

# **Report on regulation and the electricity market 2011**

**Norway**



**Norwegian Water Resources and Energy Directorate (NVE)**

31<sup>st</sup> of July 2011

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## **1 Foreword**

The Norwegian electricity market was formally opened up for competition when the Energy Act came into force the 1st of January 1991. The regulatory tasks are ensured by the Norwegian Water Resources and Energy Directorate (NVE). A regulatory office (department in NVE) was set up in 1990. As electricity regulator, NVE has played an active role in developing network regulation, real market access for all customers, easy procedures for customer switching, security and quality of supply and efficient regulation of system operation.

The development of the Norwegian market has been followed by similar market opening in the other Nordic countries, and today we have an open and integrated electricity market in the Nordic region with a common Nordic power exchange. The Nordic market is also interconnected with the continental European market and Russia.

Norway is member of EFTA and a party to the European Economic Area agreement (EEA). As a consequence of this, the EEA procedures regarding adoption of new EU directives apply for Norway. The electricity directive 2003/54/EC and Regulation 1228/2003 passed through the EEA Committee in December 2005. The report is based on the reporting requirements in the directive 2003/54/EC articles 3(9), 4 and 23 (1 and 8), and directive 2005/89/EC article 7.

NVE is a member of CEER. NVE has in 2010 continued its work with the goal that NVE should be included in the new Energy Agency, ACER. This is expected to be decided as part of the EEA process related to the third energy market package in 2011.

This report follows the common reporting structure created by the Commission and CEER.

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## **2. Main developments in the electricity market**

### **Introduction – about NVE**

The main statutory objectives for NVE concerning energy, and which the regulatory functions is a part of, is to promote social and economic development through efficient and environmentally sound energy production, and promote efficient and reliable transmission, distribution, trade and efficient use of energy.

For NVE, both for regulatory tasks as well as for other tasks, the responsibility and field of work are defined in law, regulations and decisions from the Parliament and Government and in the annual allocation letter from the Ministry of Petroleum and Energy.

NVE is delegated powers according to the Energy Act. NVE has powers to issue regulations on economic and technical reporting, network income, market access and network tariffs, non-discriminatory behaviour, customer information, metering, settlement and billing and the organised physical power exchange (Nord Pool Spot). As well as issuing regulations on system responsibility and quality of supply. NVE can take necessary decisions to fulfil the delegated powers according to the Energy Act.

NVE is the national independent regulatory authority for the electricity market in Norway. The Director General acts as regulator. NVE has no ownership interests in the electricity industry and is independent from the economic interests in the electricity industry. NVE is an independent legal entity with its own budget adopted by Parliament and power to act in the scope of its competences.

There is a cooperation agreement between NVE, the Competition Authority (mergers, etc) and the Financial Supervisory Authority of Norway (financial markets). NVE also has a cooperation agreement with The Directorate for Civil Protection and Emergency Planning (DSB). The Competition Authority has in accordance with the Electricity Directive, prepared its own report regarding an assessment of competitive conditions in the electricity market for 2010.

### **NVE as regulator – resources and staff**

The Norwegian Water Resources and Energy Directorate (NVE) has responsibilities within a broad scope of regulatory activities. The regulatory staff counts approximately 100 employees, with competences in economics, engineering and other academic professions and cover the following responsibilities; energy modelling and analysis, economic regulation of network companies, regulation of system responsibility, network operation and planning, network pricing, wholesale and retail market regulation and monitoring, energy efficiency, energy resources, energy security and emergency preparedness.

Regulation and monitoring of network companies, efficient market functioning including cross border market coupling, monitoring of security of supply and resilience of the energy system have been increasingly important during the last years, and have required increased resources. The overall budget covering the regulatory functions are mainly provided through the yearly government budget and to some extent by fees paid by the regulated companies. As a whole the budget resources have been reasonable adequate.

## Status implementation third package

The third package will be implemented in Norway after the EEA joint committee decision and subsequent approval by the Parliament.

### **Wholesale market**

The Norwegian wholesale market is part of the Nordic wholesale market through the common Nordic power exchange for physical power, Nord Pool Spot AS. In 2010 there were traded 305.2 TWh (285.5 TWh in 2009) at Nord Pool Spot, which accounts for 74% (72% in 2009) of the power consumption in the Nordic region. The remaining volume of the Nordic market was traded bilaterally. NVE regulates Nord Pool Spot through the market place licence, in accordance with the Norwegian Energy Act (1990).

The total volume of financial contracts traded at NASDAQ OMX Oslo ASA (Change of name from Nord Pool November 2010) was 1 219.7 TWh (2009) including international contracts. NASDAQ OMX Commodities Clearing Company (Change of name from Nord Pool Clearing November 2010) cleared a total of 2 162.2 TWh (power trading and clearing of OTC trades). Nord Pool Spot (physical trade) has a total of 333 members and NASDAQ OMX Oslo ASA (financial trade) has 350 members.

### **Retail market**

Each entity operating in the electricity market and/or in the network business is required to hold a trading licence. Status in June 2011 was that the Norwegian Water Resources and Energy Directorate (NVE) kept about 440 trading concessions under surveillance. In week 23 2011 there were 25 suppliers with offers in all grid areas in Norway and a total of 98 suppliers in the whole country<sup>1</sup> ).

In Norway there is one official website for price comparison, run by the Norwegian Competition Authority. It compares the three most common contracts in the market. The customer can easily carry out an evaluation and make the choice of supplier using a price calculator. There are no regulated prices, except electricity delivered to those customers who have not yet chosen a supplier (supplier of last resort) and information on prices and contracts is public information. The arrangement of the market has led to competition, but still prices between suppliers vary.

### **Regulation/Unbundling**

#### Congestion management

Actions have been taken to harmonise and improve the Nordic principles and practices with respect to congestion management. Svenska Kraftnät has adopted a formal decision to subdivide the Swedish electricity market into four bidding areas from 1 November 2011. The decision is fully in line with the commitments offered to the European Commission, which were approved by decision of the Commission 14 April 2010 (see also section 3.2.1).

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<sup>1</sup>The data is collected from the National price comparison site operated by the Norwegian Competition Authority. All suppliers offering at least one of the three main contract types in Norway are obliged to register on this comparison site.

## Network tariffs

The methodology and procedures for the regulation of transmission and distribution companies have been unchanged in 2010.

## Unbundling

There were no major changes in the unbundling requirements on the network companies in 2010.

