NordREG
Nordic Energy Regulators

NordREG report on the price peaks in the Nordic wholesale market during winter 2009-2010

Report 1/2011

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Preface

During the winter 2009-2010 the Nordic market witnessed three significant price spikes. The high spot prices initiated public discussions in Sweden, Finland and Norway about the functioning of the Nordic market. The market and its power exchange were criticized among others for the lack of transparency that is seen to allow the generators to avail of the market opportunities to raise the price.

As a consequence of the incidents and the public discussion that followed, NordREG decided to analyse the events and to propose improvements where possible. Subsequently, the Electricity Market Group (EMG, a working group under the Nordic Council of Ministers) requested NordREG to examine how the Nordic market functioned during the winter 2009-2010.

This NordREG report provides a description on the price spikes and their causes during the previous winter. It is based on a consultancy study prepared by Gaia Consulting Oy that described in detail the anatomy and causes for the price peaks in the Nordic electricity wholesale market during the winter 2009-2010.

The project had a steering group, which consisted of the representatives of the Nordic energy regulators and the Nordic competition authorities. A stakeholder workshop was arranged in early October to discuss the draft consultancy study and to collect the views and valuable information from the stakeholders.

When finalising this report, the findings of the consultancy study have been complemented by the results of the stakeholder workshop and the views of the energy regulators and the competition authorities, though the opinions presented herein cannot constitute a legally binding opinion for any of the mentioned authorities.

This report incorporates action proposals that NordREG considers necessary and beneficial to address the key problems associated with the emergence of the price peaks. The action proposals are presented herein and will subsequently be included in the 2011 NordREG work program.

Copenhagen, January 2011

Finn Dehlbæk

Chair of NordREG

Summary

This report has been prepared by the NordREG ad hoc team. The initiative for this report was the price peaks that occurred in the Nordic electricity wholesale market during the winter 2009-2010. The high prices that were seen alarmed the politic and the regulatory level of the Nordic regulatory system. NordREG decided at its March 2010 Board meeting to undertake an analysis of the recent price spikes and the decision was followed by a request in May 2010 from the Electricity Market Group under the Nordic Council of Ministers (EMG) to examine how the Nordic market functioned during the winter 2009-2010.

A consultancy study was commissioned from Gaia Consulting Group. A steering group for the study was set up and it composed of the representatives from all the Nordic energy regulators and the competition authorities. An interim NordREG report to EMG was submitted by mid September and the consultancy study was completed by the end of September.

There are a number of primary causes for the occurrence of the price peaks and no single individual cause can be pinpointed to bear the key responsibility. The fact that the weather was cold all over the Nordic area in conjunction with the low availability for the Swedish nuclear generation capacity, however, could be indicated as the key underlying causes. At the same time the methodology how the Nordic transmission capacity is allocated for the market and the resulting low availability or non-availability of transmission capacity towards areas with scarce production resources contributed to the price peaks. Thus, it is relevant to consider improvements that lead to better utilisation of the network.

In this report NordREG has also identified and proposed possible measures to avoid or at least to reduce the probability of the occurrence of unreasoned price peaks in the Nordic area in the future. These actions will be included in the NordREG Work Programme 2011.

One important factor which has contributed to price peaks has been the unavailability of the production capacity – especially the Swedish nuclear generation. The Swedish energy regulator has undertaken a parallel analysis of the Swedish electricity market including its generation fleet and proposed measures to ensure transparency of the use of the cross-owned nuclear plants.

The analysis has shown that price peaks can be substantially reduced through only small increases in the available transmission capacity between certain bidding areas. Today the TSOs determine transmission capacities before market players submit their bids to Nord Pool. The amount of transmission capacity that is made available depends on how the production, consumption and load flow conditions are expected to be in the operating phase. This may be a challenging task for the TSOs to predict and because of uncertainty the announced capacities published to the market may be lower than if the actual market conditions were known. Thus, NordREG finds that a review of the methods of allocating

transmission capacity for the market should be carried out. As a part of this, an analysis that addresses the delimitation of price areas, maintenance planning of the transmission network infrastructure and an assessment of incentives for the TSOs to remove congestions should be prepared.

It should be noted that the flexibility on the demand side is not very large in the Nordic region. However, simulations have shown that even small degree of increased price elasticity could substantially cut the price peaks. This could be seen as an improvement potential of the trading system reflecting the present inability of the market participants to react on the price signals the market place provides. Therefore, NordREG finds that facilitating the appearance of a real price elastic behaviour of the users of electricity can be seen as one of the key fixes for the problem. Furthermore, NordREG suggests that a consultancy study on how to promote demand flexibility in the Nordic market in a coherent way should be prepared.

In addition to these, NordREG finds that it should be assessed whether the area bidding curves at Nord Pool Spot could be publicized to enhance the transparency of the market and to enable all the market participants to have access to the trading data. Transparency in the Nord Pool Spot bid data would enhance confidence in market developments.

NordREG also proposes that the trading mechanisms at the Nord Pool Spot should be assessed. This study should especially focus on how to increase flexibility into the market, how to improve pricing and offering of peak load reserves to the Nord Pool Spot and how to improve possibilities to hedge against area price risks.

NordREG emphasizes that the assessment of the Nord Pool Spot trading mechanism and the proposition on increasing transparency of the trading data should be prepared in close coordination and cooperation with Nord Pool Spot.

Finally, one of the key issues for ensuring a well-functioning electricity wholesale market is the optimal and sufficient transmission network with its cross-border interconnectors that support the wholesale electricity market. The European TSO organisation ENTSO-E published the pilot Ten Year Network Development Plan in June 2010 and the process for preparing the next one is already underway. This planning work and the results of it will have a significant impact on the functioning of the Nordic, Northern and the whole European electricity wholesale market and its integration. This work needs to be analyzed and followed by NordREG.

1 Introduction

The Nordic wholesale power market prices peaked during the winter 2009-2010. For Sweden, Finland, Eastern Denmark, and Mid as well as Northern Norway there were three very high price peaks that occurred on 17 December 2009 at 17-18 in the evening, on 8 January 2010 between 8-9 in the morning and on 22 February 2010 between 8- 9 in the morning. For these areas, the prices during the three peaks were 1400, 1000 and 1400 EUR/MWh, respectively. The system price remained at 300 EUR/MWh or below. At the same time the price in Southern Norway and Western Denmark was relatively low, at about 65 EUR/MWh.

The price spikes draw attention and initiated a public discussion in each of the Nordic countries initiating a debate on the functioning of the Nordic wholesale electricity market. The Nordic Energy Regulators – monitoring and supervising the wholesale electricity markets on the basis of their national mandates – decided to jointly undertake an analysis of the Nordic wholesale electricity market focusing on the occurrence of high prices during the winter 2009-2010. A decision was made at the March 2010 NordREG Board meeting to launch a review and to commission a consultancy study to provide necessary background information for the analysis.

NordREG invited the Nordic competition authorities to participate in the project as the mandates of the energy regulators and competition authorities in the area of wholesale electricity market issues are intertwined and often somewhat overlapping. Furthermore, the Nordic competition authorities, too, have analysed the Nordic electricity market and its functioning.

In 2007, the Nordic competition authorities jointly prepared a study on the Nordic wholesale electricity market “Capacity for Competition”. A previous study by the Nordic competition authorities - “A Powerful Competition Policy” was issued in 2003. The 2007 study pointed out that concentration in the Nordic electricity market had changed due to mergers. Furthermore, cross-ownership was considered still widespread in the Nordic market and may be problematic from a competition point of view. The study also drew attention to the fact that bottlenecks can be a result of strategic conduct in markets and advocated the agreed investments in the transmission network. The interconnections between the Nordic market and the neighbouring countries were touched upon and the use of efficient methods for capacity allocation and congestion management was supported.

The Electricity Market Group of the Nordic Council of Ministers had also paid attention to the incidents on the Nordic wholesale electricity market and as a result requested in May 2010 NordREG to provide a status report of the functioning of the Nordic market during the past winter.

Gaia Consulting Oy was given the assignment to prepare a background study that described and analysed the price spikes of winter 2009-2010 and based on the analysis also provided propositions to develop the market and its arrangements. The study was overseen by a steering group consisting of the representatives of the Nordic energy regulators and competition authorities.

An integral element of the project was a stakeholder workshop organised in October 2010 in Arlanda, Sweden. The workshop provided an opportunity to present the findings of the consultancy study and to discuss the issues with the key stakeholders of the Nordic wholesale electricity market.

