response was seen as the best solution for increasing consumer trust in the market, reducing electricity prices for small consumers, managing variable generation and providing the greatest increase in market efficiency.

Other topics that were identified by a large number of respondents as being important were the system of default suppliers for consumers and the introduction of smart meters and smart grids that allow for more sophisticated demand response. Increased transmission capacity was also identified as an important issue.

Question 1

The question was: What are the biggest challenges facing the Nordic electricity market? The results, shown in Figure 1 below, clearly indicate that lack of demand response is considered the greatest challenge to the economic efficiency of the Nordic market by respondents. The integration of renewables was also identified as an important issue.

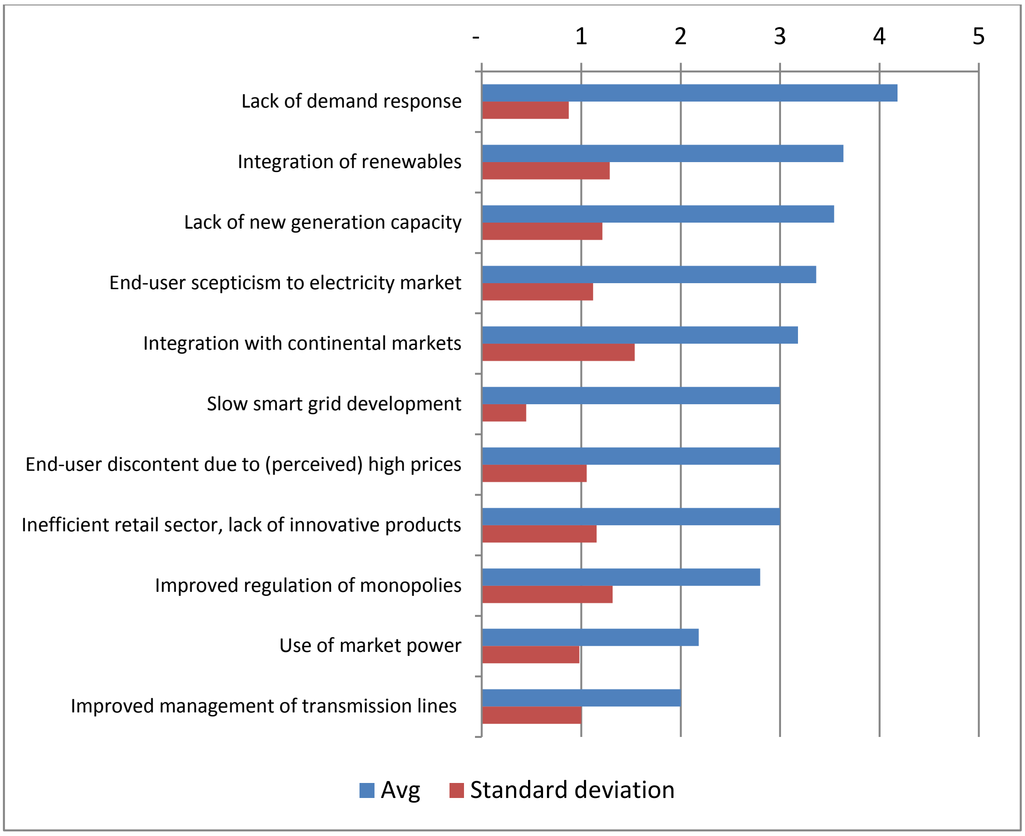

Figure 1: Average and standard deviation of answers to question1: What are the biggest challenges facing the Nordic electricity market? Priority range 1-5.

Question 2

Question 2 asked the respondent what the best possibility for increasing consumer trust in the market with respect to electricity prices? Demand response is identified as the most important issue for increasing customer trust along with more advanced products providing variable time-of-use tariffs that send a stronger price signal to consumers on the scarcity or abundance of generation. Interestingly common invoicing is not considered particularly important for increasing customer trust in the market despite the high level of focus on this issue.

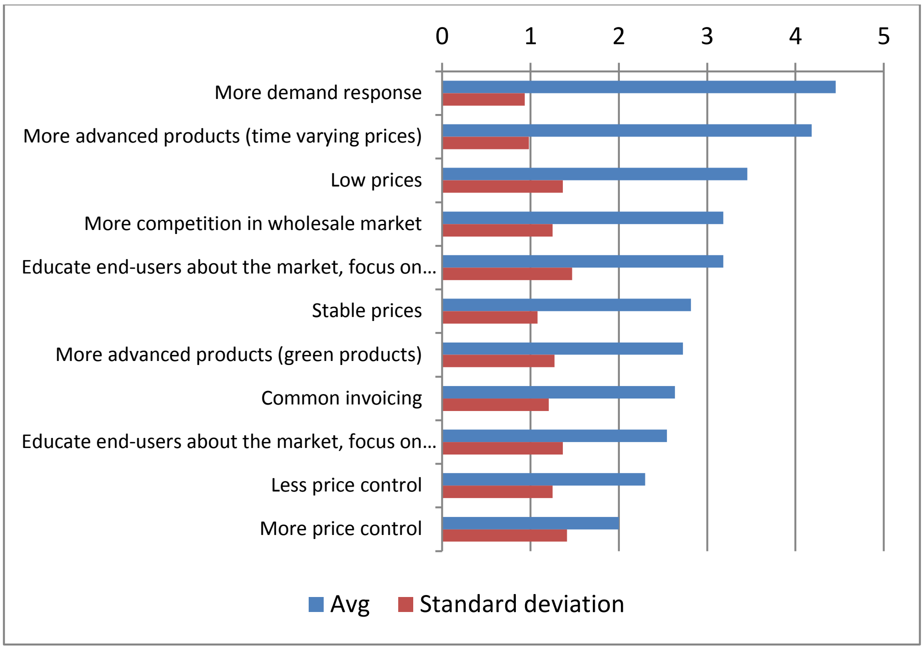

Figure 2: Average and standard deviation of responses to question 2: What is the best possibility for increasing consumer trust in the market with respect to electricity prices? Priority range 1-5.

Question 3

What are the largest challenges related to attracting investments in new Nordic generation capacity? Respondents felt that permitting procedures and public approval were the greatest challenges for attracting investment in new generation. This is especially true for new nuclear, wind and hydro plants, but the statistics show that there have been substantial investments in new generating capacity over the last ten years despite this with generating capacity increasing by 10 % over this period. Low electricity prices are identified as a challenge for investments in new generation as are political uncertainty relating to subsidies to renewables and environmental legislation. There is no broad consensus on question 3 as shown by the relatively low average of the most common answers and the relatively higher standard deviation.

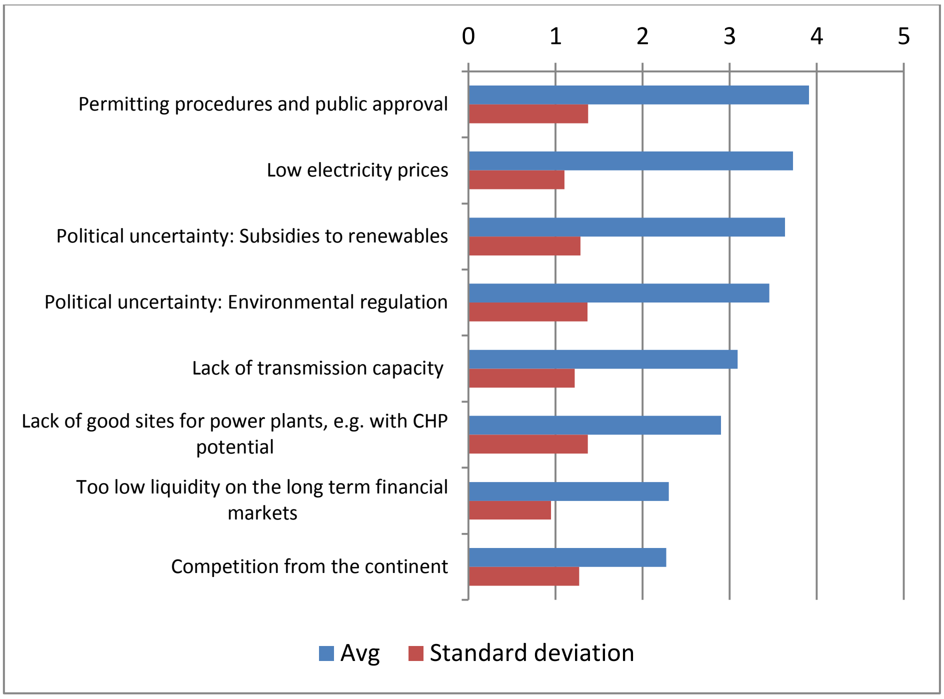

Figure 3: Average of responses and standard deviation for question 3: What are the largest challenges related to attracting investments in new Nordic generation capacity? Priority range 1-5.

Question 4

Question 4 asked how the price of electricity for small end-users could be reduced. Once again the ability of consumers to respond to price signals from the market was seen as key to securing lower prices for consumers through increasing the efficiency of the power market. The system of default suppliers for consumers that is common utilised in the Nordic market was identified as being a barrier to low prices for consumers. There was a relatively wide spread of answers to question 4, but of the top 5 four were directly related to demand response, smart metering and providing price signals to consumers.

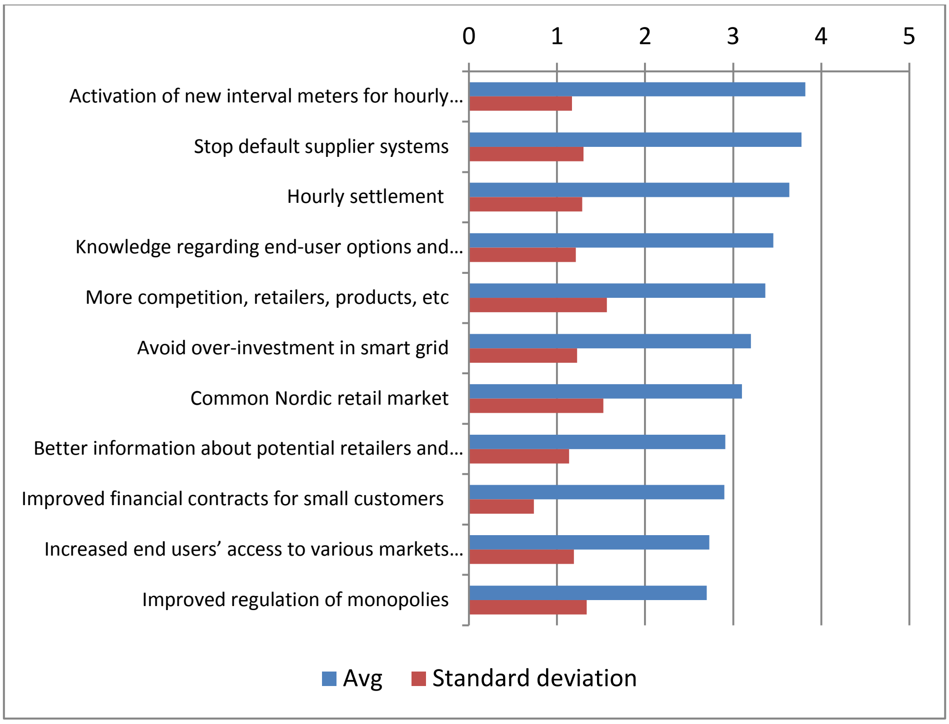

Figure 4: Average and standard deviation for question 4: How can the price of electricity for small end-users be reduced? Priority range 1-5.

Question 5

How can one best manage integration of fluctuating renewables? Demand response was, once again, one of the favoured solutions for meeting the challenge of integrating increasing amounts of renewables into the grid. Increasing transmission capacity within the common Nordic market and between neighbouring countries and the Nordic region were also favoured solutions. Strengthening the transmission grid is the more traditional Nordic method used for integrating variable generation. This has the additional advantage of creating market coupling. This can be advantageous for hydro dominated power systems as it often results in increased value of electricity.

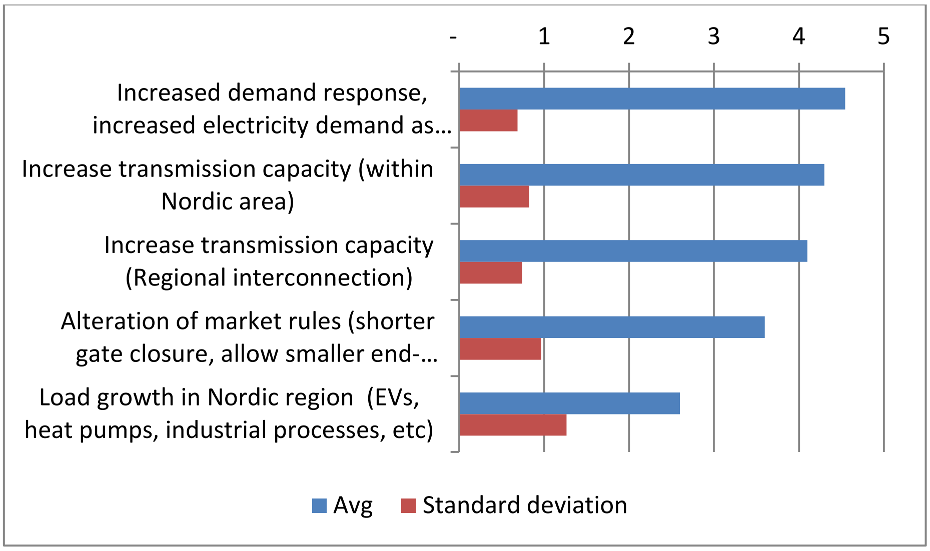

Figure 5: Average and standard deviation of answers to question 5: How can one best manage integration of fluctuating renewables? Priority range 1-5.

Question 6

What will result in the greatest improvement in market efficiency? Greater demand response facilitated by smart grids and the extension of the transmission grid were seen as the best ways for improving market efficiency. This is in line with the answers to the other questions. Improved demand response in one way or another is considered the best way of meeting future challenges in the Nordic power system.