There is only one TSO in Norway, namely Statnett SF. The TSO has been legally unbundled in a separate company since 1992, and has to comply with the ordinary functional provisions.

On DSO-level, the 8 companies with more than 100 000 residential customers in Norway are legally unbundled. These companies cover around 70 % of the total mass of residential customers. The 8 companies are also obliged to participate in the compliance program, in accordance with the electricity directive. The compliance program serves NVE in its monitoring of the DSOs fulfilment of the provisions regarding legal and functional unbundling. Besides the 8 DSOs with over 100 000 residential customers, there are additional 30 legally unbundled DSOs. There is a total of 150 DSOs in Norway, and the majority are publicly owned.

## **Security of Supply**

In 2010 the total Nordic net generation was 375.6 TWh, which is 12.6 TWh higher than registered in 2009. The growth was basically due to increase in thermal generation. Cold weather and high electricity consumption gave a Nordic net import of 18.8 TWh in 2010.

The Norwegian net generation was 122.8 TWh in 2010 (130.5 TWh in 2009). The share of the hydro plant generation accounted for around 95.0 % of the total Norwegian net generation in 2010. This percentage shows the importance that the weather conditions have on the net generation capacity. The inflow to the hydro reservoirs in Norway was below normal inflow level in both 2009 and in 2010.

Norway had a net import of electricity in 2010 of 7.5 TWh. In 2009 Norway was a net exporter of 9.0 TWh. Norway had a net import of 3.9 TWh from Sweden in 2010, and a net export to Sweden of 5.2 TWh in 2009.

## NVE - competences security of supply

### *Contingency planning and preparedness*

Norway has detailed regulations and means for handling critical energy situations and energy rationing. This is due to the large share of hydro based electricity production and the fact that Norway has an inflow sensitive power system.

The individual grid and production companies are responsible for routines regarding resources, material and equipment, but there is a common project to ensure that the individual companies cooperate on these issues.

### *Market information and monitoring*

Several reports are prepared and published by the Norwegian TSO, Statnett, and by NVE on possible development in energy and power balance. When it comes to monitoring the market development NVE publish regular reports describing the development.

### *Norway's special regulations for highly critical power situations*

Statnett is responsible for the operation, also during extreme occurrences. In Norway, though, NVE is head of the power supply preparedness organisation and also works as the rationing authority. This means NVE is responsible for decisions relating to rationing and curtailment.

Regulations relating to power system operation regarding handling of extreme situations came into force on 01.01.2005. This regulation aims to secure extreme situations and is not relevant for normal operation. Through this regulation, Statnett is given an extended responsibility to continuously investigate and develop necessary measures to ensure that there is momentary balance at all times and to ensure the energy balance during the winter season. Statnett shall inform NVE of its different findings. NVE shall approve, with terms, the different measures before they are put into force. Permanent- and operations cost for the different measures shall be handled within Statnetts income cap. Statnett have to develop the means within the following set of premises:

- Not to completely eliminate the probability for electricity rationing, but to reduce the risk.
- Must be effective for handling of extreme situation, and yet not influence the electricity market or investment decisions within the production or the network.
- Not to change or move the TSO (Statnett) neutral and independent position in the power market.
- Contribute to a socio-economic handling of extreme situation and not to reduce the efficiency of the physical power market
- Take into consideration the all ready existing flexibility in production, transmission and consumption.

The different measures that are approved by NVE are:

- Mobile gas turbines which can be used for production back-up.
- Energy options, contract with different consumers to reduce the consumption.

The measures can only be activated after decision from NVE. The measures will only be accepted in a situation where rationing is considered likely.

### **Infrastructure**

The 580 km, 700 MW undersea NorNed-cable, between Norway and the Netherlands, was commissioned May 2008. The cable is a part of the regulated asset base and incomes for the TSOs in both countries.

The 25 km 420 kV OH line from Nea eastwards to the border with Sweden was commissioned October 2009. The OH line is also renewed from the border to Järpströmmen in Sweden by Svenska Kraftnät. The new OH line removes a bottleneck by replacing the existing 300 kV OH line, which is an upgrade from 220 kV and cannot be upgraded further.

A new 140 km DC cable between Norway and Denmark, Skagerak IV, was granted licence June 2010. The transmission capacity will be 700 MW. The cable is expected to be in commission in 2014.

### **3. Regulation and Performance of the Electricity Market**

#### **3.1 Regulatory Issues**

##### *3.1.1 Management and allocation of interconnection capacity and mechanisms to deal with congestion*

According to regulations and concessions pursuant to the Energy Act, cross border electricity exchange shall be set out by implicit auctioning. Congestion management concerning Norwegian interconnectors to Sweden, Denmark and Finland are fully integrated with the functioning of the wholesale market and are handled by implicit auctioning through the power exchange (Nord Pool Spot).

Rules governing information from the Transmissions System Operator (TSO) in the context of congestion management is regulated in the regulations given for the System Operator (Regulations relating to power system responsibility). The relevant information is published at Nord Pool Spot.

For “long and stable” bottlenecks (congested areas), Statnett is, according to the regulation, in principle obliged to establish elspot areas. In most of 2009 Norway was divided in three elspot areas; Southern-, Middle and Northern-Norway (NO1, NO2 and NO3). Between 17. November 2008 and 13. April 2009, Middle- and Northern-Norway constituted one elspot area with a common price. Congestions within an elspot area are mainly to be handled by counter trade.

The TSO shall, according to the regulation, determine the maximum permitted limits for transmission capacity between the elspot areas on an hourly basis (trading limits). The system operator shall provide information about the trading limits two hours before gate closure of the elspot market of the Nordic power exchange. Trading limits are published on the web pages of the Nordic power exchange, Nord Pool Spot.

Actions have been taken to harmonise and improve the Nordic principles and practices with respect to congestion management. Svenska Kraftnät has adopted a formal decision to subdivide the Swedish electricity market into four bidding areas from 1 November 2011. The decision is fully in line with the commitments offered to the European Commission, which were approved by decision of the Commission 14 April 2010.

The NorNed interconnector between Norway and the Netherlands was included into the Interim Tight Volume Coupling (ITVC) 11. January 2011. This implies that the capacity of the cable is traded more efficiently through implicit auctions. Until this date the capacity has been allocated through explicit auctions. This was a temporary solution and not in line with prerequisites of Statnett’s licence. The reason for the delay of market coupling was deviating gate closure times between the Dutch and Nordic power exchanges.