NordREG ad hoc project group has finalised this report that contains NordREG propositions on the necessary measures to improve the functioning of the Nordic wholesale electricity market. These measures are to be included in the NordREG work programme for the year 2011 as far as the measures concern actions by the energy regulatory authorities. The report harnesses the Gaia Consulting study, the results of the stakeholder workshop and the subsequent discussions among the Nordic energy regulators.

2 Anatomy of the price peaks

2.1 Description of the peak price situations

During the winter 2009–2010 the Nordic electricity market experienced several periods of high spot prices. The prices were 1000 EUR/MWh or higher on three occasions:

- 17 December 2009 for hours between 16–18
- 8 January 2010 for hours between 7–10
- 22 February 2010 for hours between 7–12 and 17–19

All three peak price situations experienced in the winter of 2009-2010 have been studied in this project. The peak price situation on 8 January 2010 was chosen for in-depth analysis and is described more closely in Chapter 2.1.2. However, to frame the setting, an overview of physical conditions in the market during winter 2009–2010 is given first in the following section. The analysis then focuses on the areas that most likely have contributed to the high price situation in winter 2009–2010.

2.1.1 Description and analysis of the physical underlying conditions

2.1.1.1 Supply

Nuclear power production availability

The Swedish production of nuclear power was reduced during the winter 2009–2010. The low availability of nuclear power was the result of the fact that revisions and maintenance of nuclear plants had been planned for the spring and summer of 2009. These revisions had not been completed before the winter period.

The availability of Swedish nuclear power during the winter 2009–2010 and previous two winters is shown in Figure 1. During the winter period between October and March, the availability of Swedish nuclear power was 61 % on average. During the price peak of 17 December 2009 the availability was at its lowest at 46 %, on 8 January 2010 availability was 69 % and on 22 February 61 %. All three Swedish nuclear production sites, Forsmark, Oskarshamn and Ringhals, were affected with numerous problems. Many power plants underwent scheduled maintenance and modernization work that took much longer than originally planned.[1]

[1] EMI, Half year report about the electricity market October – March 2009/2010

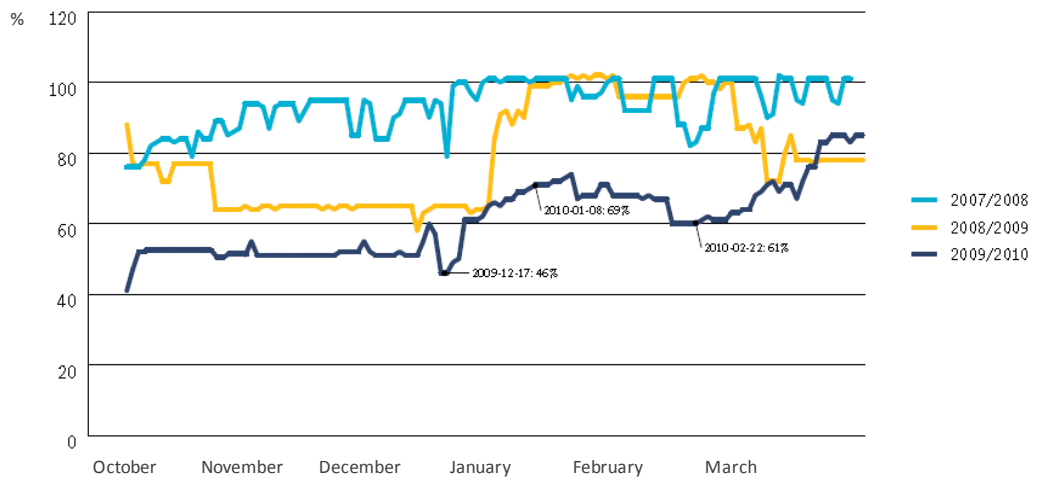

Figure 1. The availability of Swedish nuclear power during winter times 2007–2010. [2]

Finnish nuclear power production was running without major incidents in the period December 2009 – February 2010.[3]

Several non-nuclear production units had production failures during the winter 2009–2010. The total number of market messages relating to production failures was over 400 in the Nord Pool market messaging system. The number of failures is on the same level as in the previous two winters.[4] All these failures have not been analyzed in detail, but it has been estimated that the failures in smaller production units have had a more limited effect on market prices than the issues with Swedish nuclear production.

Hydropower reserves

At the beginning of November 2009, the hydrological situation was normal and the energy situation in Norway was considered to be good by the Norwegian TSO.[5] The levels in the Nordic hydro reservoirs were close to the median levels. However, hydropower reserves were depleted because of higher than normal production. The production was higher as hydro power was used to compensate low Swedish production and also problems with the imports from the Netherlands. In addition, despite the high snowfall in general, the snowfall did not favour the areas with high hydropower

[2] Energimarknadsinspektionen, Halvårsrapport om elmarknaden oktober–mars 2009/2010 (*in Swedish*), EI R2010:09. Original source Montel Powernews. This data is not available from Nord Pool Spot.

[3] Fingrid, Sähköjärjestelmän toiminta joulukuun 2009 ja tammikuun 2010 huippukulutustilanteissa (in Finnish), 12 Feb 2010 and Nord Pool Spot Urgent Market Messages.

[4] Nord Pool Spot, On the basis of the Urgent Market Message database the total number of approved failures from all companies (excluding TSOs) from 1 October 2009 to 31 March 2010 was 414. With same conditions, the number of failures was 451 in winter 2007–2008 and 402 in winter 2008–2009. Database was accessed on 30 September 2010.

[5] Statnett, In Exchange Information, No 93/2009 Energy situation in Norway is good as winter looms, Nord Pool Spot, 4 November 2009.

production capacity.[6] The development of the hydrological reserves is presented in Figure 2.

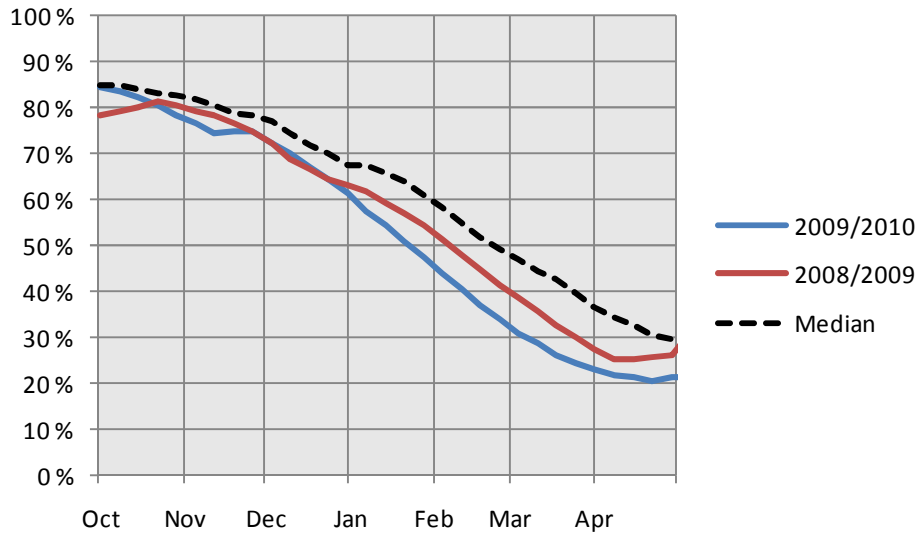

Figure 2. Nordic water reservoir levels during the winter 2009–2010, the previous winter, and in typical conditions (median).

2.1.1.2 Demand

Electric heating, which makes up an important part of electricity consumption in the Nordic area, was a contributing factor to the high levels of consumption. As a result of cold weather experienced during an extended period of time, electric heating consumption lifted the overall consumption of electricity on a Nordic level.

The temperatures were below average for extended periods of time in the winter of 2009–2010. For instance on 8 January 2010 the temperatures in the Nordic countries were 10–12 degrees below average. As an example, Figure 3 presents the deviation of Swedish temperatures from normal during the winter.

[6] Energimarknadsinspektionen, Halvårsrapport om elmarknaden oktober–mars 2009/2010 (in Swedish), EI R2010:09.