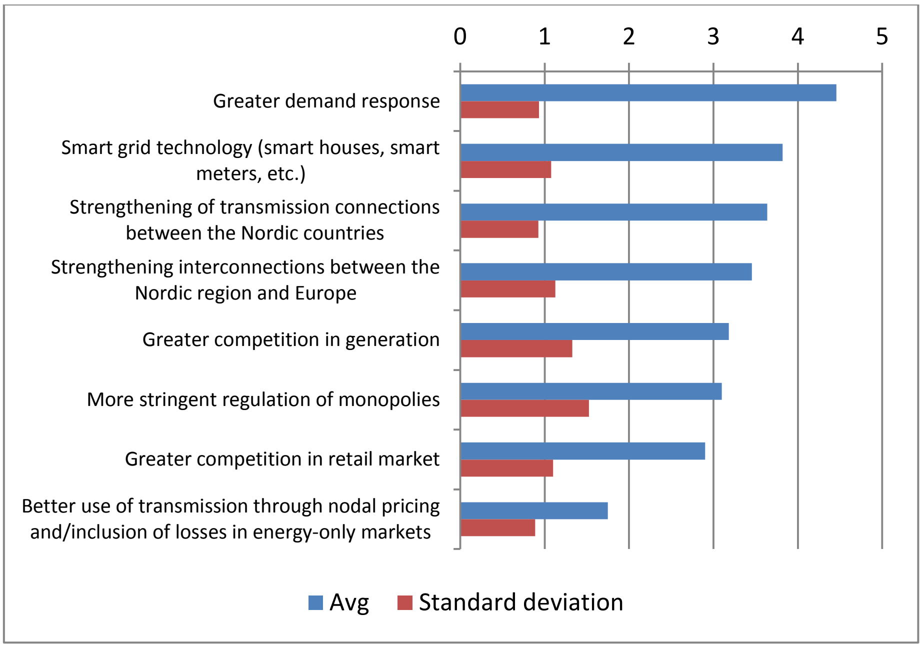

Figure 6: Average and standard deviation for question 6: What will result in the greatest improvement in market efficiency? Priority range 1-5.

4 Challenges for the market

The Nordic electricity market is recognised as a well-developed, well-functioning market. However, the market is not perfect and there are a number of situations where it is tested and its limitations exposed.

Difficult to activate end-users

Households often find it complicated to select optimal contracts for electricity. Electricity is a product which is indistinguishable between different suppliers. Price variations in the electricity market can be difficult for end-users to understand, and in many cases competition in the retail market is limited.

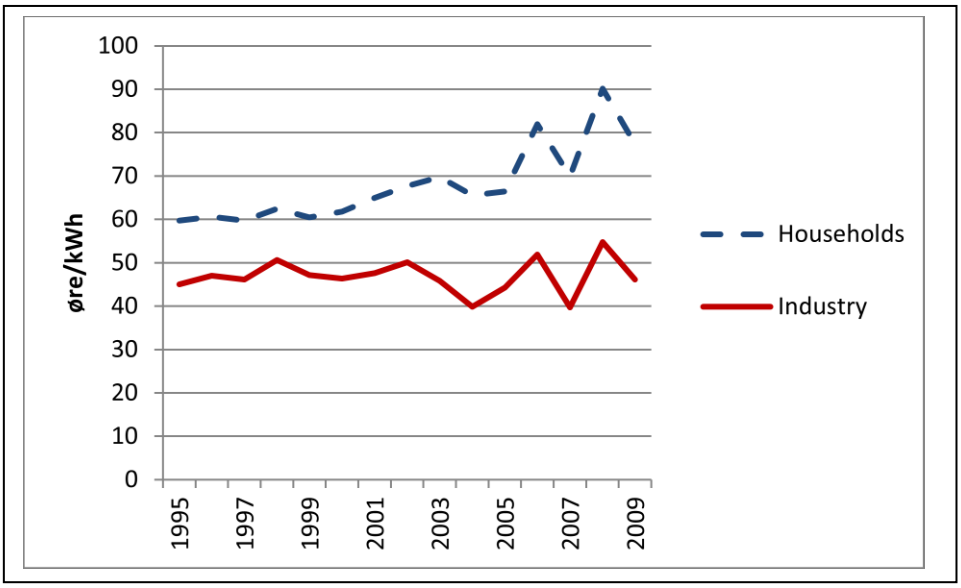

Figure 7: Development in consumer electricity prices in Denmark in 2009 kroners (Togeby & Larsen, 2011)

An analysis of the development in electricity prices in Denmark (1995 to 2009) shows that the electricity price has increased more in households than in industry as shown in Figure 7. Part of the reason for this is lack of consumer interest in switching supplier, combined with the Danish price regulation for default suppliers (Togeby and Larsen, 2011).

Figure 8 shows the price development for Swedish households.

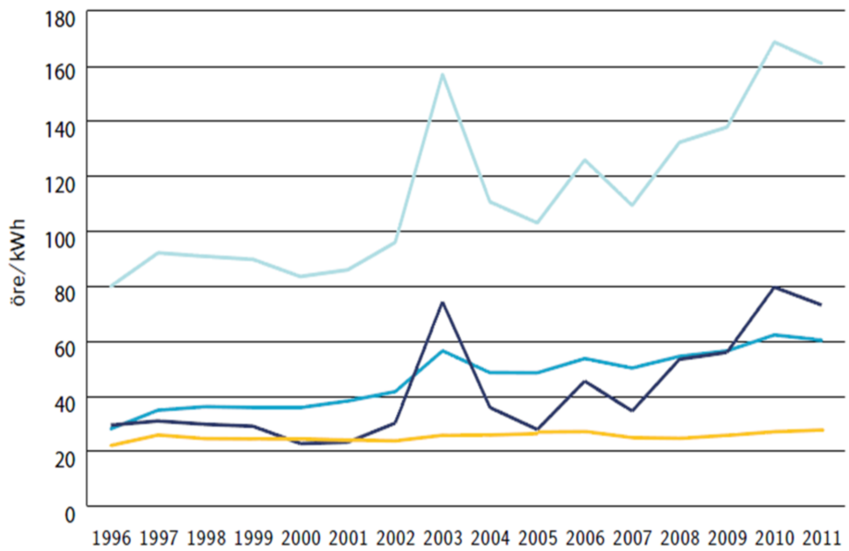

Figure 8: Development of cost elements for Swedish household with a consumption of 20,000 kWh. The lines according to colour are: Network (yellow), Taxes (aqua), Energy (navy blue) and total costs(light blue) (Energy Markets Inspectorate, 2011).

Misuse of market power

In some specific situations a generator can set the price in the electricity market. This can be the case if a dominating generator exists in a local area and if due to congestion in the transmission system, the area has its own spot price. For example, a generator in West Denmark was convicted of misuse of market power during the years 2003-2006 (Konkurrencestyrelsen, 2006 and 2007).

Demand response

Demand response has been discussed for many years and large industrial consumers already have the opportunity of providing demand response to the market. Despite this the volume of demand response is low. Demand response can both play an important role in integrating high levels of renewable generation as well as improving the position of the consumer in the electricity market.

Profitable short-term demand response for small users is currently not possible due to the profiling system used in the absence of hourly settlement. In Norway, Sweden and Denmark all small users have a profile that is defined as the residual: Total demand minus the demand measured hourly. In Finland different profiles exist for different types of end-users.

Profiling system

In the Nordic countries a profiling system is used for all consumers without an interval meter – or more correctly without hourly settlement. These consumers have meters that are read once a year (for Sweden this is now monthly). The purpose of the profiling system is to construct hourly values for each end-user without interval meters. These values are then used to define how much electricity the different retailers should have supplied and the amount of imbalances for each retailer.

In short, the profiling system computes for every hour the total consumption in a DSO area minus the consumption that is metered with interval meters. This results in a profile (consumption per hour) which is common for all consumers within the profiling system. The profile is distributed among the consumers with respect to their total annual consumption. This means that a retailer with customers within the profile system has to buy electricity for each hour according to the fluctuations in the profile – not according the fluctuations in the consumption of his consumers.

For consumers within the profiling system it is thus not possible to define a contract that rewards the retailer if the end-user shifts electricity consumption to hours with low prices because without interval meters it is not possible to demonstrate that the consumption has been moved.

Demand response can improve the utilisation of transmission and distribution lines and can balance the need of investments in new lines. Demand response also has the potential to play a role in integrating large amounts of variable generation from renewable resources into the power system by increasing the flexibility of the power system and its ability to respond rapidly to fluctuations in supply.

Demand response has had some focus over the last ten years. Demonstration projects have been carried out and new meters installed at many consumers. Electricity meters that can be read remotely and make hourly settlements are necessary requirements for end-users to have full economic benefit of demand response. Today this is in place for larger consumers, like industrial end-users.

Most stakeholders recognise the value of more demand response. The current volume of demand response has had a positive impact on price spikes in dry years. However the volume is limited, and insufficient to avoid extreme price spikes.

Barriers exist to demand response, especially amongst households, small and medium industry and businesses. These include the profiling system used for small end-users as well as moderate economic incentive for demand response.

Losses in transmission system

When the dispatch of generation takes place on the spot market, losses in the transmission system are ignored. Losses are paid through network tariffs and are, therefore, not included in the computation of spot market prices. This results in too much electricity being transported in some situations. It would be better to increase/decrease generation and/or demand in the respective areas as losses typically increase by a factor 4 when the flow on a line is doubled.

The ideal way of considering losses is to include *marginal* losses in the computation of spot prices. Typically *average losses* in the transmission system are only 1-2%, but the marginal losses can be as high as 20%, e.g. if the marginal generator is situated in northern Norway and demand is in the south of Denmark.

Ignoring losses in the dispatch of power generation is a simplification – making it easier to read and understand price formation, but the overall supply of electricity becomes more expensive. As a new feature, losses are included in the use of the Kontek cable between Eastern Denmark and Germany. Electricity will only be transported when the price difference is larger than the costs of using the cable.

Locational Marginal Pricing

Locational Marginal Pricing (LMP) is a market-pricing approach used to manage the efficient use of the transmission system. Marginal pricing is the idea that the market price for electricity should be the cost of bringing the last unit of electricity - the one that balances supply and demand - to market. LMP recognizes that for electricity this marginal price may vary at different times and locations based on transmission congestion.

Grid congestion develops when capacity or technical restrictions in the transmission system prevent the least cost supply of electricity from serving the demand. This can occur if the grid does not have sufficient capacity to transport all the electricity required to match demand at a specific location on the grid at the marginal price for the system. The presence of supply constraints at a point in the system may require the use of generating units with a higher marginal cost than the market price in order to satisfy demand at the point of congestion. LMP addresses this by including the additional cost of supply at the point of constraint rather than throughout the entire system as occurs in markets with large pricing areas such as the Nordic market.

LMP is calculated at different nodes, hence it also being referred to as nodal pricing. Nodes represent points where generators feed electricity into the system or where demand withdraws electricity from the system. Nodal prices are made up of three components: energy costs, congestion and transmission losses.

A small amount of electricity is always lost when sent over transmission lines. Nodal prices are adjusted to incorporate the marginal cost of losses in the transmission system.

The energy component is defined as the marginal cost of serving the next increment of demand at the specific location, or node that can be produced from the least expensive generating unit in the system that still has available capacity.

If the transmission network is congested, and the next increment of electricity cannot be delivered from the least expensive unit on the system the transmission congestion cost is calculated at the node as the difference between the energy component of the price and the cost of providing the additional, more expensive, electricity that can be delivered at the node in question. The congestion component can also be negative if there is more generation than demand at a node and there is no possibility for transporting the electricity away from the node.

If higher priced generation is dispatched to relieve congestion, the higher cost for this generation is borne by consumers at the location at which the constraint occurs rather than being absorbed by all consumers across a price area regardless of their contribution to the transmission constraint.

LMP is a market-based means of pricing the efficient use of the transmission system when constraints prevent least cost dispatch from flowing to where it is needed. LMP can improve the efficiency of electricity markets by reflecting the cost of transmission restraints in electricity prices and ensuring that the least-cost supply of electricity is delivered while respecting the physical limitation of the transmission network. LMP can relieve congestion by promoting efficient investment decisions. Because LMP creates price signals that reflect the value of electricity at specific locations, market participants can readily determine the true value to the system of investing in generation, transmission and demand response programs at different points in the system.

Nodal pricing is challenging many deep-rooted understandings, e.g. that power always should flow from low cost areas to high costs areas. With nodal pricing – and its optimal power flow – the opposite can be found in some cases due to the physical properties of electricity flow.

In the theoretical grid in Figure 9, a single congestion results in a large number of different prices. Nodes close to the congested line show the highest price differences, while prices level out as the distance from the congested line increases. This illustrates the different marginal impacts of the critical line.

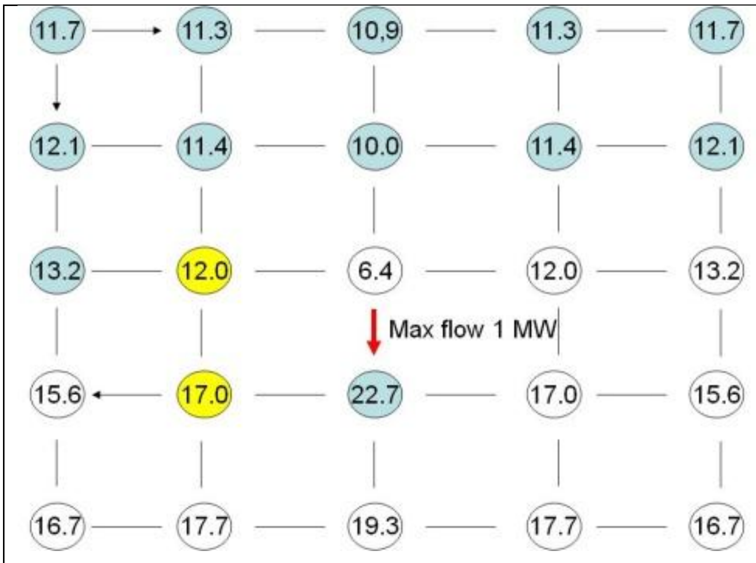

Figure 9. An example of nodal pricing in a meshed network.