The extent of the congestions in Norway fluctuates over time. Both the hydro situation and the trading capacities affect the extent of congestions. The diagram below shows the average



transmission capacity that has been available to the market on different Nordic interconnectors compared to normal maximum capacity.

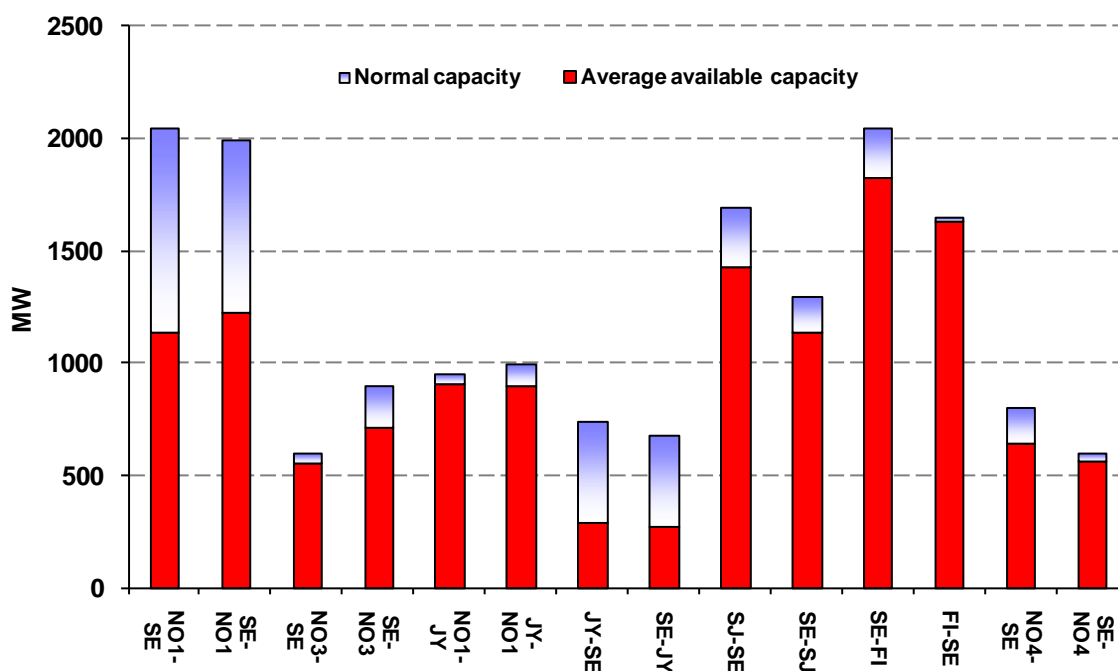
NVE has otherwise an ongoing project to investigate possible ways to improve the utilization of the transmission network. Key elements here are the number of regional prices and the utilization of the current transmission system details. An expert group, lead by Professor Torstein Bye, analyzed these issues for the Ministry of Petroleum and Energy and handed over their report in December 2010. The report is a valuable input in the ongoing NVE project.

The transmission capacity available for the market has been reduced on all the Nordic interconnectors in several hours in 2010. The interconnector between Southern-Norway and Sweden and the interconnector between Jutland (DK1) and Sweden has had substantial capacity reductions in 2010. How much of the physical capacity that has been made available to the market has to large degree been dependent on the stability of the system inside the market areas. A technical failure has led to only 50 percent available transmission capacity on the Kontiskan-cable between Sweden and Jutland.

The transmission capacity on the interconnector between Southern-Norway and Sweden has been reduced to about half of its normal capacity on average in 2010. In hours with cold weather and high load in the densely populated areas around Oslo the export capacity from Southeast-Norway (NO1) to Sweden has been very low to prevent overload on lines from west to southeast in Norway. In 48 hours there has been no transmission capacity available towards Sweden at all.

Reduced transmission capacity out of Southern-Norway towards Sweden combined with low Swedish nuclear power production (caused by technical problems) and high consumption contributed to congestions towards Sweden and much higher price in Sweden than in Norway during the winter 2010. During the summer Norway more often imported power from Sweden to fill up reservoirs when the load and prices are low. The table below shows the time (in percentage) were there are price differences between the different elspot areas. Southeast-Norway (NO2) had lower price than Sweden in 21 percent of the time in 2010, while Sweden had lower price than Southeast-Norway in 22 percent of the time. Sweden had often common price with Finland, Zealand (DK2) and the Middle- and North-Norway (NO3-NO4) most of the time in 2010.

South-Norway was divided into three market areas (NO1, NO2 and NO5) during the winter to handle congestions inside this region.



2010		Lower elspot price than:									
		NO1	NO2	NO3	NO4	NO5	Sweden	Finland	DK1	DK2	EEX
Higher elspot price than:	NO1										
	NO2	1.0 %	28.0 %	19.6 %	22.7 %	16.6 %	22.1 %	25.8 %	51.4 %	23.2 %	71.1 %
	NO3	29.7 %	49.9 %	19.0 %	11.0 %	41.6 %	16.5 %	20.8 %	59.9 %	21.6 %	73.0 %
	NO4	23.2 %	45.8 %	1.7 %		37.1 %	10.7 %	16.3 %	58.3 %	16.4 %	72.1 %
	NO5	1.6 %	12.7 %	19.3 %	22.4 %		21.8 %	24.6 %	47.7 %	23.1 %	68.5 %
	Sweden	20.9 %	43.7 %	2.6 %	6.4 %	34.8 %		6.2 %	52.3 %	7.5 %	71.2 %
	Finland	21.3 %	42.5 %	2.8 %	6.6 %	33.9 %	0.6 %		51.8 %	7.4 %	70.9 %
	DK1	14.2 %	16.2 %	14.5 %	17.1 %	15.7 %	15.1 %	16.5 %		12.6 %	62.1 %
	DK2	25.0 %	46.0 %	10.2 %	13.7 %	38.7 %	9.2 %	13.7 %	49.6 %		72.0 %
EEX	28.9 %	32.3 %	26.9 %	27.9 %	31.5 %	28.8 %	29.1 %	37.8 %	27.9 %		

- NO1: East- Norway (Oslo)
- NO2: Southwest-Norway (Kristiansand)
- NO3: Middle-Norway (Trondheim)
- NO4: North- Norway (Tromsø)
- NO5: West-Norway (Bergen)
- SE: Sweden
- DK1: Denmark (Jutland)
- DK2: Denmark (Zealand)
- FI: Finland
- EEX: European Energy Exchange in Germany

### 3.1.2 The regulation of the tasks of transmission and distribution companies

#### Network Tariffs

For regulatory purposes, in particular connected to the setting of revenue caps and tariffs, the electricity network is divided into three levels; the central grid (transmission system), the regional grid and the distribution network. Statnett SF is the TSO, and is responsible for the Central Grid (Transmission) tariffs and the system responsible entity according to the

regulations. Statnett SF owns 91 pct. of the components in the Central Grid (measured by its share of the revenue cap). The rest is owned by 20 different companies.