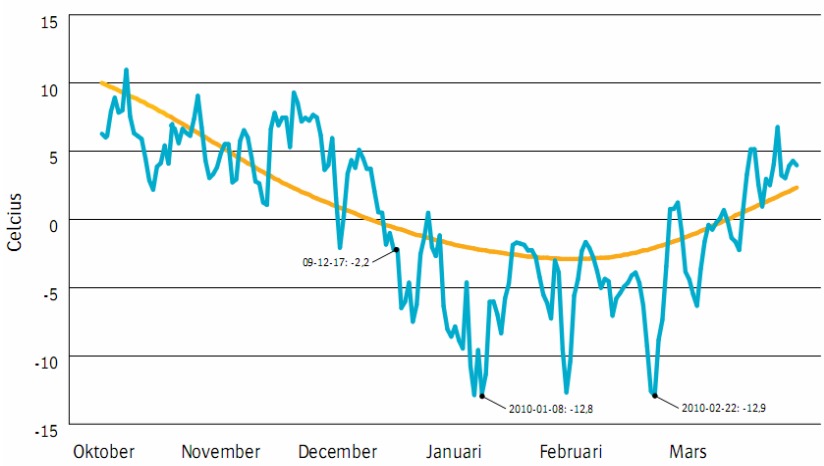

Figure 3. Temperature in Sweden on peak price days. [7]

Electricity consumption was higher on the peak price periods of winter 2009–2010 than during the two previous winters as seen from Figure 4.[8] The main reason for the high consumption was the low temperatures that increased the use of electric heating. Industrial demand was affected by the global economic downturn from 2008. In Finland and Sweden, industrial consumption was lowest during the winter 2008–2009, but recovered slightly for the winter 2009–2010.[9] In Norway, the industrial demand was lower during the winter 2009–2010 than in 2008–2009. [10]

[7] Energimarknadsinspektionen, Halvårsrapport om elmarknaden oktober–mars 2009/2010 (*in Swedish*), EI R2010:09. Original data from SKM Market Predictor. Temperature data for the Nordic region is not publicly available.

[8] Nord Pool publishes data from the current and two previous years.

[9] Online database Statistics Sweden, accessed 30 September 2010, and Finnish Energy Industries, Monthly energies, 15 September 2010.

[10] NVE, Kvartalsrapport for kraftmarkedet (*In Norwegian*), 1. kvartal 2010.

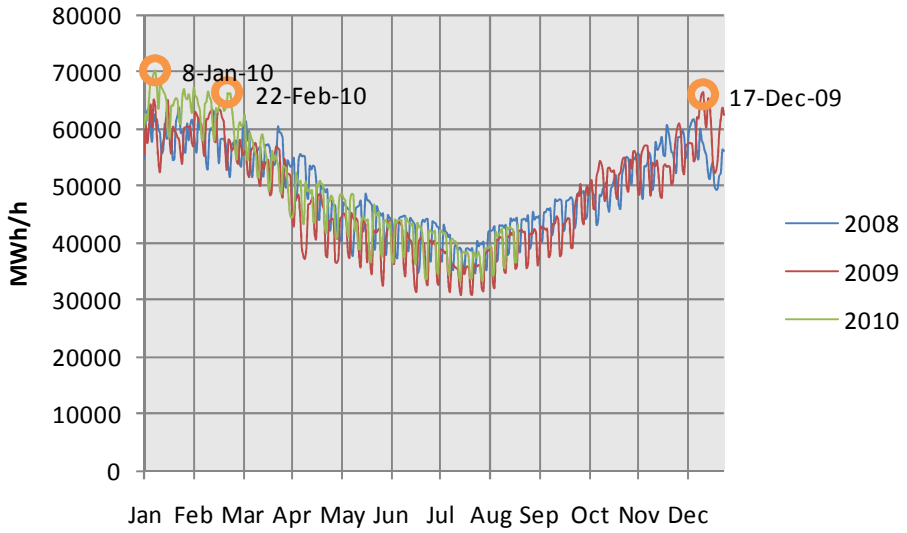

Figure 4. Highest consumption during the day in the Nordic area 2008–2010 with the peak price dates highlighted. [11]

2.1.1.3 Transmission capacity and its availability

The Nordic interconnection capacity was somewhat limited from the maximum technical capacity during winter 2009–2010. The major capacity restrictions were internal to the Nordic area.

The major external connections to the Nordic area from Germany, Russia, Estonia and Poland were operational during winter 2009–2010. However, the NorNed cable connecting Southern Norway and the Netherlands went out of operation on 29 January 2010.[12]

The technical transmission capacity between Southern Norway and Sweden had been reduced in certain situations for an extended period already in early 2009. The reason for the reduced availability is a cable failure in the so called Rød Hasle connection.[13]

In addition, capacity allocated by the TSOs from Western Denmark to Sweden was reduced to half from 740 MW to 370 MW because of technical problems. [14]

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[11] Date source: Nord Pool Spot. The highest consumption is calculated as a sum of the maximum consumption of the areas.

[12] Nord Pool Spot, Urgent Market Message, 1 February 2010, hour 13:03. Note the delay between the event and published information.

[13] Nord Pool Spot, Exchange Information No.45/2009 Net Transfer Capacity (NTC) from NO1 to SE, 4 May 2009.

[14] Nord Pool Spot, Urgent Market Message, 27 October 2009, hour 12:28.

2.1.2 Peak of 8 January 2010

2.1.2.1 Nord Pool Spot prices on 7-9 January 2010

The highest prices during the peak of 8 January 2010 were seen between 7 and 10 in the morning. The Nord Pool Spot system price was 300 EUR/MWh between 8 and 9. Because of capacity constraints in the grid, the Nordic area was split into different price areas.

Nord Pool Spot area prices for Sweden (SE), Finland (FI), Central and Northern Norway (NO2 and NO3) as well as Eastern Denmark (DK2) were 1 000 EUR/MWh. Area prices for Southern Norway (area NO1) and Western Denmark (DK1) were 65 EUR/MWh. The system price and the prices in the different areas during a 72 hour period 7–9 January 2010 are shown in Figure 3.5. Prices are lower on 9 January 2010 because of the lower demand as it was Saturday. Notice that the area price in Western Denmark was below 3 EUR/MWh on morning of the 9 January 2010. This was due to high wind production and limited transmission capacity to Germany that also had high wind production. [15]

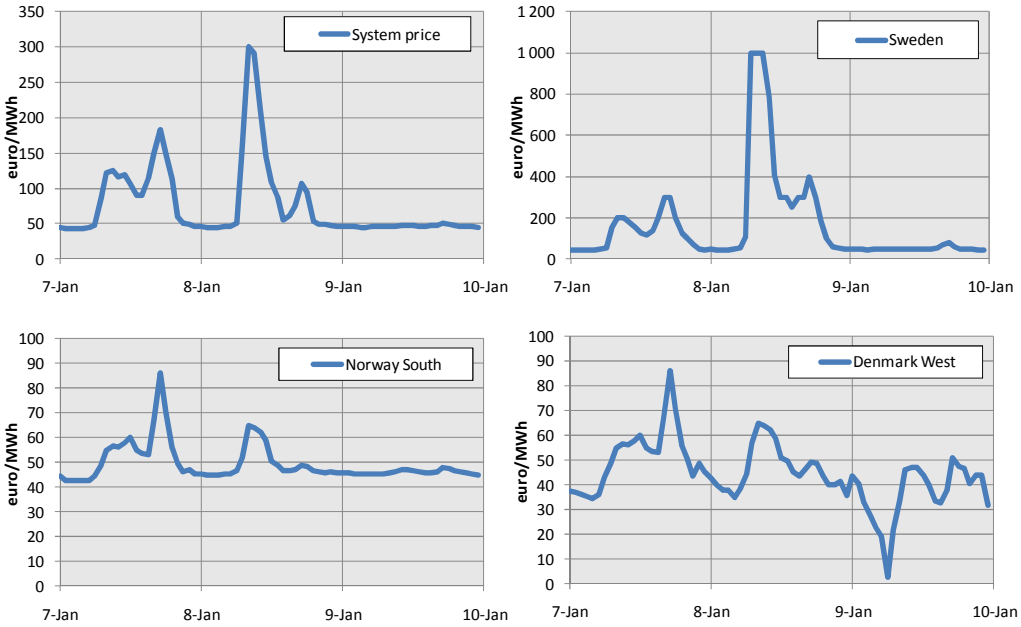

Figure 5. System price and area prices for a 72 hour period 7-9 January 2010. [16]

The hour between 8 and 9 had the highest system price and highest area prices in all the areas. It is analyzed in more detail below and also the following Chapter 2.1.2.2.

[15] Nord Pool Spot, Urgent Market Message, 8 January 2010, hour 08:26.

[16] Source: Nord Pool Spot.