In today's price area system the TSO often reduces market capacities of interconnectors. This is done to secure a safe operation of the system. However, this procedure is far from perfect, as the TSOs need to predict the next day's prices to foresee potential challenges. With nodal pricing the security constraints can be included in the algorithms. The TSO would then have a more neutral role in the price setting.

Nodal pricing is widely used in the USA, New Zealand, and Russia and is being considered in Poland (Sikorski, 2011).

In several US versions of nodal pricing the same market is managing energy and reserves in so-called co-optimisation (e.g. in New England). This requires additional input from the generators, e.g. start-up cost, ramp rates and minimum loads. However, nodal pricing can be applied without these aspects.

Nodal pricing is generally accepted as being the theoretically ideal method for handling congestion management. However, a number of practical aspects mean that nodal pricing is not seen as an alternative for the Nordic electricity market in the near future. This includes the challenge related to attracting sufficient liquidity in financial contracts for hedging purposes with thousands of prices instead of a handful. Generators may also lose some flexibility as each power plant will typically be attached to one node whilst with prices areas several power plants may be located within the same area. In nodal pricing it is more difficult to understand the state of the transmission system, but with price areas congestion can be understood by looking at the price gradient between areas.

Integration of renewable generation

Integration of more than 6,000 MW of Nordic wind power currently takes place daily. Wind power, hydro, and coal-fired power plants interact indirectly via commercial contracts in the market. Hydro power acts as energy storage, with total annual generation limited by water inflow. The injection of wind generated electricity displaces the most expensive generation, typically coal, gas and oil based generation. Due to the interaction with hydro (and its ability to store energy), the reduction in thermal based generation may take place weeks later than the actual wind based generation.

According to the National Renewable Energy Action Plans the total wind power capacity in the Nordic area is expected to be 15,000 MW in 2020, generation in the order of 44 TWh/year. This will have significant impacts on the entire system, and involves a number of challenges. Wind power contributes to increased

- Variation in generation
- Difficulties in accurately predicting generation
- Concerns over whether there will be sufficient generation capacity available in extended periods with little wind (ENTSO-E, 2010, IEA, 2011).

More wind power will require both increased activity on intra-day markets and more regulating power. New sources may need to be activated for these markets – as a supplement to increased transmission capacity.

Need for a capacity market?

The Nordic electricity market is an "energy only market". Generators are paid for the electricity they sell and this is arranged via a marginal pricing system. In such a system all generators receive a price equal to the bid from the most expensive generator that has been activated. The generators are motivated to bid according to their short term marginal costs, but as a result all receive a price that is higher (except for the marginal plant – the activated plant that bid in with the highest price). The difference between their bid short term marginal cost, and the price received contributes to covering fixed costs.

When an investor decides to build new generation capacity, he expects that the margin is sufficient to cover fixed costs, including cost of capital. In theory an energy only market can motivate the relevant investments. However, many are concerned whether this is the case when demand response is not well developed, and when large-scale wind power is introduced via the use of strong subsidies.

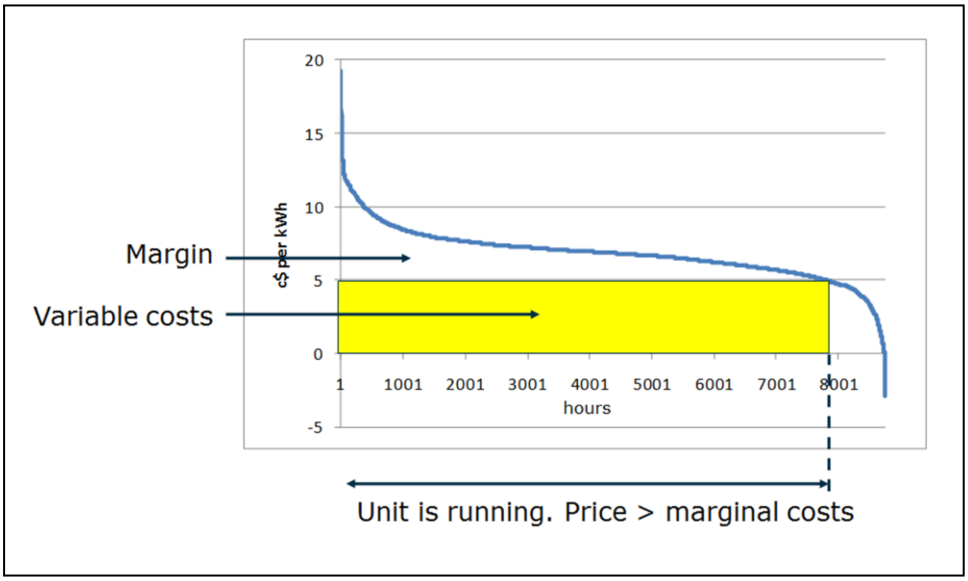

Figure 10: Revenue in an energy only market. The graph illustrates a duration curve of prices for one year.

The power system is a dynamic system, subject to continuously changing conditions, some of which can be anticipated and some of which cannot. The primary function of the power system is to serve a varying demand load. The reliability of a power system is determined by its ability to respond to and accommodate expected and unexpected changes and disturbances whilst maintaining continuity of supply to end-users. Adequate generating capacity must be available so that demand and supply are equated at all times. Otherwise the stability of the power system can be jeopardised.

Before the electricity market reform utilities were responsible for ensuring security of supply by providing adequate generating capacity to meet demand. Under the Nordic market system the transmission system operators still have the responsibility of ensuring momentary balance, but the provision of sufficient generating capacity is a function of the market determined through price signals to investors[1].

In the electricity market production and consumption must always balance. With limited demand response to price signals, adequacy on the supply side is essential to maintain momentary balance. Due to long approval processes, some uncertainties in the market framework, and not least the deployment of supported renewable production capacity, there are proponents for providing payments to generators for maintaining and investing in new firm generation capacity. This could be done through capacity payments.

Some argue that the increase in variable generation in the electricity system will result in revenue from energy-only markets being insufficient for conventional generators due to changes in load factors and running patterns of power plants. Capacity payments are seen as a way for power plants to recover income lost through the introduction of increased levels of renewable generation, much of it receiving subsidies (Brunekreeft et al., 2011).

Others argue that capacity payments will effectively cancel an important part of the electricity market, namely the investment decision process. With capacity payments, there is a real danger that all decisions on investments in new production capacity will be based on subsidies in one form or another.

Even though they are often referred to as capacity markets the price level of capacity payments is generally set by a regulator and is often based on administrative estimates of the cost of building and maintaining a peaking plant.

Capacity payment systems can be broadly classified as either price or quantity based. The basic principle of price based systems is that capacity availability is rewarded through lump sum payments or through a premium payment on top of the energy payment determined using the probability of an outage occurring.

Quantity based payments require that system operators must satisfy a capacity obligation by ensuring the availability of sufficient capacity to satisfy their expected monthly peak plus a reserve margin. This can either be done through internal or bilateral agreements with generators or through the capacity market where generators sell a recall right to the system operator to call on their capacity in the case of shortages. This type of capacity payment is prevalent in the US.

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[1] There is, however, an emergency clause in the Nordic market agreement that gives the TSO powers to commission generating capacity if the market should fail to provide this.

Smart grid

A smart grid is an electrical grid with digital communication that gathers, distributes, and acts on information about the power flow in the grid. It does so in order to improve the efficiency, reliability, economics, and sustainability of electricity services.

Figure 11: A new form of frequency controlled reserve. A Vestfrost bottle cooler equipped with electronic control for adjustment of set-point according to system frequency

Examples from the transmission system include PMUs (Phasor measurement units) and state estimators. The PMU monitors the phase angle at different places in the system (e.g. Denmark and Norway) using – among other things - GPS technology. The measurements can be clocked in microseconds. These huge amounts of data can be processed into information regarding the development of phase differences in real time – and thereby possible risks for voltage collapse can be predicted.

Many blackouts occur when the phase difference gets too large and the voltage can therefore not be maintained. Thus it is of great importance for the security of the system that it is possible to take countermeasures against a wholly or partial break-down of supply.

A state estimator is a calculation tool designed to create an overview over the entire state of the power system. It models the network and the flows, and based on numerous measurements (some of which are erroneous) the model creates a comprehensive description of all power flows, a list of potential outages of plants and other components in the system, as well as suggestions for preventive action (DI, 2010).

The main tasks for the local grid have traditionally been to connect grid users, to make necessary network investments and to operate the grid. Expected grid problems originating from increased local renewable production or increased demand are traditionally solved with increased grid investments. Smart grid functionality can reduce the need for increased investments in distribution grids. Often the concept smart grid is defined with regard to the use of new technologies for monitoring, communication and control of the grid.

More market-oriented definitions of the concept smart grid focus on the problems that are solved. A smart grid can reduce the need for new grid investments by interacting with the grid users (consumers and producers). Agreements can be done with local producers to change their production when it is needed to ensure a secure operation of the grid. Such agreements could also be done with local consumers – or more probably with retailers or other aggregators who can aggregate changes from several consumers into a more significant change for the grid company.

A necessary prerequisite for a market-oriented smart grid development is that the role of the local grid company is explicitly changed to also include market-oriented measures for the system operation of the local grid. The grid company can in such a case start to identify possible market-oriented measures and to develop frame agreements for such measures.

Smart meters make it possible to verify that agreed changes in demand have also been realized. The smartness of a smart meter is more related to the communication structure around the meter than the meter itself.

Smart meter installations have so far been seen as a project for the local grid company. The involvement of a consumer has been limited to open the premise for the installation of the smart meter.

Especially in the Netherlands the position of the consumer has now been improved. New regulations clarify that it is the consumer who "owns" the measurement data. New smart meters in the Netherlands have now standardized gates. One gate is for the disposal of the consumer who can connect a display or other equipment to obtain data in real time. The expectation is that different companies will develop and offer applications and services connected to this gate. The gate enables also transfer of data to other than the grid company and the retailer (e.g. companies with energy efficiency services).

A possible further development is that a retailer or a so called aggregator agrees with the customer to install equipment for automatic control of some appliances and simultaneously agrees with the TSO and/or the local grid company about the ability to disconnect or connect some demand on request during a certain period of time. Such a reserve for national system operation can be an interesting complement to existing reserves for ancillary services. Such a reserve for local system operation can enable the local grid company to postpone or abstain from costly new investments.

Extreme prices in dry years

Several studies have investigated the cases with unusually high prices, e.g. NordREG (2011,a) and Bye et al (2010).

NordREG (2011, a) focuses on three cases: 17 December 2009, 8 January 2010 and 22 February 2010. The report identifies high demand due to cold weather and the low availability of Swedish nuclear power stations as important factors underlying high prices on these days. However, the report also questions whether the current way of determining the allowed market capacity on the transmission lines is efficient. The Nordic TSOs allocate the capacity before the Spot market closes – and must base this on expectations of the next day's generation. This is in reality speculation on the next day's prices.

In addition, Bye et al (2010) analyses the high prices that occurred in 2009/2010. The report recommends developing more dynamic rules for security of supply. The current "N-1 rule" is considered as static and can be improved. The N-1 rule is the basis for secure operation of the electricity system. The rule requires that the system always is able to manage the largest possible fault, without needing to disconnect consumers. A certain level of redundancy is needed to fulfil the rule. The largest fault can be the loss of a power plant or a transmission line.

The report also recommends studying nodal prices as an alternative to price areas. Nodal prices will improve utilisation of the transmission system. With improved use of the transmission system extreme high prices can be expected to be reduced. It is highlighted that the many prices is most important for the supply side and that nodal pricing can be combined with price areas on the demand side as is done in some states in the USA.

Lastly, demand response is highlighted as an important resource. Use of hourly billing for end-users with modest consumption (below 100,000 kWh/year) is considered as an important step for increasing demand response.

5 Improving the position of the consumer

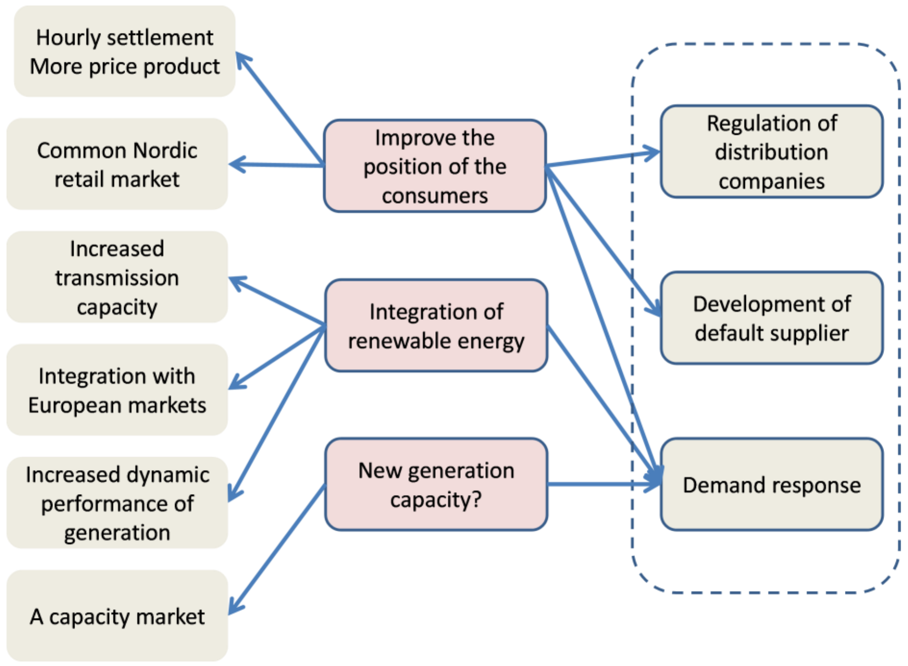

Figure 12: Important issues for improving the Nordic electricity market

Many actions can be taken to improve the electricity market, see Figure 12. Of the challenges described in the previous section, the stakeholder analysis identified two challenges in the common Nordic electricity market as the most important: Improving the position of consumers and the integration of renewable energy.