The general principles for the tariff structure are the same for all network levels. In addition to the current tariff, network companies may charge an investment contribution to cover the costs of new network connections. The tariff structure consists of different components such as a usage-dependent energy component and a fixed component.

For feeding into the network the fixed component of the tariff is independent of the grid level of connection. The procedure for setting network tariffs has principally remained unchanged in the price strategy of the Central Grid (Transmission) for the period 2010 to 2013 compared to the period 2007 to 2009. The annual national G was 1 €/MWh in 2010 (NOK 8, exchange rate € 1 = NOK 8).

Within the framework of regulations of tariff structure given by the NVE, the network companies are responsible for the actual tariff levels in their network, given their expected revenue cap and CENS (cost of energy not supplied) for the coming year. Complaints and disputes regarding the regulation, including the tariffs are handled and settled by NVE.

On January 1st of 2007 a revision of the revenue cap (RC) regulation based on a yardstick formula was introduced. The RC yardstick formula is based on 40 pct. cost recovery and 60 pct. of the norm cost resulting from benchmarking exercises, with a two year lag.

The methodology and procedures for the regulation of transmission and distribution companies have been unchanged in 2010.

### **Quality of electricity supply**

NVE has a wide legal power as regards quality of electricity supply regulation. This includes setting requirements for all parties connected to the Norwegian power system including network companies, the TSO, power producers and end-users regardless of whether they hold a license according to the Energy Act or not. In short, the Norwegian quality of electricity supply regulation has had the following development since the Energy Act entered into force:

- 1991 – The Energy Act entered into force; focus on socio-economic optimization. Companies obliged to provide customers with information about the quality of supply. Results from a customer survey regarding long interruptions (>3min).
- 1995 – Mandatory reporting of long interruptions (>3min) to NVE based on standardised method. Mandatory of reporting of operation disturbances occurring in the grid at 110 kV or above to the TSO based on standardised method.
- 1997 – Mandatory reporting of operation disturbances occurring in the grid at 33 kV or above to the TSO based on standardised method. Revenue cap regulation introduced – five year regulatory period.
- 2001 – Standardised method for calculation energy not supplied introduced. Customer divided into 26 end-user groups. Incentive based regulation of continuity of supply (CENS-arrangement) was introduced divided into two customer groups, and for each of them notified and non-notified.
- 2002 – New five year regulatory period. Updated results regarding customers' costs divided into six customer groups, and for each of them notified and non-notified.

- 2003 – Updated incentive based regulation on continuity of supply based on the survey finalised in 2002. Number of end-user groups was extended to 27.
- 2005 – Introduced a separate quality of supply regulation containing minimum requirements regarding continuity of supply, voltage quality and customer complaints and information regarding the same issues. Companies obliged to collect data on short interruptions. Decision that mandatory monitoring of voltage quality shall be performed by the companies from 2006.
- 2006 – Mandatory reporting of short interruptions to NVE based on standardised method. Modifications to the requirements for collecting continuity of supply data.
- 2007 – Adjustments to the revenue cap regulation, introduced two year regulatory period. Interruption costs are now more harmonised with the companies' other costs. Mandatory reporting to the TSO of operation disturbances at voltage levels above 1 kV up to and included 22 kV. Direct payment to customers at all voltage levels due to very long interruptions (>12 hours) introduced.
- 2009 – The incentive based regulation on continuity of supply extended to include also short interruptions. Dynamic specific interruption costs introduced (kr/kW) depending on the time occurrence of the interruption (intraday, week day, month). Number of end-user groups extended to 36.

### **Voltage Quality**

The Norwegian Quality of Supply Regulation includes minimum requirements for the voltage frequency, slow supply voltage variations, voltage dips, voltage swells, rapid voltage changes, flicker, voltage unbalance, and harmonic voltages. NVE has the legal power to set minimum requirements for other voltage disturbances as well, if and when considered necessary.

### **Interruptions**

NVE publishes annually a statistical report on interruptions providing continuity of supply levels at country level, county level, company level and end-user level.

The TSO, Statnett SF, publishes annually operational disturbance statistic report providing reliability levels for the system.

In Norway, network companies have been obliged to report specific data on interruptions since 1995. From the start, the data were reported with reference to so-called *reporting points* in the network. A *reporting point* is a distribution transformer or an end-user connected above 1 kV. NVE used the energy not supplied as input to the incentive based regulation on continuity of supply from 2001. For energy not supplied the exact number of customers is not important, but more separating for various end-user and customer groups.

From 2005, the interruption data are also referred to end-users. This was important to introduce due to two main reasons (1) easier to understand for non-technical customers and (2) better possibility to compare with other countries.

Only incidents at voltage levels above 1 kV are reported, and the reported data can be summarised as follows for *long and short interruptions starting from 1995 and 2006 respectively*.

- Number (ref reporting point + ref end user from 2005)

- Duration (ref reporting point + ref end user from 2005)
- Interrupted power (from 2006)
- Energy not supplied (ENS)
- SAIDI, SAIFI, CAIDI, CTAIDI, CAIFI (from 2005)
- Notified and non-notified

Common indices with reference to customers are presented in the table as regards short and long interruptions. The indices have the following description:

- SAIFI: System average interruption frequency index (average number of interruptions per end user)
- CAIFI: Customer average interruption frequency index (average number of interruptions per affected end user)
- SAIDI: System average interruption duration index (average duration per end user)
- CAIDI: Customer average interruption duration index (average duration per interruption)
- CTAIDI: Customer total average interruption duration index. (average duration per affected end user)