2.1.2.2 Hour 08–09 on 8 January 2010

Situational overview

Figure 6 presents an overview of the key Nordic electricity market parameters on the hour 08–09 on 8 January 2010. The figure gives an overview of prices in different areas, transmission capacity available for Nord Pool trading, actual power flows, and consumption prognosis made by TSOs, actual consumption and production in different price areas

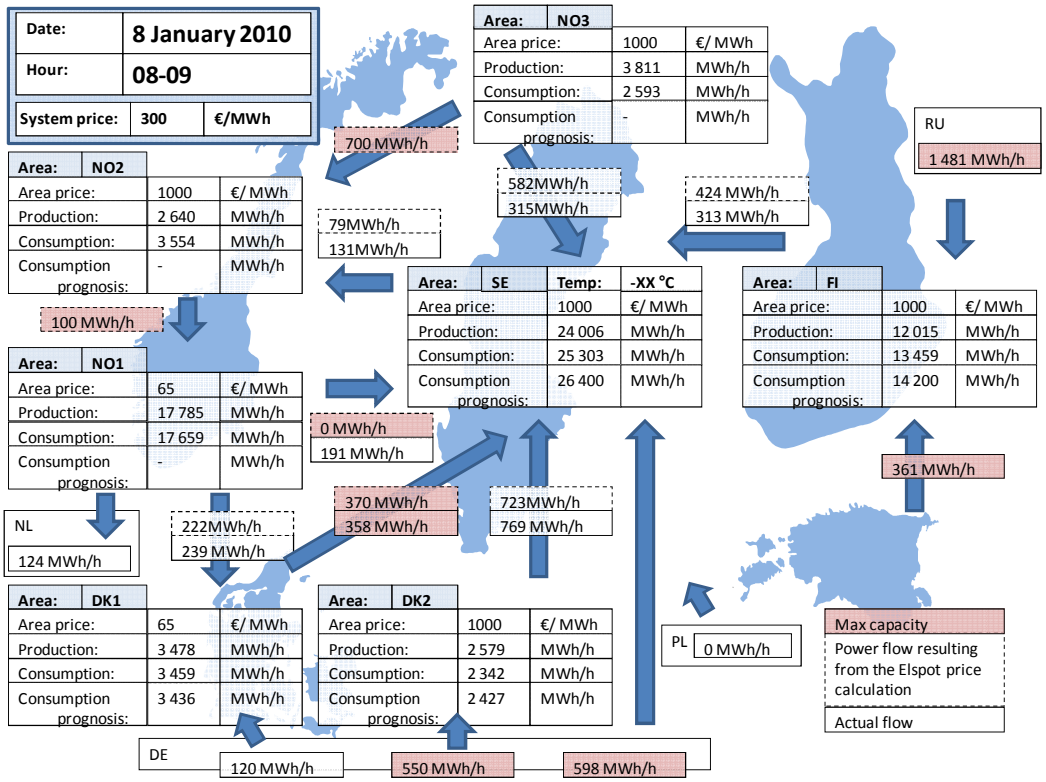

Figure 6. Situational snapshot of the hour 08–09 on 8 January 2010. Constrained transmission capacities within the Nordic area are highlighted. [17]

During the peak hour, the total Nordic production was 66 314 MWh and consumption 68 369 MWh. The net import to the Nordic area was 2 055 MWh. Production was lower than consumption in Finland, Sweden and Central Norway. Production and consumption were almost equal in Southern Norway and Western Denmark. Only area with clearly higher production than consumption was Northern Norway and to lesser extent also Eastern Denmark.

Consumption and consumption prognosis

Consumption during the peak price situation was on a high level historically. However, the consumption prognosis made by the TSOs was even higher, as shown in Figure 7. The consumption during hour 08–09 on 8 January 2010 was lower than the prognosis by 1 097 MW in Sweden and by 741 MW in Finland. The prognosis by the TSOs is used as a basis for making the transmission capacity allocation.

[17] Data from Nord Pool Spot.

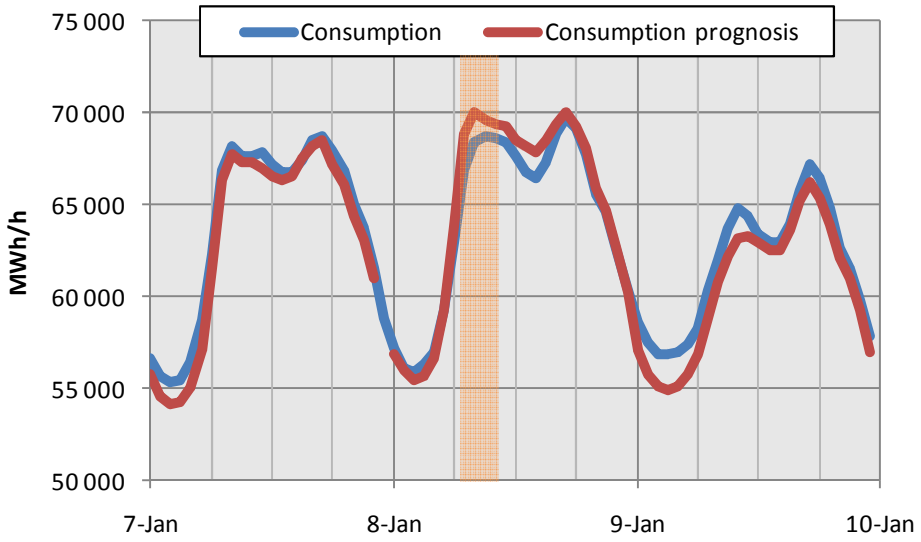

Figure 7. Production, consumption prognosis, consumption and system price 7- 9 January 2010. The time of the high price hours is highlighted.

It should be noted, that market participants have made their own consumption prognosis on the 8 January 2010. The Nord Pool Spot prices are matched on the basis of the bids that the market participants provide. The consumption prognoses made by the participants are not public, and they can differ from the prognoses made by the TSOs. Therefore, the higher consumption prognoses by the TSOs have not directly affected Nord Pool Spot price formation.

Production availability

On 8 January 2010, 69 % of the Swedish nuclear power production capacity was available. Compared to a normal situation, this means that some 2 800 MW of nuclear production was unavailable. Otherwise there were some problems with smaller production facilities.

Use of peak power reserves

The supply and demand bidding curves from the market participants failed to meet during the hours from 8–10 on 8 January 2010. There was not enough supply to meet the demand in the high price areas. Therefore, market price formation on 8 January required the activation of peak power reserves maintained by the TSOs.

The amount of peak power reserves activated is shown in Table 1. The total production in the Nordic area was around 65 000 – 66 000 MW, and around 45 000 MW in the high price areas. The activated peak power reserves corresponded to around 0.3 % of the total production in the Nordic area[18].

[18] In addition to that, the reserves were used by the Swedish TSO in order to maintain enough reserve margins for operatinal purposes.

Table 1. The amount of peak power reserves activated on 8 January 2010. [19]

Hour	Finland (MW)	Sweden (MW)	Total (MW)
07–08	20.5	143.1	163.6
08–09	45.4	145.4	190.8
09–10	35.3	86.9	122.2

Transmission capacities

The areas with high prices imported from the areas outside the Nordic area mostly at or close to the maximum technical capacity. Denmark and Sweden imported from Germany and Finland from Russia and Estonia. An exception was the transmission between Poland and Sweden, which was zero during the high peak price hour. The lower priced Southern Norway exported to Netherlands and the import from Germany to lower priced Western Denmark was lower than the maximum capacity.

Transmission capacity from the low price areas to high price areas was restricted to maximum allocated capacity during the peak hour. The transmission from Central Norway to Southern Norway was restricted to 100 MW, although the price in Southern Norway was lower than in Central Norway.

Capacity from Southern Norway to Sweden was reduced down to 0 MW because of the expected high load in the Oslo area.[20] Figure 8 shows the capacity available for the spot market in the Southern Norway to Sweden connection, the transmission resulting from the spot price calculation, and the actual physical exchange.

[19] Nord Pool Spot, Urgent Market Message, 7 January 2010, hour 13:16.

[20] Nord Pool Spot, Urgent Market Message, 6 January 2010, hour 12:24.