Many improvements are underway in the Nordic electricity market. This includes integration with European markets and construction of new transmission capacity, new transmission lines and a common Nordic retail market.

Integration of renewables

The integration of renewables was identified in the stakeholder analysis as one of the major challenges facing the Nordic electricity market. The planned large-scale role out of wind power in the Nordic system over the next ten years will have a significant effect on the way the Nordic power system is managed.

Several options have been explored extensively at a Nordic and a European level on the integration of renewable generation into the grid. These include increasing transmission capacity, greater integration with European markets, increased dynamic performance of generation and demand response.

The Nordic region is in the process of strengthening its transmission grid and developing further interconnection with neighbouring markets. The driving force behind this is greater market integration rather than integrating renewable generation, but it plays an important role in integrating renewables in the Nordic power system together with the flexibility the hydro power reservoirs provide.

Demand response

Demand response has the potential to improve the position of the consumer in the electricity market by providing consumers with a simple mechanism for deriving benefits from the electricity market.

When electricity demand is adjusted according to price signals from the market, it is called *demand response*. Demand response can be the shifting of demand a few hours in time to avoid expensive hours, or it can be fuel switching, e.g. from electricity to natural gas. It can also be industrial plants that stop or reduce production when the electricity price is above a certain threshold. In this way demand response can act as short term energy storage by delaying consumption to a period with less scarcity of generation capacity.

The wholesale market is designed to treat electricity generation and demand equally. In the spot market price dependent generation compete directly with price dependent demand. Large consumers are able to buy electricity at an hourly price, and to adjust demand to avoid high prices.

However, there are many aspects that hinder demand response from small and medium sized consumers. Most importantly, profiling systems instead of hourly settlement block the economic profitability for demand response for small and medium sized consumers.

Norway, Sweden and Finland are planning to expand hourly settlement to most end-users. In Denmark a "3rd settlement-group" has been suggested as a step in the same direction. The time requirements for sending final data are less stringent for this group.

Another aspect that hinders demand response from small and medium sized end-users is the tax and tariff structures. In Denmark, the spot price only comprises about 25% of the total cost for the end-user. The remainder is largely comprised of taxes and grid tariffs that are charged as a fixed rate per kWh consumed. If dynamic tariffs where introduced this would increase the incentive for participating in demand response.

More demand response and other new resources can improve the power balance at peak power (times when electricity demand is high and/or the generation portfolio is hard-pressed to meet demand), thus reducing peak prices, particularly during dry periods. In the winter of 2002/2003 electricity demand in Norway was more than

1,000 MW lower than usual – demand was held back because of unusually high prices. This was due to reductions from both heavy industry and households.

If more demand was price sensitive, the incentives for dominant generators to use market power would be reduced as the corresponding price increases from withdrawing production would be smaller. In this way demand response increases competition in the common Nordic market and improves the position of all consumers in the market. Demand response could provide consumers with the opportunity of benefiting from the daily variation in electricity prices by receiving price signals at regular intervals and, on that basis, moving some electricity consumption from a period with high prices to a period with lower prices.

Demand response also allows consumers to participate actively in the spot market. This could be large industrial consumers identifying elastic demand and integrating electricity prices into planning production cycles. District heating systems could also benefit from utilising demand response as electric boilers and heat pumps could be activated in periods when electricity prices are lower than fuel costs.

Demand response does not only have the potential to improve the position of the consumer, it has system benefits as well. Peak demand can be reduced through active demand response. Consumers will have the ability to respond more clearly to market signals. This will reduce electricity demand in periods where the cost of delivery is high and increase consumption when the cost of delivery is low. Historically, production has followed the variations in demand. With demand response, demand can also follow some of the variations in production. This could potentially allow generation and consumption to follow each other in a more cost efficient way, thereby optimising the use of renewable generation and reducing reliance on expensive peak load and reserve capacity.

The NordREG (2010) report highlights that the current flexibility on the demand side is not very large in the Nordic area. This issue is therefore studied in Gaia (2011) where it is concluded that demand response is an underutilised resource. The potential for demand response is estimated to be 5,000 MW in the short term – mainly in large industry. In the long term an additional 5,000-7,000 MW in households is possible to be activated. This is mainly electric heating, but also electric vehicles. These potentials can be compared with the total demand in the Nordic area which varies from 30,000 to 40,000 MW.

IEA (2011) indicate that demand response could be developed to cover as much as 15-20% of peak demand. The report highlights that ancillary services can serve as a key catalyst, providing the critical mass needed to establish commercially viable and sustainable markets for demand response.

Step by step the Nordic countries are preparing to expand hourly settlement to more end-users. However, if demand response shall develop to be a significant resource further steps are needed:

- Demand must also be encouraged to participate in markets for ancillary services operated by TSOs and network companies
- New products and contracts that reward demand response must be developed by the retailers.
- Consumption data must be obtained by the end-users in an easy-to-understand and appealing way
- End-users must be encouraged to participate in the electricity market

This development cannot be expected to be realised without special action. It is suggested that each Nordic country develop activities that can help deliver demand response. This can include a tendering process offering capacity payments from TSOs to market actors that can deliver demand response as a resource for ancillary services.

Without a radical improvement in the amount of demand response other – more problematic - interventions may be necessary. This can be creation of a general capacity market to secure the balance between generation and demand.

Default supplier

The stakeholder analysis identified concerns about consumer protection in a liberalized retail market and how consumer protection can be ensured without overtly affecting the efficiency of the retail market. This function is currently performed by default suppliers in the Nordic market.

Strictly speaking the default supplier refers to the electricity retailer that is appointed to supply consumers that have chosen not to enter into a supply contract with an electricity retailer, whilst the supplier of last resort is obliged to provide electricity to consumers that either cannot enter into a contract with a retailer, are temporarily without a contract with a retailer e.g. due to having moved or had a retailer that has gone out of business. To a large extent the supplier of last resort also functions as the default supplier in the Nordic countries and, therefore, both elements will be addressed as the default supplier unless explicitly differentiated in the text.

Rules for and regulation of default supply can strongly influence the functioning of the retail market and the way consumers perceive the market.

The regulation of default supply varies between the Nordic countries. In broad terms there are two models; one model provides an assurance that consumers have access to a retailer with price protection for consumers. The second model only provides an assurance that all consumers can purchase electricity from a predetermined supplier. The two options may appear very similar, but seen from a market perspective the two models are quite different. The first model actively attempts to influence the market and send a benchmark price signal to consumers. The second model allows the market to set the price of default supply and provide an incentive for consumers to actively participate in the electricity market.

Table 1: Overview of default supply systems in the Nordic countries

	Party responsible for default supply	Regulated price for default supply	Consumers on default supply
Denmark	5 year government concession awarded without public tender to daughter companies of distributers	Yes, regulated every quarter	More than 80 %
Finland	Dominant retailer in distribution area, usually associated with distribution company	No, but regulation can be used if prices deemed unreasonable	60%
Norway	Distribution company	Yes, first 6 weeks spot + 5 øre. After 6 weeks unregulated	2 - 3 %
Sweden	Retailer chosen by distribution company	No	~20 %

Denmark

86 % of Danish household consumers are on default supply (Togeby & Larsen, 2011). There appear to be three main reasons for this; the price of default supply is strictly regulated, the low average consumption for households and the high level of taxation on electricity reduces economic incentive to participate in the electricity market and default suppliers and distributors have an economic incentive to keep consumers on default supply.

Consumers are on default supply if they have never chosen a supplier, have changed address and not chosen a new supplier, if the chosen supply contract has expired and not been renewed or replaced with another or if the customer has chosen to return to the default product.

Regulation describes the setting of the default price in detail and how it is determined based on a market model's approximation of the market price for the coming quarter. This is done based on the average price for financial contracts on Nord Pool over the coming quarter. An additional allowance for a reasonable profit margin and administrative costs is then added to the price to determine the default price for the coming quarter. The price is published on the regulator's homepage. There are two default products; one for hourly metered clients and one for residual clients. In total 44 % of the total volume of electricity sold in Denmark is done through default supply (Togeby & Larsen, 2011).

Companies responsible for default supply in a region must have a government concession to do so. These are awarded for five year periods. There is no tradition for putting the concessions up for tender and the default supplier is generally a daughter company of the distribution company in the area. This apparent apathy on behalf of the authorities may hark back to the not-for-profit tradition that existed in the Danish electricity distribution sector before the market was introduced. It has been estimated that default supply price that is determined before the start of each quarter has been 10 – 15 % higher than the spot price in the Danish price areas. This has resulted in consumers having paid a premium of approximately DKK 322 million annually for default supply (Togeby & Larsen, 2011).

The prevalent argument for the price premium on default supply is that it is an insurance against uncertainty surrounding the future price of electricity as the default price is known before the start of every quarter. The default supply is also promoted as reducing short term volatility in electricity prices for consumers. It is uncertain whether this has proved successful. In any case the price premium for these services appears excessive as the market has fixed contracts that consumers can enter into that ensure a stable price for longer periods than default supply does and generally at a better price.

Despite the very high number of consumers on default supply in Denmark analyses have shown that 50 – 75 % of households are aware that they can switch supplier, but in practice the awareness of how this is done is limited, the expectation for savings is high if they are to switch and the willingness to use time on evaluating the market is low (Togeby & Larsen, 2011). These issues, together with the low average consumption of households in Denmark, are a major barrier to greater market activity by consumers.

Finland

The default supplier in Finland is automatically awarded to the dominant electricity retailer in each distribution area. The dominant retailer is that with the highest market share in the distribution area. The default supplier must provide electricity to consumers at a reasonable price and without any limitations or conditions that could restrict competition in the retail market. Default prices are not regulated, but the Finnish regulator does have the jurisdiction to regulate default prices if they are considered to be too high.

Finnish stakeholders estimate that approximately 60 % of household consumers are on default supply. Local suppliers retain considerable market power in Finland and it is estimated that most households and small consumers that have switched have renegotiated a supply contract with the incumbent retailer (Lehto, 2010). The main reason for this appears to be the very competitive prices that default supply traditionally has provided. Figure 13 below compares the average default supply price in Finland with the spot price and average fixed prices on the competitive retail market from May 2006 to May 2012. The default price is in fact lower than the spot price in 2006, but increases steadily over time and in 2011 and 2012 is more expensive than the average fixed term prices in Finland. The lack of economic incentive to change supplier is one explanation for why households and other small consumers have generally been inactive on the Finnish retail market. This may be changing due to increasing default prices.

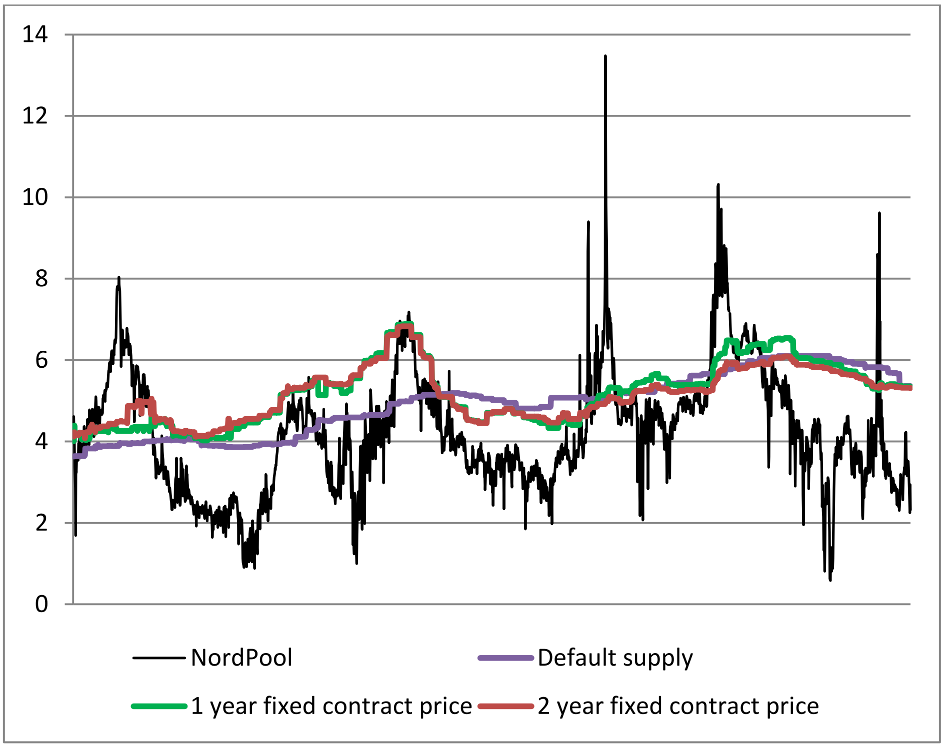

Figure 13: Comparison of default supply prices and fixed price contracts (energy only prices) for Finnish households with the spot price for Finland, May 2006 to May 2012 (Data from EMV)

The number of customers changing supplier in Finland doubled from 2008 to 2009. This higher level of activity was maintained in 2010. This is in line with what one would expect when one considers Figure 14, which represents the linear trend in the daily prices shown in Figure 13. It can clearly been seen that default supply prices have increased at a greater rate than competitive fixed price contracts. Average default price overtook 2 year contracts at the start of 2010 and 1 year fixed contracts at the end of 2010. This may be as a result of customer intransigence and the realisation by suppliers of the opportunity costs of not charging more for default supply or a number of other reasons.