	<b>SAIDI</b> [hours]	<b>SAIFI</b>	<b>CTAIDI</b> [hours]	<b>CAIDI</b> [hours]	<b>CAIFI</b>
<b>2005</b>	<b>2.3</b>	<b>1.9</b>	<b>2.9</b>	<b>1.2</b>	<b>2.4</b>
<b>2006</b>	<b>2.6</b>	<b>2.1</b>	<b>4.6</b>	<b>1.3</b>	<b>3.4</b>
<b>2007</b>	<b>2.4</b>	<b>2.0</b>	<b>3.6</b>	<b>1.2</b>	<b>3.1</b>
<b>2008</b>	<b>2.5</b>	<b>2.1</b>	<b>3.9</b>	<b>1.2</b>	<b>3.3</b>
<b>2009</b>	<b>2.0</b>	<b>1.8</b>	<b>3.2</b>	<b>1.1</b>	<b>2.9</b>
<b>2010</b>	<b>1.7</b>	<b>1.6</b>	<b>2.8</b>	<b>1.1</b>	<b>2.6</b>

**Continuity of supply indices with reference to the end users as regards long interruptions in Norway**

	<b>SAIDI</b> [minutes]	<b>SAIFI</b>	<b>CTAIDI</b> [minutes]	<b>CAIDI</b> [minutes]	<b>CAIFI</b>
<b>2006</b>	<b>1.4</b>	<b>1.8</b>	<b>3.0</b>	<b>0.8</b>	<b>3.8</b>
<b>2007</b>	<b>1.4</b>	<b>1.9</b>	<b>3.0</b>	<b>0.8</b>	<b>3.9</b>
<b>2008</b>	<b>1.7</b>	<b>2.1</b>	<b>3.3</b>	<b>0.8</b>	<b>4.3</b>
<b>2009</b>	<b>1.2</b>	<b>1.8</b>	<b>2.6</b>	<b>0.7</b>	<b>3.8</b>
<b>2010</b>	<b>1.0</b>	<b>1.4</b>	<b>2.4</b>	<b>0.7</b>	<b>3.4</b>

**Continuity of supply indices with reference to the end users as regards short interruptions in Norway**

Reported “Energy not supplied”, is up to 2008 divided into 27 end user groups. From 2009 the number of end-user groups has been extended to 36. Energy not supplied was a direct input to our financial incentive based scheme on continuity of supply (the CENS arrangement) up to and including 2008. From 2009 customers’ costs are calculated using the interrupted power on a given reference point in time (typically worst case), and then adjusted for the time occurrence of the interruption. The regulation includes specific interruption costs (kr/kW) as a function of the duration of the interruption for six different customer groups. The interruption costs are reduced by given factors if the interruptions are notified in advance.

All collecting of data, reporting and calculation of indices are standardised. A standardised system is important in order to get the large amount of network companies to collect and

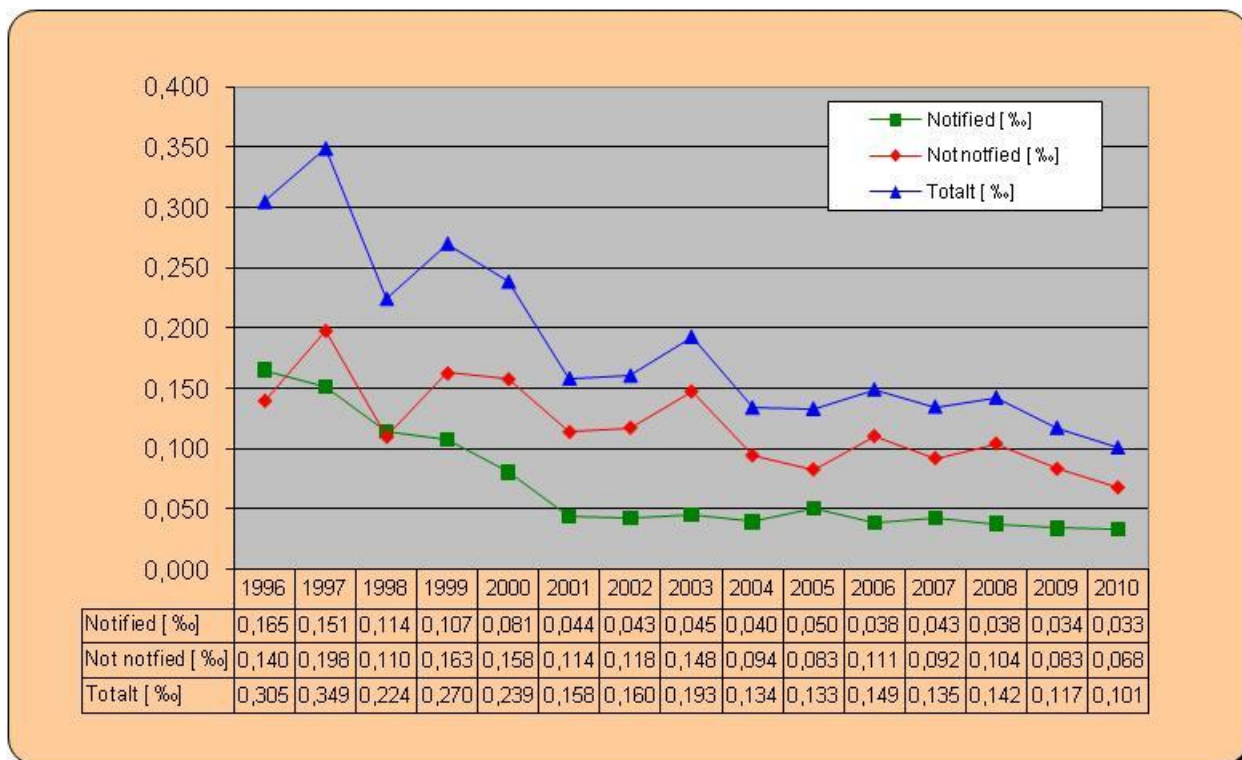
report and calculate the different indices in the same unique way. Energy not supplied is calculated taking into account a lot of factors and by using customers' load profiles. Hence, energy not supplied is the energy that would have been supplied during the interruption if it hadn't occurred in the first place. The development in the energy not supplied relative to the energy supplied gives a good indication of the development of the continuity of supply level in the power system.

The main objective of the CENS arrangement is to give the network owners incentives to operate and maintain their networks in a socio-economic optimal way and thereby provide an acceptable level of continuity of supply. The companies are forced to internalise the customers' costs related to interruption.