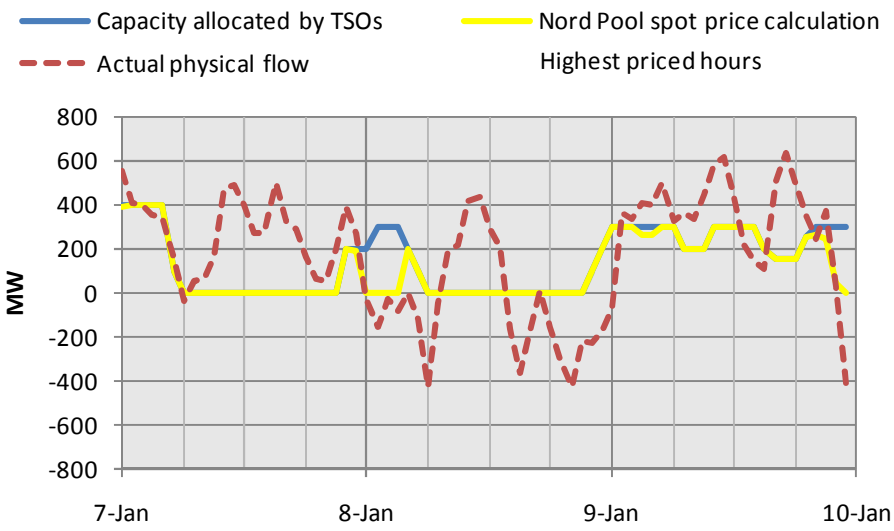

Figure 8. The interconnection capacity available between Southern Norway and Sweden in 7–9 January 2010. [21]

Internal management of price areas

Svenska Kraftnät announced on 6 January 2010 that it will use counter trade on 7 January 2010 to maintain operational security in the southern part of Sweden.[22] There was no similar announcement for the 8 January 2010. However for the 8 January 2010, E.On arranged 484 MW of gas and oil turbines[23] and Vattenfall a 240 MW oil turbine[24] to be used as reserve capacity. According to the announcements this capacity was withheld from the market. It is unclear from the announcements how much of this reserve capacity that was used for counter trade, and if additional capacity was used.

In addition, Svenska Kraftnät announced that available capacity between borders south of Cut 2 would be reduced in order to maintain Swedish power system security.[25]

System balance and regulating market

As is illustrated by **Figure 9** there was significant down regulation on 8 January 2010. The down regulation was over 2 000 MW between 8 and 9 and close to 2 500 MW from 9 to 10. A major part of the down regulation was at this time realised in Finland and Sweden, which were the high price areas.

[21] Data from Nord Pool Spot.

[22] Nord Pool Spot, Urgent Market Message, 6 January 2010, hour 7:54.

[23] Nord Pool Spot, Urgent Market Messages, 7 January 2010, hour 10:32, 10:33, 10:34, and 10:35.

[24] Nord Pool Spot, Urgent Market Messages, 7 January 2010, hour 15:12.

[25] Nord Pool Spot, Urgent Market Message, 7 January 2010, hour 8:27.

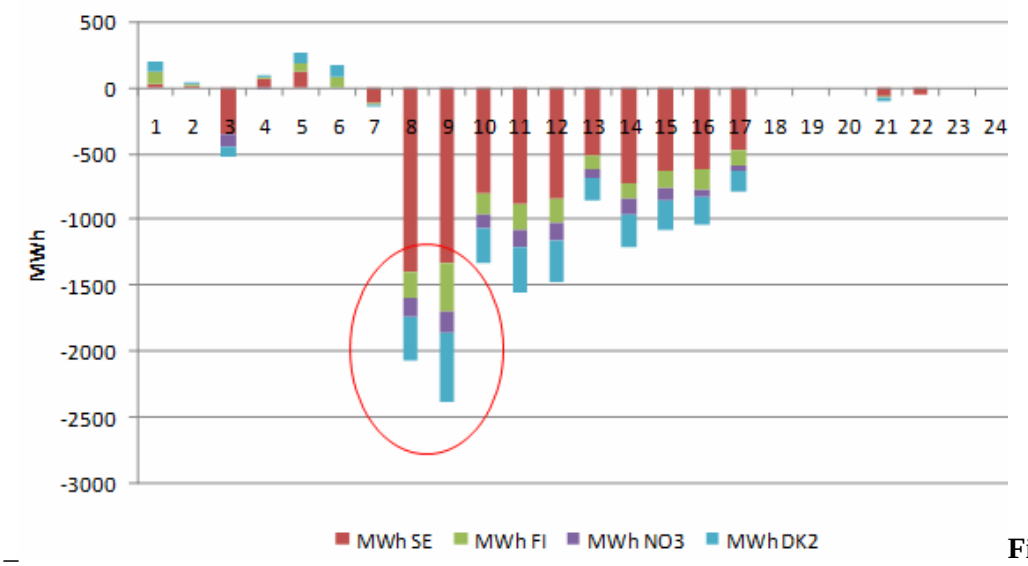

Figure 9. Up and down regulation on 8 January 2010. [26]

2.1.3 Other price peaks

2.1.3.1 Peak of 17 December 2009

The peak price situation on 17 December 2009 had similarities with the peak of 8 January 2010 described above in detail. The prices in the peak hours 16–17 were 1 400 EUR/MWh. Finland, Sweden, Eastern Denmark and Central and Northern Norway formed a unified price area. The technical maximum price at Nord Pool Spot was reached and effect reserves were activated in Sweden and Finland to reach an equilibrium market price.

The transmission capacity from Southern Norway (NO1) to Sweden was 100 MW lower than in the surrounding hours, but not at the very low levels of 8 January or 22 February 2010. On 17 December 2010, only 46 % of the Swedish nuclear power capacity of 9 300 MW was available. Five nuclear plants with an installed capacity of 5 154 MW were out of production. During the day Oskarshamn 3 returned in production.

In short, the availability of Swedish nuclear capacity was even lower on 17 December 2009 than on 8 January 2010, but this was compensated by the lower consumption. As a result, the area prices on 17 December reached around the same level as on 8 January 2010.

2.1.3.2 Peak of 22 February 2010

Compared to 8 January 2010, a new price area had been added to Southern Norway. Again Finland, Sweden, Central and Northern Norway and Eastern Denmark formed a unified price area during the high price hours. Previously joint Southern Norway was divided into two price areas, NO1 and NO2. Still, Southern Norway and Western Denmark had significantly lower prices than rest of the market areas. Nord Pool Spot prices in the high price areas were 1 000 – 1 400 EUR/MWh in the morning between 8

[26] Source: Nord Pool Spot.

and 10, and 1 000 EUR/MWh in the evening between 17 and 19. The prices were over 1 000 EUR/MWh for at total of seven hours on February 22.

The transmission between Southern Norway (NO1) and Sweden was again reduced, but this time not to zero but to 150 MW. Around 230 MW of effect reserves were activated through Nord Pool at this time to reach a market price. There were again problems with Swedish nuclear power which was running at 61 % of maximum capacity.

Sensitivity analysis with the use of a simplified Elspot model

This section discusses the theory and some numerical properties of the Nord Pool Spot model. Competitive equilibrium is the basic underlying principle in Nord Pool Spot in allocating the bids and the transmission capacity to production, consumption and bilateral trade among areas. Traditionally, such spatial equilibrium is computed maximizing the total producer and consumer surplus and the equilibrium prices and quantities are obtained from optimal solution of this maximization problem.

However, in Nord Pool Spot there are complicating constraints, binary choices, which require that block bids can only be accepted at 100% level of bid quantities or rejected completely. This leads to a combinatorial equilibrium problem. Simple examples show that such block bid requirements can, in theory, result in an increase in market price and in producer surplus. Also nesting conditions can further increase prices and producer surplus.

An experimental Elspot model was implemented for numerical analysis. For model validation, the Elspot prices were replicated in the 72 hour period of 7–9 January 2010, one of the periods with peak prices of electricity. Sensitivity analyses were carried out for the same 72 hour period.

Transmission capacity was varied in the bottle neck connection between southern Norway and Sweden. During the peak price day of 8 January 2010, actual capacity in Elspot was zero during the hours 7-22. Small relaxation of this capacity had a major impact in market prices. Similar impact was achieved, when the capacity of this bottle neck was determined simultaneously with price calculation.

Tests concerning the sensitivity of price calculation with respect to variations in price elasticity of demand indicated a major impact in market prices during 8 January 2010, a tight market day. However, during a more normal day of 9 January 2010, such impact was much weaker. Tests concerning variations in supply and demand indicated strong (weak) incentives of exploiting market power during 8 January 2010 (9 January 2010).

Possible future studies may concern changes in regional subdivision, simultaneous price-capacity calculation, impacts of grid investments and alternative auction mechanisms.

3 The proposals of the consultancy study and feedback from the stakeholder workshop

3.1 Gaia Consulting Study proposals

3.1.1 Increase market transparency

The Nord Pool Spot already provides a lot of market data. However, current publicly available data has three major drawbacks:

- Market participants seem still to be in unequal position. Those that control larger production and/or consumption array have more detailed and more real-time knowledge on the market than those participants that have more limited or no physical assets.
- The scientific community does not have enough access to data to make independent analysis on how the market operates. Independent and transparent monitoring by the academic world is crucial to ensure that the behaviour and incentives of market participants follow the market rules and regulation.
- The analysis of current market data is cumbersome. The amount of provided data is huge, but available for limited time, and contains some inconsistencies and errors.