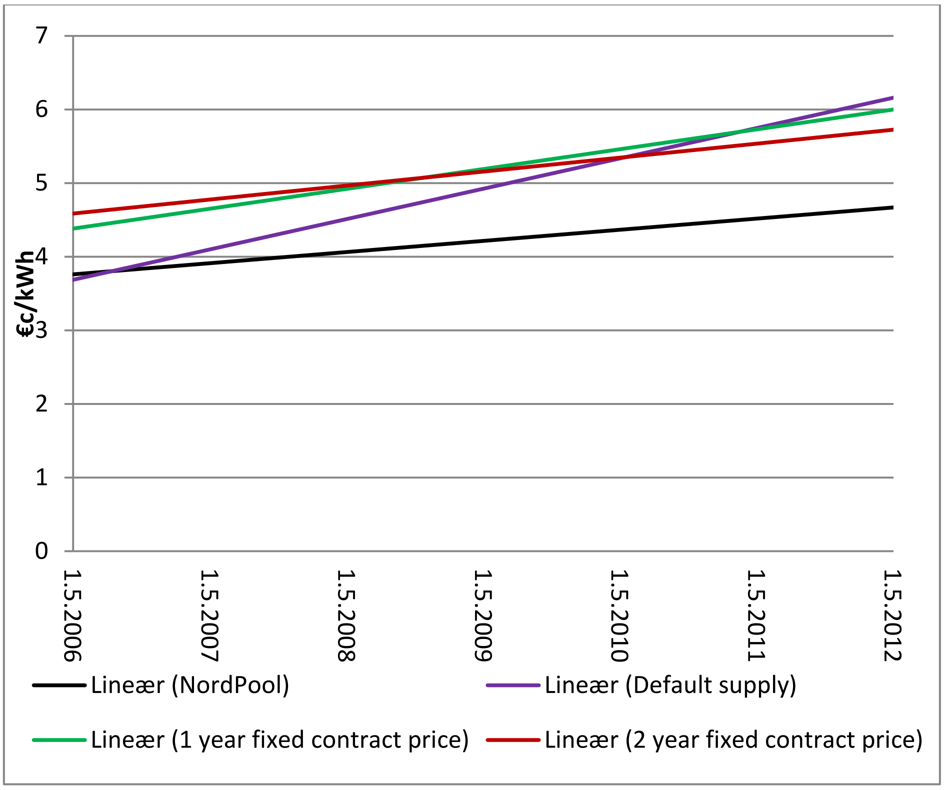

Figure 14: Linear representation of spot price compared with average default supply prices and average fixed term contracts for households

According to EMV (2010), customers believe that switching is complicated and that making price comparisons is problematic. This may be the case, but if one considers which customers are switching suppliers in Finland it indicates that the economic benefit of switching supplier is probably the greatest incentive for consumers. Nearly 3 times as many consumers with a connection greater than 3 × 63 A changed supplier in 2010 when compared to consumers with a smaller connection. Households with an annual consumption higher than 10,000 kWh were also more active on the retail market than households with annual consumption below 10,000 kWh as shown in Table 2 below.

Table 2: Share of Finnish customers that have changed suppler (EMV, 2011)

	Households and other permanent dwellings		Other customers		Total
	<10,000 kWh/a	>10,000 kWh/a	Max 3 × 63 A	>3 × 63 A	
2006	3.1 %	7.7 %	3.8 %	7.7 %	4.2 %
2007	3.0 %	6.8 %	3.3 %	8.0 %	4.0 %
2008	3.4 %	5.6 %	2.8 %	6.2 %	4.4 %
2009	7.2 %	10.9 %	5.1 %	11.6 %	8.1 %
2010	8.0 %	10.5 %	4.8 %	12.6 %	7.6 %

This provides an indication that the retail market now provides an incentive for consumers to participate in the electricity market, but these benefits are not necessarily sufficient for small consumers e.g. without electric heating. This appears to confirm Finnish stakeholders' belief that of households with electric heating only about 20 % are currently on default supply compared to 60 % of all households. The volume of electricity sold as default supply may well be a lot lower than the number of households indicates. In 2003 the total of all active consumers measured by volume of electricity purchased was nearly 60 %. At this time more than 80 % of households were on default supply (Lehto, 2010). One could expect the level of active consumers measured by volume to be higher now.

Those with very low levels of consumption do not appear to have sufficient economic incentive to participate in the retail market. This could be due to comparatively high network charges for lower levels of consumption reducing incentives for market participation or the proportion of expenditure on electricity in the total household budget being relatively low compared to other expenses.

The selection process for the default supplier in Finland promotes localised market concentration and in reality provides retailers with customers without having to actively market their products. This in itself works against an efficient market with active competition from retailers and is highlighted by the fact that more than half of Finnish retailers are only active in their local area (EMV, 2010).

Norway

Norway has had the greatest success with moving the customer base from default supply to market based contracts. The main reasons for this appear to be the high level of electricity consumption in Norwegian households, the maturity of the retail market, compulsory information from the distributor to the retailer when a customer notifies a change of address, unregulated default supply prices after 6 week grace period and the lack of economic incentive for suppliers to keep consumers on default supply. There is a constantly high rate of supplier switching in Norway as seen in Figure 15 below. There are approximately 2.5 million households in Norway.

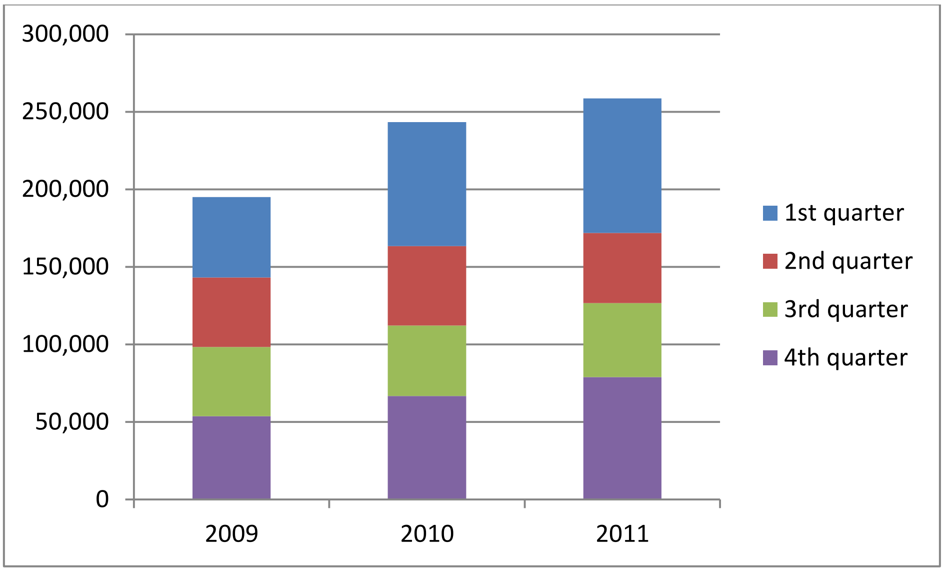

Figure 15: Number of Norwegian households switching retailer (NVE, 2011)

In Norway default supply is seen as a form for insurance for consumers. If a retailer goes out of business then customers are not left without electricity. They are ensured supply for 6 weeks at a fair price (currently spot + 5 øre/kWh) providing them with time to enter into a new electricity supply agreement. Default supply also provides electricity to those that have defaulted on electricity payments and, therefore, no longer are able to enter into contracts with retailers. The last group of consumers on default supply are those that have moved and no longer have a contract with a retailer. According to the latest quarterly report from NVE the number of consumers on default supply was 2.6 % of households making up 2.3 % of the volume of electricity sold to households. Approximately half of these have been on default supply for more than 6 months (NVE, 2011). 3 % of business customers were on default supply in 2011 accounting for approximately 1 % of the volume of electricity sold to the business sector. These figures remained stable for the whole of 2011.

The problem is not that the retailer is unaware of the move since it is compulsory for the distributor to inform the retailer when a consumer notifies a move. The problem is that if the customer moves to a distribution area where the retailer is not active then the contract is no longer binding and the consumer reverts to default supply. The consumer may not be aware of this. Interviews with Norwegian stakeholders indicated that many consumers that move are unaware of the fact that they no longer have a contract with a retailer. Despite the information sent to consumers on default supply informing them of their status and possibilities for choosing a supplier many believe that they already have chosen a supplier and the information is, therefore, not relevant for them. Distribution areas generally have a one dominant supplier, which is often the local retailer. On average nearly 75 % of households and 55 % of business customers in each distribution area in Norway are with the dominant retailer in that distribution area. Many retailers only operate in their local area, which compounds the problem for those consumers moving to a new municipality or distribution area.

The average consumption for households in Norway is very high when seen from an international perspective being approximately 20 MWh annually. This in itself provides consumers with an incentive to find the best possible price for their needs as electricity is an important part of household economy. Consumers using 2,000 – 3,000 kWh per year have very little incentive to change from default supply to a retailer as fixed cost charges are not allowed for default supply. This makes default supply competitive with market alternatives even though the variable price is 5 – 15 øre/kWh above market prices (NVE, 2010).

Default supply in Norway is provided by the distribution system operator. The default supply price is regulated for the first six weeks. After that the distributor may set the default price as they wish. Income from default supply customers falls within the regulated revenue framework and, therefore, contributes to reducing network tariffs for all customers. If default supply does not make a profit network tariffs can cross subsidise the costs. There is, therefore, no economic incentive for distributors to keep consumers on default supply. This is an important difference compared to the other Nordic countries, where the default supplier often has an economic incentive to keep consumers on default supply contracts.

Sweden

The Swedish retail market has been the topic of debate in recent years due to price spikes during the cold winters of recent years and the increasing prices for consumers on default supply. The system of default supply is designed to provide an economic incentive for consumers to actively participate in the electricity retail market. Default prices are unregulated and suppliers may set prices as they wish. If a consumer has not entered into a supply contract, a retailer is provided for them by the local grid company. The distributor must inform the customer which retailer they have been assigned and the legal rights and obligations for changing supplier. Electricity sold as default supply has become appreciably more expensive than other products on the Swedish market. The mark up on default supply has been increasing steadily over the past few years as shown in Table 3 below.

Table 3: Increase in retailers' average margin on default supply (EI 2010 & EI 2011)

Average mark- up	Oct '09– Mar '10	Apr – Sep '10	Oct '10 – Mar '11	Apr – Sep '11
Default supply	14 öre/kWh	21 öre/kWh	22 öre/kWh	27 öre/kWh

Not surprisingly the number of customers on default supply has fallen steadily as the price differential between default supply and other products has increased. In March of 2012, 21 % of consumers were on default supply. The number of consumers on default supply has decreased as shown in Figure 16. It is unclear how many consumers on default supply are there because they have moved compared to customers that have never actively participated in the retail market at all.

The distributors register about 600,000 connections to the grid annually. There is no requirement for distributors to inform the customer's retailer if the customer moves. If the customer forgets to inform both the distributor and the retailer, the customer is transferred by the distributor to the default supplier. The default supplier is nearly always a retailer in the same company group as the distributor.

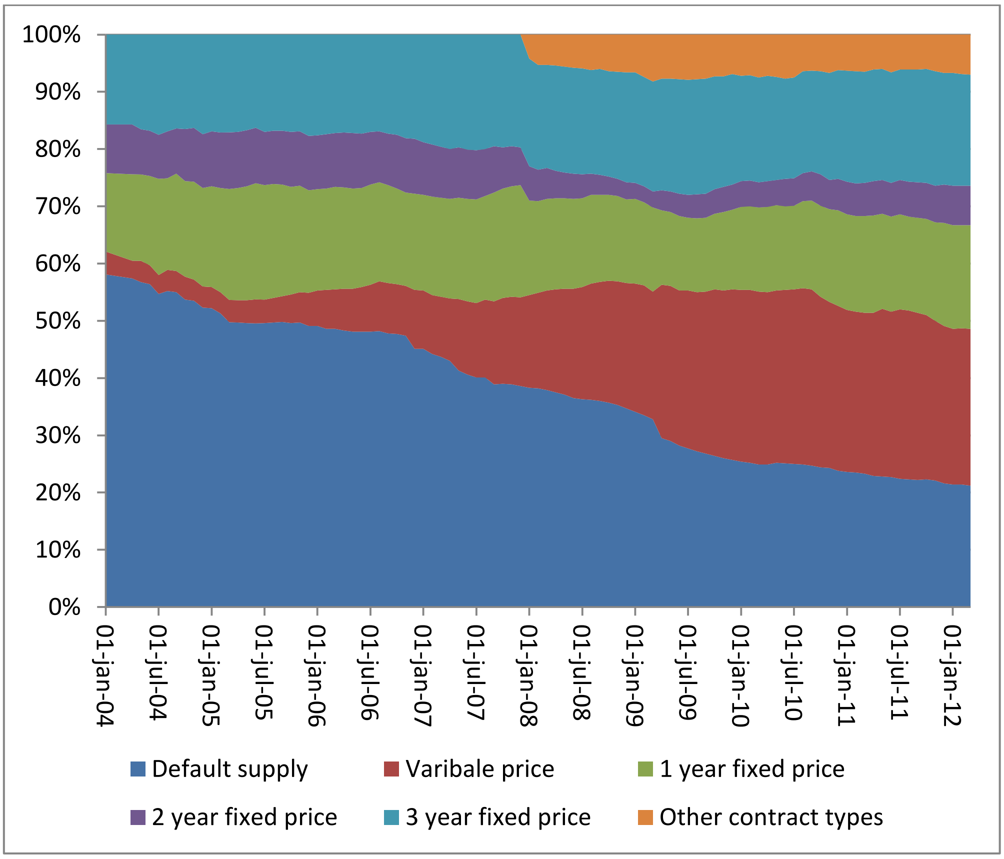

Figure 16: Spread of consumers between different retail products over time (data from SCB)

Many customers are not switching from their default supplier in spite of the high mark-up they need to pay. One reason is probably that consumers in apartments and houses without electric heating simply don't have the same economic incentive to switch supplier as larger consumers do. There is an economic balance between the time spent on orientating oneself about the market and the options available and deciding which product fits best and the potential saving for switching. Apartments with an annual consumption of 2,000 kWh would have saved SEK 604 on average last year. The savings for small consumers is very significant as a percentage of costs, but in absolute number compared to other expenses in the household a monthly saving of SEK 50 is not that substantial. These savings may be considered relatively small on a monthly basis for the individual consumers, but the accumulated value for the default suppliers is very substantial. A retailer who is appointed by a distributor as default supplier has therefore a substantial advantage in relation to an independent retailer who is not a member of a group including a distribution company.