Year	Energy supplied GWh	Energy not supplied - notified interruptions GWh	Energy not supplied - non-notified interruptions GWh	Energy not supplied in total GWh
1996	98571	16.8	15.8	32.6
1997	101987	16.5	24.0	40.5
1998	106228	13.9	13.6	27.6
1999	106525	11.8	19.0	30.8
2000	104193	8.9	18.1	27.0
2001	108361	5.1	14.2	19.3
2002	107656	4.9	15.0	19.9
2003	105145	4.9	16.9	21.8
2004	109306	4.4	11.6	16.0
2005	111804	5.7	9.9	15.6
2006	106380	4.1	11.7	15.8
2007	109 712	4.7	10.1	14.8
2008	109570	4.2	11.4	15.6
2009	107052	3.6	8.9	12.6
2010	111041	3.7	7.5	11.2

**Energy supplied and some continuity indicators in Norway, as regards long interruptions.**

Two major incidents occurred in 2003 and 2006, caused by hurricane, resulting in a high amount of energy not supplied even when energy supplied had a normal level. Figure 1 shows the development of energy not supplied in per thousand of energy supplied for the last 14 years in Norway.



**Energy not supplied (ENS) in per thousand of the energy supplied (ES) to end users in Norway since 1996**

## **Balancing**

Norway participates in the common Nordic balancing market, known as “the Nordic regulation power market”. It is based on a TSO-TSO model with a common merit order. The market is for manually activated reserves, where both generators and large consumers can submit bids to meet the TSOs need for regulating power to balance the system. In 2009, the four Nordic countries implemented a common model for settlement of imbalances, a so-called one-and-a-half price settlement. This refers to that consumption units are faced with a one-price-settlement, whereas producers are faced with two different prices in the settlement, depending on whether their imbalance is “with” or “against” the system balance.

The regulation power price varies around the spot price (day ahead) for electricity. In periods with up-regulation the regulation price will typically be above the spot price, and vice versa in periods with down regulation the regulation price will typically be below the spot price. In spring and summer there are usually several hours during which the regulation price is zero or very close to zero.

It is the Norwegian TSO, Statnett who performs the balance settlement, and for this holds a license from NVE. In 2009 this license was renewed and slightly altered with an increased focus on risk management in the settlement business. Statnett’s settlement business is a separate cost centre with separate books and one of the new requirements in the licence was that a dedicated risk capital be set aside for the settlement business.

The Norwegian part of the Nordic regulation power market had up to 28 active participants in 2010. The regulation power market is relatively un-concentrated with a fair framework for competition. There have not been any causes for action against dominant market players in

the regulation power market. NVE has close collaboration with the Norwegian Competition Authority in following the wholesale market, including the regulation power market.

### *3.1.3 Effective unbundling*

There were no major changes in the unbundling requirements on the network companies in 2010. In the following, the main issues regarding the implementation of unbundling in Norway are described.

The Norwegian practice of legal unbundling is stricter than the requirement in the directive. While the directive enables undertakings performing functions of generation or supply to own undertakings performing activities of transmission or distribution, the Norwegian Energy Act requires that the undertakings performing functions subjected to free competition, such as generation or supply, can not own undertakings performing the activity of transmission or distribution, and vice versa.

There is only one TSO in Norway, namely Statnett SF. The TSO has been legally unbundled in a separate company since 1992, and has to comply with the ordinary functional provisions. Statnett is state owned and does not form part of any integrated undertaking. The TSO Statnett SF and the state owned generator, Statkraft SF, are moreover since 2002 owned by two different ministries, complying with requirements for ownership unbundling. Statnett's offices are not located together with any production or supply company.

The 8 DSO-companies with more than 100 000 residential customers in Norway are legally unbundled. These companies count around 70 % of the total mass of residential customers. The 8 companies are also obliged to participate in the compliance program, in accordance with the directive. The compliance program serves NVE in its monitoring of the DSOs fulfilment of the provisions regarding legal and functional unbundling. Besides the 8 DSOs with over 100 000 residential customers, there are 30 more legally unbundled DSOs. There is a total of 150 DSOs in Norway, and they are mainly in public ownership.

As noted above the nature of the Norwegian retail market implies that the majority of the DSOs are exempted from the provisions regarded legally unbundling. NVE can indeed require vertically integrated companies to separate into unbundled legally entities in the event of mergers and acquisitions, as long as these trigger the obligation to acquire a trading licence. In any case, all 150 DSOs are under regulations concerning neutral and non-discriminatory behaviour in relation to information to customers (including websites), customer switching, handling of new connections, measurement data and billing and these regulations are subject to supervision by NVE.

## **3.2 Competition Issues**

### *3.2.1 Description of the wholesale market*

The Norwegian wholesale market is part of the Nordic wholesale market through the common Nordic power exchange for physical power, Nord Pool Spot AS. In 2010 there were traded 305.2 TWh (285.5 TWh in 2009) at Nord Pool Spot, which accounts for 74% (72 % in 2009) of the power consumption in the Nordic region. The remaining volume of the Nordic market was traded bilaterally. NVE regulates Nord Pool Spot through the market place licence, in accordance with the Energy Act (1990).



Nord Pool Spot is organized as a market place where producers, distributors, traders, energy companies, large consumers and TSOs are able to buy or sell physical power. The price calculation is based on the balance between bids and offers from all market participants – finding the intersection point between the market's supply curve and demand curve. This trading method is referred to as equilibrium point trading, auction trading, or simultaneous price setting.

The total Nordic market is divided into bidding areas, elspot areas; these may become separate price areas if the contractual flow of power between elspot areas exceeds the capacity allocated for spot contracts by the transmission system operators. If no such congestion occurs between the Nordic elspot areas, the equilibrium price (the system price), will be the common price in all Nordic elspot areas. When grid congestion develops, however two or more elspot area prices are created in the Nordic areas. The Norwegian grid was divided into three elspot areas up to the 11<sup>th</sup> of January 2010. From the 11<sup>th</sup> of January and until the 15<sup>th</sup> of March 2011 there were four elspot areas in Norway; on the 15<sup>th</sup> of March a fifth elspot area was introduced so that Norway currently has five elspot areas. By 31.12.2010 Denmark had two bidding areas, while Sweden and Finland were not divided into price areas. However, there are from 01.11.2011 planned established four bidding areas in Sweden.

The generation structure in the Nordic area consists of hydro, nuclear, wind and various conventional thermal sources. The hydrological situation and hydropower production possibilities determine to what extent other generation sources are demanded. In a seasonal context this determines the value of the water which is the opportunity cost of production in the future. In the short-term hydropower generation is low when demand (and prices) is low and high when demand is high. In some cases the hydropower flexibility is large enough to level out price differences over the day. In winter peak periods, however, prices may be set by peak thermal capacity.