Gaia Consulting concluded in their report that it should be further assessed how much and what data exactly should be made public. The exact decisions should be made carefully, as too much public data could lead to the possibilities of collusion. The risk of collusion is further emphasised as both the demand and supply structures change relatively slowly over time. However, the risk of collusion should be weighed against the current information asymmetry that favours larger market players. Data that could be considered to be published includes area price level bidding curves with some delay and a combined real time situational overview of production and transmission availability.

One area where transparency could clearly be improved is the actions and decisions taken by the TSOs and the Nord Pool Spot. These include for example on what socio-economic basis transmission capacity allocation decisions are made and how counter trading and peak load affect other parts of the market.

3.1.2 Activate demand flexibility in the spot price market

According to the model analysis included in the Gaia Consulting study, increased demand flexibility could have a sizeable impact especially on high price situations. The demand flexibility should increase as a result of the high prices, because there is a clear incentive for them to do so.

Demand reductions are the easiest way to influence pricing in situations where production capacity is approaching levels when peak load reserves are needed, as for instance during the peak hours in the winter of 2009-2010. Demand reductions can be industrial disconnectable load, which is an easy way to reduce consumption or it can be reductions of electricity consumption by households, mainly by reduced electricity heating at peak hours.

The regulators need to follow the development of demand flexibility carefully. Demand flexibility is not beneficial for all market participants. In the case of distribution companies, the profits of the companies can be indifferent or negatively affected by allowing customers to exercise demand flexibility in their market area. According to the model analysis, vertically integrated retail companies do not necessarily have incentives to increase demand flexibility and reduce high prices.

One of the key arguments for smart metering and hourly measurements is the ability for consumers to have more control over their electricity consumption. However, there is currently no guarantee for the consumers to utilize their smart meters to benefit from demand reduction during high price situations. The lack of market based solutions can motivate regulatory actions if the market is considered to function in a suboptimal manner.

Until the hourly measurements are activated in the balancing calculations, the Finnish load profile system should be studied in detail. Revisions to the system should be made if it indeed causes an automatic demand overestimation in the spot price calculation and inflates the prices artificially. The apparent lack of industrial demand flexibility in the spot market and some of the phenomena seen on the after spot balancing should be studied in more detail. In addition to the regulatory and technical changes, demand flexibility could be increased through increased awareness.

3.1.3 Prepare for long-term market changes

The Nordic market seems to have been unprepared for a situation like the winter 2009–2010. While of course not foreseen beforehand, the problems with the Swedish nuclear power did not occur for the first time, nor did the cold weather. Future energy market is facing unprecedented changes as climate change mitigation aims to increase both energy efficiency and carbon free production. The effects of these plans should be analysed on Nordic level in conjunction with the planned transmission and other investments.

3.1.4 Ensure correct market incentives for TSOs

Bottlenecks in the market create income for the Transmission System Operators (TSOs) that are responsible of the border transmissions. If this bottleneck income is not earmarked for new transmission capacity investments to reduce the bottlenecks in question, the TSOs do not have economic incentives to reduce bottlenecks and their own income.

For the common market area, a key issue regarding grid investments is that the Nordic (European) value of such investments must be visible to the TSO and the country that is making the investments.

TSOs determine transmission capacity for the Nord Pool Spot price calculation. The capacity allocation is made on the basis of the principles agreed with the regulators and

the TSOs. However, TSOs have no responsibility for the consequences of the capacity allocation decisions for the market price levels and area price differences. Currently TSOs are making decisions on balance between the system security and transmission related costs without having to bear the costs. The principles used in decision making could be reviewed to ensure that the balance is as intended.

3.1.5 Consider alternatives for peak reserve capacity

The normal Nord Pool Spot market mechanism failed to provide an equilibrium market price on the three high peak price situations. As a result, TSOs activated peak reserve capacity to ensure the functioning of the market.

According to the current rules, the peak reserve capacity enters the market at the level of the highest market supply bid. This guarantees that all suppliers' bids are accepted. The system is motivated by that it should maintain the incentives for new capacity investments. However, it also creates opportunities for the suppliers. For example, an arbitrarily small volume bid at or close to maximum price can lift prices in the case peak reserves are activated. Also, the model calculations seem to indicate current suppliers do not have an incentive to invest in capacity that could reduce peak prices in any case.

For the consumers at large, it could be beneficial to pay the peak reserve capacity rent and to bid it to market at marginal cost, if they avoid peak price situations by doing so.

One alternative for the current peak reserve capacity system could be an introduction of a capacity market, whereby the current system could be made more transparent and open. Another alternative is to include the peak reserve capacity to the market bidding at some relevant cost level. While these alternatives could alleviate peak price formation, they could endanger the incentives for new capacity investments. In any case, the issue seems to warrant a further study.

3.1.6 Consider stricter regulation of revisions and maintenance

Low availability of nuclear power was a major contributor to the high prices. Technical problems in two cables contributed to the high differences in area prices. In both cases, the current market model would seem to give some adverse incentives for the suppliers and TSOs.

If the market incentives seem to be uncertain, and correct market incentives cannot be guaranteed, the regulator could take a more active role in verifying that revisions and maintenance work are carried out without unnecessary delays. A light version is to collect information of all production and transmission revisions and to coordinate possible times of scarcity.

3.1.7 Consider to include capacity allocation to the pricing model

The current Nordic market model assumes that TSOs are able to take care of internal congestions within the price areas and to make optimal transmission capacity allocation decisions. The benefit of the current system has been a relatively common system price that has supported for example the development of the financial market and risk management tools.

However, some of the identified problems during the high price situations are related to the current market model. An alternative would be to include financial transmission

contracts to the spot price calculation. Thereby the price in each smaller market area, or a node, should reflect more accurately the true costs of production, consumption, and transmission. If the problems with the current market model warrant it, the topic should be studied in detail to create a balanced view on the costs and benefits of such a change.

3.1.8 Consider alternative market models

The present Nordic market model is based on the assumption that market prices give signals for market participants to make investments. High peak prices should encourage new investments to meet these peak prices.

Even though they are an expected result in the current market model, high prices raise two considerations. Firstly, there have been high price situations in the past. Secondly, the model calculations indicate, that suppliers have incentives to withhold production during high prices. Both of these considerations should be analyzed in detail to determine if the current market model delivers the promise of enough market based investments.

The Gaia Consulting study stated that there is a wide range of alternatives for the current spot price market model. For example, discriminatory auctioning could reduce the potential market power in the case of high prices or an additional capacity market could provide more transparent set of incentive compared to current peak reserve system. As with the case of nodal pricing model above, these should be studied in more detail to ensure that they would meet the objectives for the well-functioning market better than the current system.

It should also be noted, that with the ongoing integration between the Nordic and European markets, the possibilities of independent changes become more limited. On the other hand, this can also give the Nordic countries an opportunity to continue as a forerunner in deregulated electricity markets.

3.2 Findings of the workshop

On 12 October NordREG arranged a workshop where the key stakeholders of the Nordic electricity wholesale market were invited. The great attendance at this workshop was really a positive signal for NordREG as an indication of the interest of the industry and the stakeholders in this issue. Besides the regulators and the competition authorities the workshop was attended by the generators, TSOs, traders and representatives of major electricity consuming organizations. The findings of the workshop have been taken into account by NordREG when preparing the recommendations included in this report. The detailed presentations of the various teams in the workshop are presented in appendix to this report.

The key themes of the stakeholder workshop were demand response, the role of demand forecasts and their compliance with the actual demand, the way of handling peak load reserves and the calculation and allocation of transmission capacities on the interconnectors.

The discussion pointed out that there was substantial demand response in the Nordic electricity market during the peak hours, but that most of the demand response happened

in response to peak prices, not as a part of the Elspot trade. In order to affect peak prices, it is important that incentives are created so that this flexibility is bid into Elspot.

Related to the price spikes it turned out in the consultancy study that the forecast demand and actual demand differed from each other in a way that could not be considered non-significant. The workshop discussed the role of weather forecast as it seems like that most players use the same weather forecasts, and that these forecasts could overestimate the cold weather with several degrees. Since the consumption in southern Sweden increases by 250 MWh/degree (minus), such forecasts can easily lead to overestimation of demand.

Furthermore, it was stated from one of the TSOs that internal bottlenecks that are known before the operational hour are mitigated with special regulations, which generally means that up-regulation is done on the deficit side. Since in general the possible need for down regulation is left to the overall system balancing, the result can be a substantial down regulation, which partly explains the down regulations during several of the price peaks.. This has an effect on the players who are in imbalance, especially if they have bought too much power.