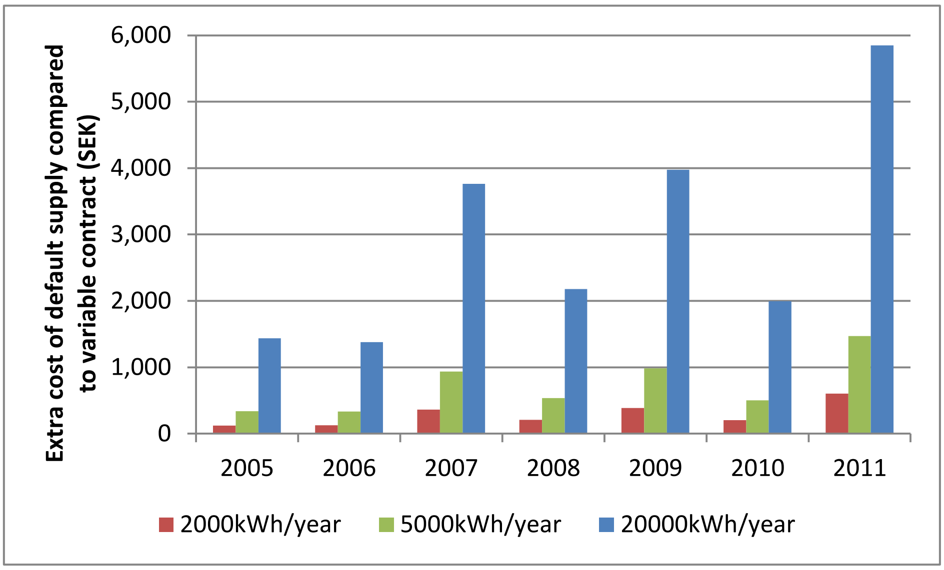

Figure 17: Annual savings for average Swedish household for choosing the average price for variable price contracts compared to default supply for three levels of annual consumption (SCB, 2012)

Conclusion

Based on this short overview the need to develop the default supplier system seems to be highest in Sweden but the high number of consumers on default supply in Denmark and Finland also gives reason for concern.

The Swedish system of default supply has resulted in a much higher mark-up on default supply when compared with the other Nordic countries. The default price is unregulated and suppliers have no obligation to assist consumers to participate in the electricity market as in Norway. The high mark-up on default supply is an indication of how the Swedish default supply system distorts competition in the retail market. Currently it gives a substantial advantage to a retailer who is also a default supplier as they obtain uncontested consumers provided to them by a regulated monopoly.

Customers who have chosen a retailer are automatically transferred to default supply if they do not inform their retailer when they move. This also happens in the other Nordic countries, but in Norway it is the responsibility of the distributor to inform the retailer when a customer moves. This inflow of new customers to default supply should be greatly reduced once single billing is introduced as all contact will be through the retailer. In cases where the customer moves to an area where their retailer does not operate the issue will remain problematic unless a better solution is found.

The main concern with the market shares in Denmark and Finland is not regarding consumer protection. The mark-up on default supply is not so substantial compared to other products, especially when compared to the mark-up on default supply in Sweden. The main concern is how default supply influences the dynamic development of the electricity market. It should not be accepted that the majority of household customers are on default supply and thereby outside the electricity market. Denmark and Finland should try to develop their default supplier systems and thereby improve the position of the consumer.

There appears to be a general coherence between a customer's level of consumption and their level of activity on the electricity market. All the Nordic countries, with the possible exception of Norway, experience that it is difficult to encourage the smaller consumers to participate in the electricity market. This challenge must not be under-estimated and creative thinking on how to address this issue is required. Experience from Sweden indicates that even very high default supply prices compared to market alternatives only provides limited results and that consumers' interest or ability to take rational economic decisions regarding their electricity bill is limited. Consumers have to make rational economic decisions on a number of issues every day. Prioritising time to study the electricity market is itself an economic decision. If the consumer does not feel there are sufficient benefits to justify spending this time, as appears to be the case in Denmark and Finland, then alternatives to current models should be considered. This could involve introducing competition into default supply in order to provide the smallest consumers with a fair price.

Regulation of grid companies

In all the Nordic countries the regulation of distribution and transmission companies are carried out as a 'ex ante - revenue cap' regulation. The calculation of the cap varies substantially, and has been adjusted over time in all the countries. Several types of regulation have been used and rejected, and most recently Sweden has changed from ex-post to ex-ante regulation since January 2012.

Distribution and transmission of electricity is considered to be a natural monopoly and is prone to market power. Economic regulation is therefore necessary, in order to balance the interests of customers, grid owners and society. While the basic regulation principle in all the countries is the same, a revenue cap, there are important differences in several details.

In all countries there are a few quite large network operators and a vast number of smaller and very small companies. The average market share is between 0.6% and 1.2% as shown in Table 4 below. There are substantial differences between the countries regarding customer density (meters network per customer) and energy density (meters network per energy unit transported).

Table 4: Key elements in the regulation of DSO's in the Nordic countries.

Subject	DK	FI	NO	SE
Main Principle	Revenue cap in combination with Rate of Return on CAPEX and benchmarking of efficiency. Quality of Service included.			
Regulation period	1y	4y	1y	4y
Regulated CAPEX:	Book value	Market value	Book value	Replacement value
Accepted rate of return (WACC)[2]	4,8%	4,2%	2,9%	4,2%
Average market share	1,2%	1,2%	0,8%	0,6%
Customer density (meter grid/customer)	51	169	157	110
Energy density (meter grid/MWh/year)	4,7	7,2	3,0	4,0
Price avg. €c/kWh (households)*(*)*	5,5	2,8	4,0	3,0
Highest/lowest (households)	2,4	4,6	6,0	2,6

(*) The registered household size is different between the countries.

Table 4 above shows that there are equalities between the countries but also substantial differences in both infrastructure and regulation.

Customer density and energy density tells something about the weight of infrastructure in supplying energy service to the customers. It can be seen that Finland has the longest grid per customer and per served energy. Denmark has the shortest grid per customer, and Norway has the shortest grid per served energy.

Some important differences in regulation are; The regulation period, calculation of the network value, accepted rate of return, and a number of details regarding how benchmarking is carried out and how the results are used in formation of the pricing of the network service. Please note that the Price average for households cannot be directly compared between countries, because the annual consumption per household is quite different. It seems to be a challenge to achieve high consumer trust in the market framework if there are large tariff-differences between comparable consumers. Naturally, some difference can be justified by local grid structure, age of the grid etc.

It is not an easy task to regulate monopoly companies and stakeholder interviews have highlighted consumer dissatisfaction caused by substantially higher tariffs in some areas than the national average. The spread between the most effective and least effective distribution companies seems to be too large and analysis shows that there is not necessarily a good correlation between costs and prices in all distribution companies. In addition, recent experience from Sweden shows that changes in regula-

[2] Own calculations based on published parameters and published interest rates (April 2012). As the only country the rate of return is not based on a WACC-calculation in Denmark but on the 30 year building bond + 1%.

tion in order to improve the system can increase consumer scepticism if such changes are expected to increase tariffs in some areas.

The overall objective of the regulation is to create incentives for efficiency at reasonable prices for the consumer. Electricity distribution and transmission is a capital intensive business, with high standards for security of supply and a relatively low "load factor". This means, that increasing the average load factor for the network can substantially improve efficiency.

New complexity is arising from integrating more renewable production and developing smart grids. The introduction of smart grids will result in distributors acting as local system operators. Current regulation has not paid sufficient attention to that possibility.

When taking the future challenges of integrating variable renewable energy and new electricity consumers into consideration, it will be of increasing importance that investment signals from the regulative framework to the grid companies are clear and efficient. When investments in smart grid technology can be expected to reduce overall grid costs it is important that incentives to invest are passed through to the investors. On the other hand the regulation should not favour overinvestments in new and unproven technologies. The incentives to choose the right investments is guarded by the caps on revenue and rate-of-return, how performance parameters are designed, and how the company is allowed to diversify its products and pricing policy towards different consumer segments. Will it – as one example – be possible for the monopoly companies to render substantial rebates to flexible consumers at the expense of consumers, who cannot so easily move their consumption pattern? New types of investment incentives and pricing strategies might be necessary in order to attract investments in smart grid technologies.

It will be a challenge to design a regulatory framework that will be accepted as efficient and fair by both the industry and consumers. There are no quick fixes to the issues at hand and an extensive process should be carried out to establish a robust, efficient and fair regulatory framework. Since many issues are common for the Nordic countries it may be advantageous if the process is carried out as a Nordic cooperation.

PART II: THE NORDIC ELECTRICITY MARKET

6 The Nordic electricity market

The Nordic countries have a well-established tradition of cooperation and trade between their national electricity systems. Cooperation was formalised in 1963 with the establishment of Nordel. This resulted in increased collaboration on technical issues and trade culminating in the establishment of a common Nordic electricity market.

In comparison with the times of monopoly and central planning, the price formation in the electricity market is based on decentralised decision making made by mutually independent companies. The balancing of demand and supply is planned by a number of balance responsible parties on a commercial basis. Every consumer and every producer in the market must either be balance responsible, or have a valid contract with a balance responsible. The System Operator takes over the physical balance responsibility in actual operation.

Driving forces for a common Nordic electricity market

The Nordic Ministers of Energy issued the Louisiana Declaration in 1995 stating that a pan-Nordic electricity market would be economically and environmentally beneficial for all countries and should be created as soon as possible.

The driving forces for developing a Nordic electricity market were market power dilution and the advantages of connecting the hydro power dominated systems in Norway and Sweden with the thermal power dominated systems in Finland and Denmark. This was expected to result in increased economic efficiency, higher security of supply and improved environmental performance of the Nordic power system. Market unification would optimise the use of Swedish and Norwegian hydro power resulting in lower average electricity prices and reduced carbon emissions in the Nordic region as a whole, whilst security of supply would be increased in dry years through integration of thermal generating capacity in Denmark and Finland.

The common Nordic market developed step by step: In 1996, the common exchange Nord Pool was established for Norway and Sweden. Finland joined in 1998 and Denmark in 2000. Thereby the spot market (day-ahead) came to cover the entire Nordic area. Today, all consumers can select their retailer, and all retailers and generators have access to the market.

The development and integration of the Nordic electricity markets has resulted in the removal of barriers to cross-border trade, the introduction of common grid codes, common handling of reserves, common planning of interconnectors, congestion management, harmonized balance settlement and common goals for retail markets etc.

The common Nordic electricity market is now being more and more integrated with adjacent regional markets with the ultimate goal of a pan-European electricity market. Nordic cooperation remains an important driver for further market improvement and continues to provide inspiration for developments in the EU market design.

The current Nordic electricity system – generation and consumption

The total Nordic electricity demand typically varies between 30,000 MW on a summer night to 60,000 MW during a winter day.

In 2010 the Nordic region had 97.5 GW of installed capacity (see Figure 18 below).

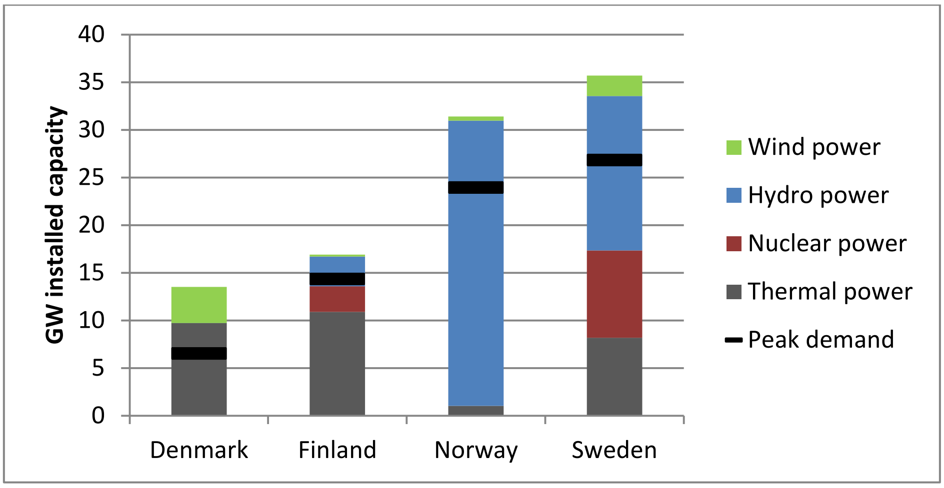

Figure 18: Installed generating capacity by technology and country and peak demand for each country in 2010 (ENTSOE, 2011)

In 2010 this capacity generated 382 TWh of electricity. Half of total generation was hydro power, 25 % thermal generation, 20 % nuclear power and 3 % wind power as shown in Figure 19. It is worth noting that 2010 was a dry year with a deficit in hydro levels of 30 TWh. This resulted in thermal generation being 15 % higher than in a normal year.

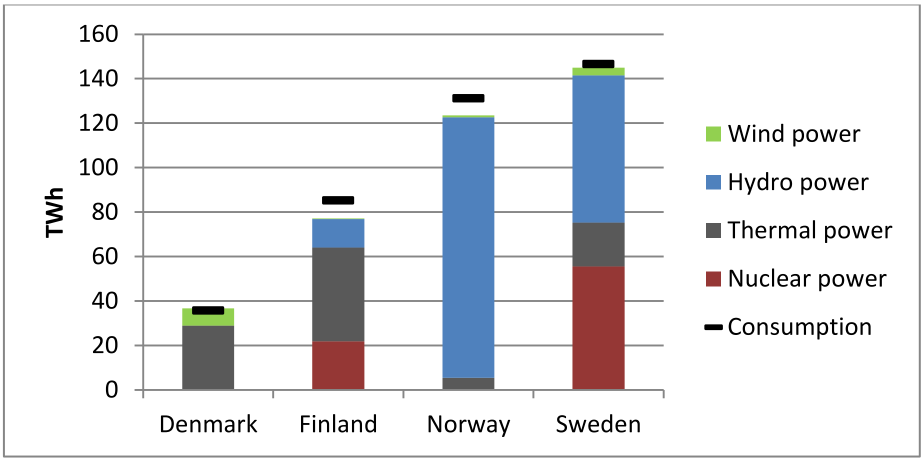

Figure 19 : Electricity generation by technology and total consumption in the Nordic countries, 2010 (Nord Pool Spot)

Meanwhile, total demand was 398 TWh, and as such roughly 16 TWh was imported. 2010 was also a cold year and the Nordic region had a higher than usual peak load of 69 GW. 77 % of demand was traded on the spot market.