NASDAQ OMX Oslo ASA (Trade name; NASDAQ OMX Commodities Europe) is a commodity derivatives exchange authorised by the Norwegian Ministry of Finance and supervised by the Norwegian Financial Supervisory Authority. NASDAQ OMX Oslo ASA provides a wide range of derivative power products; Futures - day/week, Forwards - month/quarter/year and Contracts for difference (CfD).

NASDAQ OMX Commodities has more than 350 members from 18 countries covering a wide range of energy producers, consumers and financial institutions.

#### Generation:

In 2010 the total Nordic net generation was 375.6 TWh, which is 8.6 TWh higher than registered in 2009. The increase was basically due to an increase nuclear power generation and thermal generation. The Nordic region was a net importer in 2010 with a total net import of 18.8 TWh (7.9 TWh in 2009)

The Norwegian net generation was 122.8 TWh in 2010 (132.8 TWh in 2009). The share of the hydro plant generation accounted for around 95.1 % of the total Norwegian net generation in 2009. This percentage shows the importance that the weather conditions have on the net generation capacity. The inflow to the hydro reservoirs in Norway was below normal inflow levels in 2009. The same situation repeated itself in 2010 and very low inflow and low

reservoir levels lead to lower generation in 2010. Norway had a net import of electricity in 2010 of 7.5 TWh compared to a net export of electricity in 2009 of 9 TWh. Due to low consumption and high levels of available thermal production capacity in the neighbouring countries it was profitable to import electricity to Norway during 2010.

### *3.2.2 Description of the retail market*

Each entity operating in the electricity market and/or in the network business is required to hold a trading licence. Status in June 2010 was that the Norwegian Water Resources and Energy Directorate (NVE) kept about 440 trading concessions under surveillance. In week 23 2011 there were 25 suppliers with offers in all grid areas in Norway and a total of 98 suppliers in the whole country (data collected from the National price comparison website. All suppliers offering at least one of the three main contract types in Norway are obliged to register on this website).

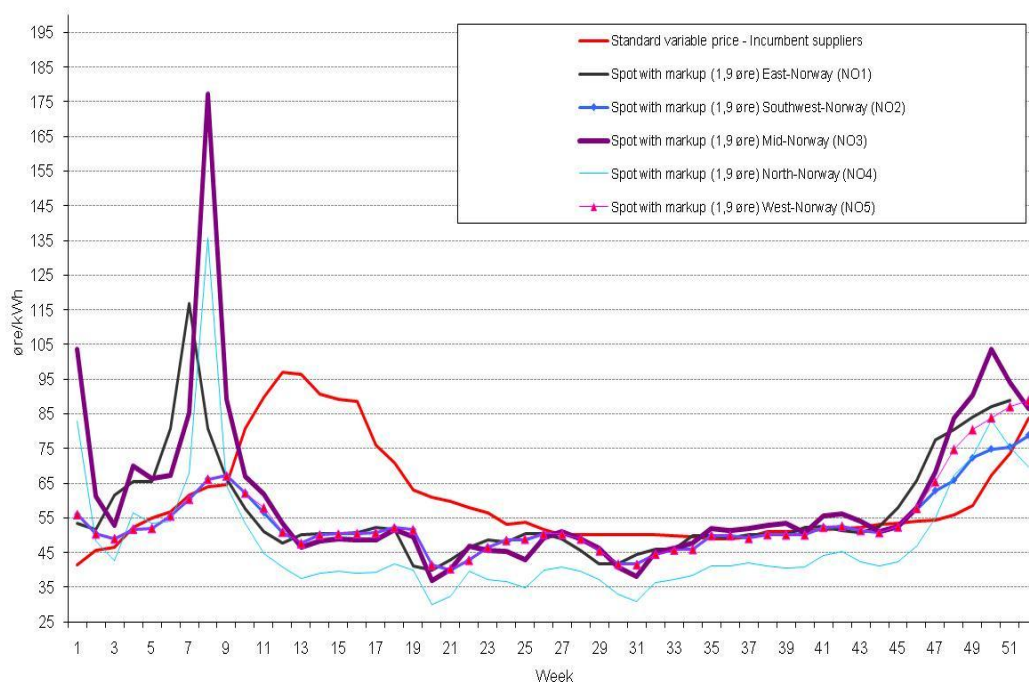
By June 2011 there are 150 DSOs in Norway. Of these, there are only eight DSOs, with more than 100.000 customers. The rest of the country is covered by DSOs with fewer customers than 100 000.

On average most end users are still customers of the incumbent supplier. The number of residential customers with suppliers other than their local supplier has steadily increased over time. About 700 000 customers in the household market was registered with another supplier than the incumbent supplier at the beginning of 2010. This is about 29 percent of all metering points in the household market.

The dominant supplier within a network area is most often a vertically integrated supplier or a supplier within the same corporation as the DSO. The market shares of the dominant suppliers within each grid area measured in numbers of metering points vary from 26 to 90 percent within the household market. On average, the dominant supplier had 73 percent of the household customers in their grid area in Norway in 2010.

### Price development

In Norway there is one official website for price comparison, run by the Norwegian Competition Authority. It compares the three most common contracts of the market. The customer can easily carry out an evaluation and make the choice of supplier using a price calculator. There are no regulated prices except electricity delivered to those customers who have not yet chosen a supplier (supplier of last resort) and information on prices and contracts is public information. The arrangement of the market has led to competition, but still prices between suppliers vary.



The figure shows the price development for the spot contract in the five Norwegian bidding areas of the Nord Pool Spot power exchange. The figure also shows the price development of The Standard variable contract<sup>2</sup> which is considered to be the default contract offered by the incumbent suppliers in Norway. The Standard variable contract is a spot based contract, but where the supplier is obliged to inform about price modifications two weeks before they take place. Approximately 40 percent of the household customers had a standard variable contract in 2010. In comparison, roughly 56 percent of the customers had a spot contract<sup>3</sup> (a contract that offers the average monthly area spot price with a mark –up) in 2010. The rest had a fixed priced contract, normally of one year duration.

### 3.2.3 Measures to avoid abuses of dominance

General competition legislation (The Norwegian Competition Act and the competition rules applicable to undertakings of the EEA Agreement) apply, and the Norwegian Competition Authority has full responsibility.

The physical power exchange, Nord Pool Spot AS (NPS), operates under a market place licence issued by NVE pursuant to the Norwegian Energy Act. In 2009 this license was renewed and altered with an increased focus on risk and adequate liable capital. In the following, the relevant framework for 2009 is described.