Nord Pool Spot mentioned that they have done a study on the request of regulators on how to improve the handling of peak load reserves, and they have presented a number of suggestions, which would reduce the incentives for gambling. Also TSOs are studying how to improve the handling of peak load reserves.

In relation to the sensitivity analysis part of the report, a discussion took place about the way transmission capacities are set by TSOs. It was stated by a TSO that the TSOs give as much capacity to the market as they dare. Furthermore, it was made clear how sensitive the market is to very small changes in transmission capacity, supply or demand during strained situations such as the peak hours – but not during normal hours.

4 NordREG conclusions for the next steps

It is NordREG's view that the Nordic electricity market is a liquid and transparent market. An indicator is the fact that about 70% of the power consumed in the Nordic countries is traded over Nord Pool Spot. Even in the extreme situation during the winter 2009/2010 there was always a market clearing price. However, as illustrated by the Gaia's analysis of the price peaks during the winter, there are situations when the present incentive structure on the market may not be comprehensive enough to ensure that all resources are bid into the market especially in situations when there is a scarcity of supply in relation to the demand.

On the basis of the Gaia Consulting study, the stakeholder workshop on October 12 and the feedback from EMG NordREG has decided to prepare an action plan presented here below. The actions proposed herein consist of short, medium and long term actions with the intended implications on those time frames. EMG has supported the preliminary recommendations and asked NordREG to follow through and implement the proposed measures as soon as possible in order to avoid similar incidents in the future. Furthermore, EMG requested NordREG to publish a status report[27].

Besides the actions proposed here NordREG has proposed to the Nord Pool Spot the establishment of a new body to oversee and consult the Nord Pool Spot on issues related to market expansion and regulatory framework[28]. Furthermore, the Swedish regulator has proposed special arrangements relating to the co-ownership of the nuclear plants, including a special independent observer in the boards of these companies to make sure that no cooperation happens. Similarly establishment of ethical codes for the industry in general could promote trust among the general public on the ethical behaviour of the industry[29].

4.1 Increased transparency in the market

Despite the high level of transparency in the Nordic wholesale electricity market, the Gaia Consulting study and the feedback from the market stakeholders raised transparency as an area for further development. It should be assessed whether the area bidding curves at Nord Pool Spot could be publicized to enhance the transparency of the market and to enable all the market participants to have access to the trading data. Transparency in the Nord Pool Spot bid data could enhance confidence in market developments. It should,

[27] EMG letter to NordREG on 18 November 2010.

[28] Letter from NordREG to NPS 8 December 2010, https://www.nordicenergyregulators.org/upload/News%20from%20the%20Board/Letter_from_NordREG_to_Nord_Pool_Spot.pdf

[29] EI Rapport Övervakning och ökad transparens på elmarknaden,

however, be analysed whether such publication will have any implications on the competitiveness of the market.

Another way that could be assessed is to find other kinds of bid information that would fulfil the goal of ensuring that market rules are not abused.

European initiatives on transparency should be taken into account.

The following proposal for NordREG 2011 work plan can thus be developed:

An analysis is to be prepared to address the question how the transparency of bidding information could be enhanced at Nord Pool Spot in a way that does not risk to contribute to collusive behaviour.

4.2 Review of the capacity calculation and allocation methods of the transmission lines

NordREG intends to set up an ad hoc expert team to look into the calculation and allocation of transmission capacity between bidding areas. The Nordic TSOs use the method of Available Transmission Capacity (ATC) to calculate the capacity to the interconnections between bidding areas. The amount of capacity calculated and allocated to the various interconnections through the Nord Pool Spot day-ahead allocation will have a decisive influence on how the electricity can be traded and transported.

Similarly an incentive structure for the TSOs to remove congestions ideally in a market based manner should be considered. The first option should be to increase the transparency regarding the TSO's actions such as countertrade and activation of different kinds of reserves. One issue to be evaluated is the feasibility of a possible introduction of financial transmission rights. This would follow up on NordREG report on the Nordic financial markets published in 2010.

The following proposal for NordREG 2011 work plan can thus be developed:

An analysis that addresses the capacity calculation and allocation methodology for the day-ahead timeframe , increased transparency regarding countertrade and use of reserves as well as the delimitation of bidding areas and maintenance planning of the transmission network infrastructure, taking into account the Capacity Allocation and Congestion Management draft Framework Guidelines as well a the restrictions posed by the market coupling between the Nordic and continental markets is to be prepared. The incentives for the TSOs to reduce congestions is also an issue to be considered.

4.3 Examine and propose measures to activate demand flexibility

The Nordic end-user market is inflexible, i.e. there is limited reaction from users on the price signals in the market. However, it seems that there is some flexible consumption

among customers with hourly metering and hourly pricing. Experience shows that many of these would rather react to price peaks when they are known, which in turn would lead to imbalance problems for their suppliers. Price peaks will, however, exist in the future and should exist as they are a sign of market functioning. The activation of demand flexibility in Nord Pool Spot could include the following actions:

- Identify the necessary arrangements and data needed by suppliers in order to promote flexible contracts to consumers and to post flexible bids on the exchange.
- Analyze and propose possible improvements in the way flexible demand can be offered into the Elspot market.

The following proposal for NordREG 2011 work plan can thus be developed:

A consultancy study on how to promote demand flexibility in the Nordic market in a coherent way should be prepared. This analysis would address the impacts obtainable through the increase in demand responsiveness. Additionally, the study should try to quantify the impacts.

4.4 Review of the functioning and implications of the peak load mechanisms

The functioning of the peak load mechanisms at the Nord Pool Spot should be assessed. This should be done together with the Nord Pool Spot. The following aspects and their feasibility could be addressed and assessed:

- Review of present practices of dealing with peak load reserves
- Should all generating resources be made available at NPS?
- Possibility for a second bidding round and assessment of consequences.
- Increased flexibility into the market – should a contract set-up be prepared to enable the demand elasticity
- Power reserves and assessment of improved pricing and procurement methodology

The following proposal for NordREG 2011 work plan can thus be developed:

An analysis of the effects of peak load mechanisms on the Nordic electricity wholesale market containing possible propositions to improve the current practices is to be prepared.

4.5 Other proposed measures

Transmission issues

One of the key issues for ensuring a well-functioning electricity wholesale market is the optimal and sufficient transmission network with its cross-border interconnectors that support the wholesale electricity market. ENTSO-E published the pilot Ten Year Network Development Plan in June 2010 and the process for preparing the next one is already underway. This planning work and the results of it will have a significant impact on the functioning of the Nordic, Northern and the whole European electricity wholesale market and its integration. This work needs to be analyzed and followed by NordREG.

NordREG will follow and monitor the ENTSO-E work on Nordic, regional and European network planning with a view to giving guidance – where necessary – to ensure the needed transmission infrastructure investments.

5 Conclusions

The Nordic wholesale electricity market has experienced occurrences of high prices and price spikes in both the whole market area and separately in a number of its bidding areas during the past years. The reasons for high prices and the cures to avoid such situations to materialise again have been studied by various parties including regulators, competition authorities and consultancy firms. The main fundamental causes for high prices have traditionally been tight demand-supply situation due to shortage of hydro power and high demand during cold periods. The market mechanism of the Nordic market has succeeded in handling the tight periods and in maintaining the power balance.

In winter 2009-2010, prices peaked on three days. The high prices that were experienced in the majority of the Nord Pool Spot price areas initiated a study on the reasons that led to the price spikes and on the possible measures to develop the Nordic market arrangements to avoid such situations in the future.

The analysis of the winter 2009-2010 events revealed that there were a number of primary causes for the occurrence of the price peaks and no single individual cause could be pinpointed to bear the key responsibility. The fact that the weather was cold all over the Nordic area in conjunction with the low availability for the Swedish nuclear generation capacity, however, could be indicated as the key underlying causes.

The analysis also showed that the way the Nordic transmission capacity is allocated can be listed as an additional factor complementing to the occurrence of the price peaks. Thus, NordREG concluded that a review of the methods of calculating and allocating transmission capacity for the market should be carried out. As a part of this, an analysis that addresses the delimitation of bidding areas and maintenance planning of the transmission network infrastructure should be prepared as well. The delimitation of the zones, i.e. bidding areas, is an issue that has raised a lot of interest in the European discussion on the future framework guidelines on capacity allocation and congestion management and the related network codes. The decision on bidding areas has relevance for the price formation as in case of congestion between bidding areas the prices for these areas will differ. So an important decision is made when the borders of bidding areas are drawn.