New generating capacity

While the total Nordic generation capacity was essentially unchanged from 1995 to 2000, an increase in capacity took place from 2001 to 2010: 9,000 MW of new capacity was built in this period, hereof 2,000 MW hydro, 3,000 MW of thermal generation and 4,000 MW of wind power (Nordel 1995,2000,2008, 2011). The increase in generation capacity over time is shown in Figure 20.

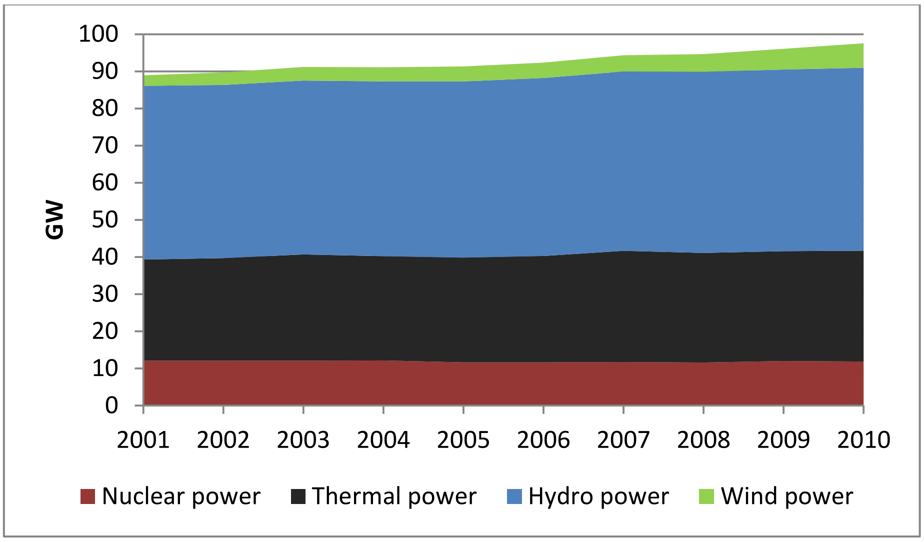

Figure 20: Generation capacity in the Nordic market 2001 - 2010 (NordREG, ENTSOE)

Interconnection within the Nordic area

The Nordic countries are in general well connected. This facilitates trade throughout the region and provides a solid foundation for the common Nordic electricity market. With the exception of Western Denmark the Nordic region operates as one synchronous power system.

The Nordic countries constantly assess the value of strengthening interconnection between and within the Nordic countries. This has resulted in new connections being recently commissioned between Sweden and Finland, Norway and Sweden and Western and Eastern Denmark in the past few years. Strengthening of transmission connections between Norway and Denmark and internally in Sweden are currently under construction.

Table 5: Interconnection between the Nordic countries

MW	DK	FI	NO	SE
DK	-	-	1,400	2,440
FI	-	-	100	1,750
NO	1,000	100	-	3,750
SE	2,040	2,150	3,450	-

Interconnectors to other parts of Europe

Transmission capacity from the Nordic area to continental Europe has been expanded with many new lines. The Nordic region has 4,700 MW of connections linking the Nordic area to its neighbours, via Russia (1,400 MW), Poland (600 MW), Estonia (600 MW), Germany (2,150-2,685 MW) and the Netherlands (700 MW). In total this capacity corresponds to 10% of the typical electricity demand in the Nordic area. There are plans for further expansion of transmission capacities to the rest of Europe.

Market coupling

As of 2009 the Nordic market has been coupled to Continental European markets through European Market Coupling Company, EMCC. In effect, bids from a generator in Northern Norway compete with bids from a power plant in the South of France when there are no congestions in the grid.

Current Nordic Market

The current Nordic electricity market consists of a number of specific underlying markets based on a timeline for the bidding offers.

Spot market (day-ahead)

The central Nordic power market is the spot market (Nord Pool Spot) where a daily competitive auction at 12.00 establishes a price for each hour of the next day (24 hours). The trading horizon is therefore 12 - 36 hours ahead of the operation hour. A bid states for each hour different prices and corresponding volumes in a certain bidding area. Producers, retailers and some big consumers are participants in the spot market. The market price is calculated for each hour as the clearing price that equals sell and buy volumes. In addition to hourly bids, also block bids can be given. A block bid from a producer states the minimum average price they must receive during a certain period. Block bids can be suitable when start-up and stop costs are significant.

The yearly turnover in the spot market is about 300 TWh or about 75 % of the total Nordic consumption.

Elbas (intra-day)

In 1999 Elbas was started in Finland and Sweden, and by 2009 it covered all four countries.

The spot auction results in market prices and sold or bought volumes for each participant. Given that the time from the spot auction to the actual delivery hour is up to 36 hours, deviations do occur. Deviations for a participant can arise from e.g. unforeseen changes in demand, tripping of generation or from changed prognoses for wind power generation. Such deviations can be mitigated via entering into hourly contracts in the continuous Elbas market, where electricity can be traded from the time the spot market closes up to 45 minutes before the operating hour.

The yearly turnover In the Elbas market is about 3 TWh or about 1 % of the turnover in the spot market. This shows that the spot market is the main market for price formation and that the Elbas market is a market for adjustments after the spot market is closed.

Automatic reserves

In the hour of operation, the respective TSOs have to their disposal several types of reserves to ensure the stability of the system. The reserves can be grouped into automatic and manual reserves. Generally speaking, the system stability is initially managed by the automatic reserves. These reserves are purchased in the market and depending on the type, can receive both a fixed payment, and an energy payment if activated. As the name would indicate, they are activated automatically in accordance with frequency deviations or planned exchange of power, but are expensive and have limited capacity.

Regulating Power

To prevent excessive use of automatic reserves and in order to re-establish their availability, regulating power in the form of manual reserves are utilised. A requirement is normally that increased or decreased generation can be fully activated within 15 minutes.

In the Nordic countries there is a common regulating power market managed by the TSOs with a common merit order bidding list. The balance responsible parties make bids consisting of amount (MW) and price (per MWh). All bids for delivering regulating power are collected on the Nordic Operation Information list (NOIS-list) and are sorted with increasing prices for up-regulation (above spot price), and decreasing prices for down-regulation (below spot price). These bids can be submitted, adjusted, or removed until 45 minutes before the operation hour. Thereafter they are economically binding. In the Nordic countries the minimum bid size is 10 MW.

Taking into consideration the potential congestions in the transmission system, the TSO manages the activation of the cheapest regulating power. The costs of activating regulating power are passed on to the balance responsible parties after the day of operation.

Reservation markets

As a supplement to the regulating market, Denmark has a reservation market. There is an interaction between the spot market and the regulating power market, and the reservation market is used to ensure sufficient resources to the regulating power market. For example, with high spot prices it can be so attractive to produce for the spot market that a reservation price is needed to maintain capacity for up-regulation in the regulating power market – and vice versa for low spot prices. The reservation price is established based on the amount needed by the TSO and bids from potential suppliers.

A similar system exists in Norway (RKOM), which is only active during the winter period. This system has also been successful in attracting demand that can be down-regulated.

In Sweden and Finland a reservation market exists in relation to peak power capacity. In winter – typically old oil-fired plants, but also consumption plants – can receive a fixed payment during the winter period in order to be a reserve for peak generation.

Financial Market

The big turnover in the spot market means that many companies are exposed to fluctuating spot prices. The financial market enables these companies to use risk management strategies and gradually hedge their future income or cost. Contracts can be done for base-load for different time periods up to five years after the present year. The most liquid contracts are the next quarter and the next year. The financial market is now operated by NASDAQ OMX Commodities.

The reference price for the financial contracts is the System Price. The System Price is an artificial price calculated by Nord Pool Spot that states the common Nordic price that would have been the result if there was only one bid area in the Nordic market. The settlement of financial contracts is totally financial against the reference price. There are no physical deliveries contrary to most other commodity markets. A company that wants to hedge its price area risk (the risk that the area price differs from the system price) can use Contracts for Differences (CfDs).

The yearly turnover in the financial market is about 2,000 TWh or about five times the Nordic consumption. This implies that many contracts have been resold and rebought several times before delivery. The Nordic market has attracted many traders who increase the liquidity and make it possible for a producer, retailer or big consumer to nearly always perform a hedge in system price contracts. CfDs are resold to a much smaller extent, so the total yearly turnover in CfDs is about 100 TWh. However, they are very important for many hedgers. February 2012 had e.g. about 15,000 MW system price contracts in delivery and about 10,000 MW CfDs in delivery.

Different markets for different timeframes

The different markets that constitute the Nordic electricity market are for different timeframes as shown in Figure 21 below.

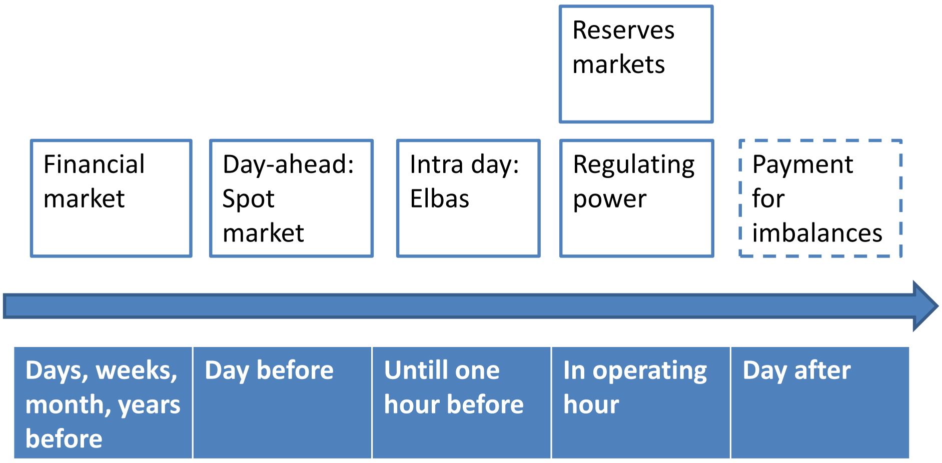

Figure 21: Timeframes for markets making up the Nordic electricity market

The financial market and the physical market are mutually interdependent. A well-functioning financial market enables producers, retailers and bigger consumers to rely on trading in the spot market instead of taking long term physical positions bilaterally as in most other electricity markets. The financial market is on the other hand dependent on the trust in the reference price. None of the stakeholders believe that any player can manipulate the common Nordic system price. There is more concern regarding CfDs since all bid areas have market power problems when there are congestions and separate area prices are obtained. This explains why there is much higher liquidity in system price contracts compared to in CfDs. It is therefore essential that the development of the physical market pays attention to the situation in the financial market.

7 The need for momentary balance

The purpose of any market is to produce a product in the most cost-effective way while at the same time addressing customer preferences. A well-functioning market is characterised by full competition. All market actors are motivated to bid at real marginal cost if no actor can game the system.

However, relative to other markets, a market for electricity has a number of unique characteristics that complicate the matter. The balance between generation and demand must exist in all time scales. This is important because no large scale options exist for electricity storage. If an electricity market is not in momentary balance, the system can totally collapse. This distinguishes an electricity system from a gas system or a district heating system where physical imbalance means that the pressure or the temperature is reduced but the system will not collapse.

The power system is a dynamic system, subject to continuously changing conditions, some of which can be anticipated and some of which cannot. The primary function of the power system is to serve a continuously varying demand load. The reliability of a power system is determined by its ability to respond to and accommodate expected and unexpected changes and disturbances whilst maintaining continuity of supply to end-users. This requires the existence of operational reserves in power systems that can compensate for unforeseen events without compromising the continuity of supply.

Optimal dispatch

One of the most important characteristics of an electricity system is the fact that the dispatch for generation must respect the limitations in the transmission grid. The flow on congested lines is controlled by limiting generation on the exporting side and increasing generation on the importing side.

The diverse mix of generation technologies in the Nordic area is part of the background behind the success of the Nordic electricity market.

Generation from hydro plants is constrained by precipitation levels. Historically, generation has varied by as much as 68 TWh (+/-17% of the average hydro generation) in the Nordic area. The 12 month variation in inflow can vary as much as 100 TWh (+/-25% of average inflow), and the capacity of all hydro dams in the Nordic area is 121 TWh. Hydro dominated areas thus need to exchange electricity with other areas. In wet years electricity can be exported, and in dry years electricity needs to be imported.

Figure 22 below shows a number of interesting features of a hydro dominated system. From week 45 in 2009 to week 15 in 2010 the hydro reservoirs were lower than was experienced in the period 1990 – 2006. This, together with problems at some of Sweden's nuclear power plants, resulted in high average prices in December 2009, e.g. 92 €/MWh in Sweden and Northern Norway. However, a year later the reservoir values were at their maximum. This resulted in average spot prices as low as 33-34 €/MWh in Sweden and Norway.

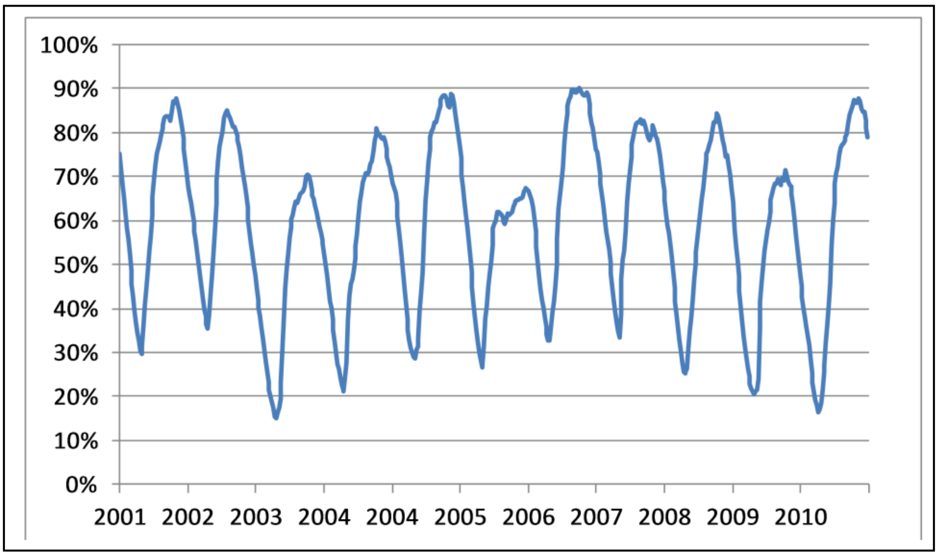

Figure 22: Reservoir levels in the hydro system in Norway, Sweden and Finland. 100% = 121 TWh

With half of the Nordic electricity being hydro based, the market has the important task of managing variations in hydro inflow. When the risk of a dry year increases, financial prices increase. These price signals give incentives for hydro conservation and increased generation from fuel based plants. Examples of dry periods are: 1996, October 2002 – April 2004 and from February 2010 to April 2011.

Most of the variations in hydro generation are compensated for by activating or deactivating thermal-based power plants in Denmark and Finland. The price of CO_2 influences the daily management of the electricity system. It affects the cost of fossil based generation and the relative competitiveness (the merit order) of fossil fuels as well as biomass and other renewables. The impact of CO_2 quotas was evident when the price peaked at €30/ton in July 2008. Today, due to the financial crises, the price has been reduced to €7/ton. Meanwhile, nuclear power typically acts as base load in the system, and nuclear production is largely unaffected by market prices.

Wind power similarly needs balancing; however the production variations occur on shorter time scales. Wind production varies between weeks, days and hours. Wind power therefore benefits from interaction with neighbouring areas, particularly areas with hydro.

A well-functioning electricity market should provide an optimal dispatch of all the different resources. Generators offer electricity to the market with bids that reflect their short run marginal costs. If the consumers in the same way present their marginal willingness to pay the market mechanism will find the dispatch solution corresponding to the lowest overall cost for meeting demand. In addition electricity prices will indicate investment opportunities to which market players can respond.

Negative Prices

In 2009 negative spot prices were introduced. This opens for a market solution when the planned generation exceeds the regionally planned demand plus the possibility for export. Before negative prices were introduced, all generators were instructed to reduce the generation on a pro-rata basis and as a result an inefficient solution was achieved. With negative prices it becomes a commercial competition between technologies as to who can reduce and/or stop production. (The idea is that the negative bids should now reflect the market players' actual marginal costs, and these costs can be negative as plants need to ramp up and down and thus the cost of doing so should be reflected in their bidding.) Negative prices occurred 10-11 times in Denmark in 2011 (DK1 and DK2), but due to their hydro capacities and/or lower share of wind power, the other Nordic countries have not experienced negative prices. Today electric boilers in district heating systems take advantage of low prices by increasing power consumption, while some wind power generators stop producing when prices are negative. The negative prices provide a motivation for making traditional generators more dynamic.

Hydro generators with a reservoir will not use marginal costs to determine production, but instead opportunity costs. These reflect the marginal value of water when it is kept in the reservoir and in the best way is used later to displace other costly generation. They thereby maximise the value of their water in the reservoir. As a result, in years with much precipitation, they will bid with lower prices to the market than in dry years.

Synchronous systems

A synchronous system is an electricity grid area that under normal operating conditions has a synchronised alternating current (AC) frequency. Within such areas electricity flows freely towards where it is needed, and in the case of the Nordic area has a frequency of 50 Hz. Two neighbouring synchronous areas can be connected via direct current (DC) transmission lines. With the exception of western Denmark (which is a part of the continental synchronous area) the Nordic area is one synchronous area.

With DC connections, in contrast to AC connections, the direction and amount of electricity flow can be directly controlled. For long distances, DC connections incur smaller losses relative to similar AC connections. DC connections are used to transfer electricity at high voltage over long distances, normally between two synchronous areas, but also within a synchronous area, as is the case with the existing FennoScan connection between Sweden and south Finland.

Congestion management

One of the most important tasks for the electricity market is to manage the available transmission capacity in the power system. When transmission capacity is restricted, the spot market must ensure optimal dispatch of power plants. Congestion will result in a price variation, with low prices in the exporting area, and higher prices in the importing area. Figure 23 provides a simple example of such a situation where the connection between Norway and Western Denmark is highlighted. In this case the transmission capacity was fully utilised, and the result of this congested line is a higher price in the importing area (DK1). The Nordic market is presently divided into 13 bidding areas; 5 in Norway, 4 in Sweden, 2 in Denmark and 1 in Finland and 1 in Estonia.

Figure 23: Transmission capacity, actual utilisation, and resulting prices when a line is congested. Data from Nord Pool Spot, 16 January 2012 at 11:15 am. The first panel displays the transmission line capacities, which for the NO2-DK1 connection was 950 MW on January 16th, 2012 at 11:15 am. The second panel shows the actual amount being transported over the line at this time (950 MW), while the final panel shows the prices in the respective areas.

Congestion management occurs daily. During 20% of the hours from 2008 to 2011 the spot price was the same in all bidding areas. During all of the other hours there was one or more congested cross-sections in the Nordic system resulting in price differences between some bidding areas. Price differences are more frequent during the day, when demand is higher.

It is costly to build transmission capacity and as such there will always be situations with congestion. DC-connections are particularly expensive, so congestions will often occur between two different synchronous systems, i.e. between Norway /Sweden and West Denmark and between West Denmark and East Denmark.

Deployment of renewable energy, such as wind power, will increase electricity flows in the transmission system since the variable nature of wind can be managed by exchanging electricity with neighbouring areas.

8 Competition in the market

The Nordic electricity market is well-developed. 74% of all electricity consumption in the Nordic countries was traded on Nord Pool Spot in 2010. From 2007 to 2010 trade in the spot market was approximately 300 TWh/year. This is similar to the combined spot market trade in Germany, France and the Netherlands (EPEX and APX).

The wholesale side of the market appears to be the most successful. The common Nordic spot market (day-ahead), Elbas (intra-day) and regulating power market (with the NOIS list of bids) deliver a comprehensive and coherent electricity market. In most hours the competition is strong and the price for electricity well-founded.

The success of the spot market is partly a function of the fact that trade between price areas must take place through Nord Pool. In addition, the differences in generation technologies motivate trade. Hydro, wind power, nuclear and coal based plants all benefit from interaction with other technologies.

In 2011 the spot price was the same for the entire Nordic electricity market 26% of the time. If one only considers Norway and Sweden, then this figure increases to 37% as shown in Figure 24 below. When areas with the same price are large (no congestion) competition is strong, however, in hours with congestion the market concentration is higher as there are physical limitations to competition. High market concentration means increased profitability for a dominant producer to withdraw production and use its market power. It is therefore important that market surveillance focusses on hours with separate price areas.

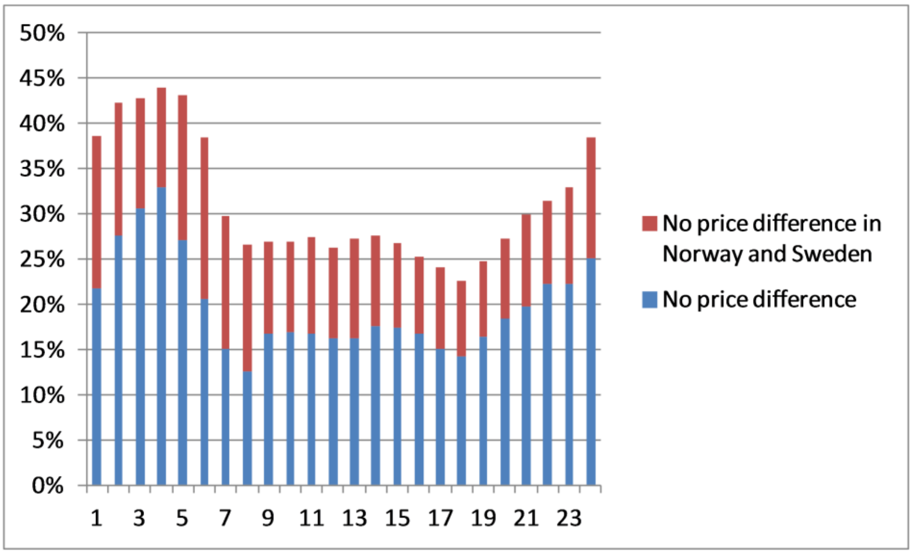

Figure 24: Hours with common price in the Nordic area. X-axis indicates the hour of the day. Analysis of spot prices from 2008 to 2010.

The Nordic financial market is very competitive. NordREG (2010, b) noted that every year in the period 2004-2009 required at least 11 companies in order to reach 50% of the total volume. At least 38 companies were needed to reach 80% of the total volume. The market concentration was bigger in CfDs. On average about one third of the total sell offers of CfD-contracts were from the dominant producer in the respective country.

Competition in retail market

Electricity consumers have the freedom to choose from a range of electricity contracts, e.g. long term contracts with a fixed price, or a combination of spot indexed price. Large consumers can also hedge with financial contracts. In theory, competition in the retail market can motivate low prices as well as the development of products (e.g. different forms of payment conditions, customer services, billing and product bundles) for all end-users. However, to date this development has not been realised and the majority of end-users have stayed with their historical supplier.

EU-Commission (GD SANCO) has 2010 carried out a study of the electricity retail market. The electricity retail market is considered a market, in which consumers are getting least out of competition (EU-Commission, 2010).

The study shows that only few consumers (households) use the possibility created by liberalization:

- Very few consumers change supplier, only in 7 EU countries is the switching rate above 10%;
- Less than one third of EU consumers (32%) have carried out price comparisons;
- 41% of consumers do not know how they can find a lower tariff;
- Less than half of EU consumers (47%) know how much electricity they consume.

The European Regulators Group, ERGEG (2010) has analysed the regulation of the household electricity market, see Table 6.

Table 6: End user price regulation for households Source: ERGEG (2010). The 31 countries are members of the EU plus Croatia, Norway, Iceland and Turkey.

Year	No information	Countries without regulation in open markets	Countries with regulation in open markets	Closed markets	Total
2008	5	11	14	1	31
2010	1	11	17	2	31

Table 6 shows that approx. 50% of countries studied have regulation of the household market for electricity (17 out of 31 countries).

A very new analysis “Impacts and Lessons from the Fully Liberalized European Electricity Market” (Ariu et.al 2012) shows a mixed picture of what is happening at the end–

user market *"Post liberalization electricity rates in Europe are volatile, diverse and appear largely unrestricted by competition by electricity suppliers."* As for shifting rates, they are increasing but there is no relation between shifting rates and either price levels per se, or the number of suppliers on the market.

In Norway – one of the most advanced markets – 55% of household consumption was billed through contracts pegged to the daily spot price in 2011 (NVE, 2012). In Denmark, on the other hand, 85% of households have decided to remain with their default supplier.

The Danish Competition and Consumer Authority (Konkurrence- og Forbrugerstyrelsen, 2011) found that competition is weak in the retail market for electricity. For example, from 2008-2010 only 6% of end-users changed supplier. Current regulation is a barrier for competition – the price regulation of the default supplier system reduces the motivation for competition, the profiling system removes motivation for end-user demand response (all those below 100,000 kWh/year), and the lack of a functioning common invoice system is considered in-efficient. The Authority recommends that:

- Grid companies install meters for hourly recording of demand
- The profiling system be removed so that all demand can be based on hourly values from 2015
- End-users shall only be billed from the retailer (common invoicing, thus in line with the NordREG recommendation)
- The price regulation for grid companies and of default supply companies be updated (as part of the government's on-going review)
- Price regulation for larger end-users (above 100,000 kWh/year) should from 2013 be stopped
- DataHub be used to maintain the relation between consumer and retailer – even when end-users move.

A common Nordic retail market

The Nordic Energy Regulators, NordREG, have recommended that a Nordic retail market be implemented in order to bring the benefits of the Nordic electricity market to all consumers. A common Nordic retail market aims to provide smaller customers better opportunities, with more suppliers and more products to choose from.

Introducing a common Nordic retail market is expected to result in suppliers having access to a larger market. This will result in the market being more attractive for new entrants, thereby increasing competition between market players. This should result in lower unit costs for consumers through reduced costs and increased innovation of products. (NordREG 2006)

There are a number of challenges associated with the introduction of a common Nordic retail market. Some practices related to the national retail markets act as barriers for the introduction of a common market. The most important issues to be addressed before an efficient retail market can be implemented are:

- Develop common procedures for customers wanting to switch supplier
- Harmonised procedures for separating distribution services from retail services in network operators (NordREG 2006)

NordREG has instituted a number of reports to address the challenges facing the introduction of a common Nordic retail market. These included an implementation plan for introducing a common retail market. This recommends that the common retail market be introduced in 2015 and that it be based around the principle of a supplier centric customer interface where most issues from the customer perspective are handled by the supplier (NordREG 2010).

NordREG (2010) also clarifies the general objectives of the common Nordic retail market and issues that must be addressed. These include:

- The common Nordic retail market be open for all suppliers
- Customer protection must be ensured no matter which supplier the customer chooses
- Low entry barriers must make it easy for suppliers to operate in all Nordic countries
- Regulations regarding obligation to supply and supplier of last resort may be a barrier for the efficient functioning of a common retail market
- Common procedures for key processes such as supplier switching, change of address, billing and data formats must be standardised and automated

NordREG has already published reports that address some of these issues. VaasaEET (2011, a) addresses the issue of billing in a common retail market. The report concludes that the current billing regime is inappropriate and will result in many lost market opportunities under a common Nordic retail market.

Combined billing is recommended as an alternative. A single electricity bill including energy costs, network costs and energy taxes, sent by the supplier is considered more favourable and accessible for customers and plays an important role in reducing the role of the regulated monopoly in the market. Combined billing is also recommended in CEER (2011,b).

Some concerns with combined billing are raised. These include issues related to retailers collecting energy taxes, risk management by suppliers and the costs of implementing the necessary processes to facilitate combined billing.

VaasaEET (2011, a) concludes that the costs incurred in introducing combined billing will be heavily outweighed by the benefits incurred over time for the end user.

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