Maintenance of the transmission network infrastructure implies unavailability of parts of transmission infrastructure, which in turn may affect available transmission capacity and thus create congestion on the interconnections. The procedures for planning timewise such maintenance work is of high relevance when it comes to transmission capacity and its availability especially during tight periods. Similarly, it would be beneficial to assess the existence of current incentives for the TSOs to remove congestions and if appropriate, to propose some new incentives in case the study could come up with such propositions.

The flexibility on the demand side has not been very large in the Nordic region. However, the background study prepared by Gaia Consulting showed that even small degree of increased price elasticity could substantially cut the price peaks. This could be seen as an improvement potential of the trading system reflecting the present inability of the market participants to react on the price signals the market place provides. Therefore, NordREG

sees that facilitating the appearance of a real price elastic behaviour of the users of electricity can be regarded as one of the key fixes for the problem. Furthermore, NordREG proposes that a consultancy study on how to promote demand flexibility in the Nordic market in a coherent way should be prepared.

A further area for improvements is transparency. Based on the consultancy study and the feedback from some stakeholders, NordREG finds that it should be assessed whether the area bidding curves at Nord Pool Spot could be publicized to enhance the transparency of the market and to enable all the market participants to have access to the trading data. Transparency in the Nord Pool Spot bid data would enhance confidence in market developments. There have recently been tabled also other transparency initiatives in the European context – ERGEG advice to the European Commission on the fundamental data transparency in electricity and the Commission's Proposal for a Regulation on Energy market integrity and transparency. When assessing the eventual measures to improve certain aspects of transparency, recognising the fact that in terms of transparency the Nordic market is already now advanced, it is worthwhile to take into account these two European transparency initiatives.

NordREG also proposes that the trading mechanisms at the Nord Pool Spot should be assessed. This assessment should especially focus on how to increase flexibility into the market, how to improve pricing and offering of peak load reserves to the Nord Pool Spot and how to improve possibilities to hedge area price risks. NordREG emphasizes that the development of the Nord Pool Spot trading mechanism and its transparency should be prepared together with the Nord Pool Spot.

Finally, one of the key issues for ensuring a well-functioning electricity wholesale market is the optimal and sufficient transmission network with its cross-border interconnectors that support the wholesale electricity market. Traditionally the Nordic TSOs used to cooperate in the area of grid planning and produced Nordic Grid Master Plans. The Nordic Council of Energy Ministers has underlined the importance of continued Nordic grid planning.

The 3rd Legislative Package raised the cooperation of TSOs on grid planning to the European level and as a task for the European TSO organisation ENTSO-E, which has organised regional groupings of TSOs to work on grid planning. ENTSO-E published the pilot Ten Year Network Development Plan in June 2010 and the process for preparing the next one is already underway. This planning work and the results of it that will materialise themselves through transmission network investments will have a significant impact on the functioning of the Nordic, Northern and the whole European electricity wholesale market and its integration. This work needs to be analyzed and followed by NordREG.

APPENDIX

Findings of the stakeholder workshop October 12, 2010

What caused the price peaks?

Team 1	Team 2	Team 3	Team 4
• **The shortage of nuclear explains the level but not the price peaks** • **Was the grid used optimally? Small changes, big impact!** • **-2600 MWs in the reserves that should have been in the market** • **The reserves did not affect the peak prices** • **Contractual issues with demand**	• **Lack of generation capacity mainly Swedish nuclear nuclear** • **Grid not dimensioned for a unified market and extreme situations,** • **Long term: base load in the system – how to provide in the future with more wind power and still unclear situation for future Swedish nuclear** • **Contracts does not support demand flexibility – how to get that into the market?** • **Price peaks will exist in the future and should exist – sign of functioning market** • **Price areas – problem in hedging, losses for market actors due to imbalances?** • **Price peaks will exist in the future and should exist – sign of functioning market**	• **Nuclear power outages – better planning of revisions** • **Bottlenecks in the transmission grid -** • **Peak load reserves – pricing contributed to high spot price levels -** • **Maybe not all production capacity available for the market?** • **Demand side flexibility was not shown in the spot market** • **Transparency in Nord Pool spot bid data – confidence in market developments** • **Transparency in Nord Pool spot bid data – confidence in market developments** •	• **Transmission capacity** • **Degree of transparency?** • **Price peaks are not a problem in it self** • **We cannot eliminate price peaks, they are beneficial in order to have a well functioning market** • **Many stakeholders, different roles & responsibilities, everyone act after their respective perspective and more or less the same input e.g. weather forecasts** • **Technical criteria vs. market demands…** • **Monitoring; use of market dominance…** • **Influence from one segment market to another, e.g. spot –**

Team 1	Team 2	Team 3	Team 4
	• **Price areas – problem in hedging, losses for market actors due to imbalances?**		

What should be done – summary of the groups: Infrastructure

Team 1	Team 2	Team 3	Team 4
• **Build more capacity,** • **Joint planning of capacity improvements** • **Financial Transmission Rights (FTRs)**	• **Short term: Better maintenance planning, transparency on available capacity and information on the basis for the decisions** • **Long term: Build more capacity in the Nordic Market, not dimensioned for a unified market, better reporting on what has been done regarding congestion management.** • **Production/demand in the right places??** • **Price areas should be based on the actual bottlenecks instead of geographical boarders** • **Incentives for the TSOs to remove congestion ideally market based, Financial Transmission Rights or CfDs** •	• **Build more capacity** • **Stronger incentives for increasing transmission lines capacity -**	• **All resources should be made available in spot** • **Robust and strong grid and interconnections**

What should be done – summary of the groups: Operational processes

Team 1	Team 2	Team 3	Team 4
• **Avoid revisions during wintertime** • **O&M of the grid**	• **Increased flexibility into the market – contract set-up that enables the demand elasticity** • **Better planning on maintenance and service of power stations – regulation and penalties**	• **Publication of capacity closer to the gate closure** • **Power reserves – improved pricing and procurement** • **Guaranteed capacity?**	• **- Many measures in order to achieve a price cross and to avoid curtailment; what if curtailment instead? Significant signal!**

What should be done – summary of the groups: Regulation

Team 1	Team 2	Team 3	Team 4
• **No price caps** • **Long run availability – Boilers, avoid negative prices??? The consequences of price volatility** • **Using the reserves in the market distorts price formation and could jeopardize the incentives for demand response** • **Hourly metering? Business models?** • **Congestion rents?** • **Better Congestion management! Hasle?**	• **Maintenance planning – regulation** • **Take the consumption reserves out of the power reserves – look over the power reserves**	•	• **Special regulation a tool for the TSOs to operate the grid although with consequences on the balance. Practice of different manners. Difficult for market players to understand. How to handle this in a proper way? SvK is prepared to look into this** • **Nordic regulator and a Nordic TSO**

What should be done – summary of the groups: industry internal rules

Team 1	Team 2	Team 3	Team 4
• **Problem with forcing industry to cooperate on revisions**	• **Hourly metering and balancing**		• **SO is not a market player and should not act in order to avoid price peaks** • **Need for more market participants in order to achieve a better competition**

What should be done – summary of the groups: **Nord Pool Spot** trading arrangements

Team 1	Team 2	Team 3	Team 4
• **Reserves should be bid into the market in similar manner across the Nord Pool market. Price of reserves should be the technical level**	• **Improve possibilities to hedge area prices** • **Block bids.** • **Possibilities for a second round if there is no price cross? Update bids.** • **Transmission capacity calculation at the same time**	• **Nuclear power outages – better planning of revisions** • **Bottlenecks in the transmission grid -** • **Peak load reserves – pricing contributed to high spot price levels -** • **Maybe not all production capacity available for the market?** • **Demand side flexibility was not shown in the spot market** • **Transparency in Nord Pool spot bid data – confidence in market developments**	• **All resources should be made available in spot** • **Small price areas make it hard to receive enough liquidity:** • **Peak load reserves; second best solution SE´s to be eliminated by 2020. SvK will over view the management and evaluate the need for amendments** • **Many measures in order to achieve a price cross and to avoid curtailment; what if curtailment instead? Significant signal!** • **SO is not a market player and should not act in order to avoid price peaks** • **Need for more market participants in order to achieve a better competition** • **Pricing according to physical bottlenecks**

What should be done – summary of the groups: Transparency

Team 1	Team 2	Team 3	Team 4
• **The authorities should have access to data** • **What is improved with the transparency directive** • **What would be the purpose? What can be done? What has been done?**	• **Increased transparency in order to empower the consumers** • **User friendly information**	• **Bid data to researchers**	

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