<sup>2</sup> The Standard variable contract offers a price based on the spot price, but without the peak variations. The price is set by the energy supplier alone, and even if it in the long run follows the spot price, what determines the price at each moment in time, is less transparent than the price setting of the spot price contract. Customers with a standard variable contract type, the customers will be notified two weeks in advance of price changes.

<sup>3</sup> A market contract is a contract that offers the monthly average area spot price at Nord Pool Spot with a mark –up. For people living in the same spot area, the only difference in price between these kinds of contract is the mark-up set by the supplier.

### Rules governing conduct of generation companies in the wholesale markets:

According to NPS' Rulebook Participants and Clearing Customers shall disclose to Nord Pool any information relating to the Nordic electricity market regarding the Participant's or Clearing Customer's own business or facilities of which the Participant or Clearing Customer concerned owns or controls or has the balance responsibility for in whole or in part, in particular information relevant to facilities for production, consumption or transmission of electricity, regarding:

- any planned outage, limitation, expansion or dismantling of capacity in the next 6-weeks period of more than 100 MW for one generator, consumption or transmission facility, or more than 200 MW for one production station, including changes of such plans;
- any planned outage, limitation, expansion or dismantling of capacity of more than 400 MW for one production station, consumption or transmission facility for the current calendar year and three calendar years forward, including changes of such plans
- any unplanned outage or failure relating to more than 100 MW for one generator, consumption or transmission facility, and more than 200 MW for one production station, including updates on such outages or failures.
- Any other information that is likely to have a significant effect on the prices of one or more Instruments if made public.

Nord Pool Spot publishes total volumes for demand and supply in each hour, transmission capacity between elspot areas within the exchange area, elspot system prices, local prices and prices on financial products.

- Bidding behaviour:
  - The standard terms for trading in Nord Pool Spot AS' physical markets include rules for bidding.
  - See also "market surveillance".
- Market surveillance:
  - According to the Market place license, NPS has an obligation to provide market surveillance. Further, The Financial Supervisory Authority of Norway requires the establishment of internal market surveillance by Nord Pool ASA, and NPS' Market surveillance cooperates with NASDAQ OMX Oslo ASA's Market surveillance in a joint function. The Market surveillance monitors the trading activities in the spot and derivatives markets and conduct investigations of possible breaches on laws and regulations. The Market surveillance also monitors possible abuse of the interaction between the two markets. The Market surveillance must ensure that market participants play by the rules to maintain the markets confidence in the exchange.

The Rulebook for trading at Nord Pool Spot regulates the market conduct in the physical market in relations to disclosure of price relevant information, misuse of insider information and market manipulation.

- Further, regulations given in the Norwegian Competition Act regarding misuse of dominant position also applies. NVE and the Norwegian Competition Authority is monitoring the Norwegian generators bidding at NPS and have developed a model for monitoring of the competition in the market where the actual market price is compared to an expected price calculated by a model that simulates an efficient utilisation of reservoir-water (estimation of water values). Differences that can not be explained as price-taker behaviour should be investigated by looking at the different participants bidding on the market place. As a part of this process, NVE has the full mandate to collect information about the bidding from NPS.

NVE has no experience with virtual power plant auctions or other capacity release measures as this is not applied in Norway.

#### Rules governing conduct of companies in the retail market

In the retail market, according to the Electricity Directive, network and supply companies may be bundled if the number of customers does not exceed 100 000. NVE monitors network companies and ensures compliance with the neutrality criteria as laid down in the Energy Act of 1990 and Regulation no 301, from 11 June 1999.

The neutrality criteria require clear separation of monopoly activities (network) and supply (power sales). E.g. the network part of the business is not allowed to give information about customers to the supply side of the business. In 2010 NVE inspected several network companies with specific focus on compliance with the neutrality criteria. The inspections in them self have an educational and disciplining effect on the network companies. On the basis of the neutrality criteria, NVE did not have cause to effectuate sanctions towards network companies in 2010.

#### Monitoring of DSO's web pages

Internet has become one of the most important channels of information, so also for the DSOs and suppliers. As the Norwegian regulation on neutrality of DSOs not explicitly mentions the issue of web pages, NVE has by the first quarter of 2009 sent a guideline to all DSOs, explaining how to interpret the regulation regarding information on DSO's web pages. The supervision aims at getting the DSOs to have neutral websites, giving as accurate information about DSO services as possible without web links or advertisement to any particular supplier. From the logo or the url address it should be clear to everyone who is the responsible party (the DSO) of the web page and the information on it.

## 4. Security of Supply

### 4.1. Electricity

#### A general description of supply and demand

##### Electricity peak demand

Domestic gross consumption in 2010 was 130.4 TWh (123.8 TWh in 2009).

The Norwegian peak demand occurs during winter season. The current all time peak electricity demand is 23 994 MW. This was measured in January 2010.

The table below shows the peak demand for the last 10 seasons.

Year	Weekday	Date	Hour	Demand [MW]
2002	Friday	04.01.2002	11	20 689
2003	Monday	06.01.2003	10	19 085
2004	Monday	21.01.2004	9	20 675
2005	Wednesday	03.02.2005	9	21 401
2006	Monday	06.03.2006	9	21 575
2007	Wednesday	21.02.2007	19	21 450
2008	Thursday	14.02.2008	10	21 589
2009	Monday	05.01.2009	9	21 884
2010	Wednesday	06.01.2010	9	23 994
2011	Friday	03.12.2010	9	23259

According to demand forecast developed by the Norwegian TSO, Statnett, the expected peak demand for Norway season 2014/2015 will be 25 000 MW with temperatures corresponding to a ten years winter day. The same forecast based on average winter temperatures shows an expected peak demand of 23 330 MW.

##### Currently available generation capacity

The Norwegian net generation was 122.8 TWh in 2010 (130.5 TWh in 2009). At the end of 2010 the mean annual generation from hydro- and wind power is 125.7 TWh and maximum annual generation from thermal power is about 7.4 TWh including internal production. Due to

hydro dependency the generation from hydro power will vary between 90 and 150 TWh dependent on the precipitation and inflow from year to another.

Total installed generation capacity (at the end of 2010): 31 438 MW<sup>4</sup>. Available generation capacity during a cold winter is about 25 000 MW.

### Current and expected generation fuel mix

	Installed capacity 31.12.2010 [MW]	Mean annual generation 31.12.2010 [TWh/y]	Net capacity added in 2010 [MW]	Expected increase in capacity in 2011 [MW]	Under construction on 31.12.2010 [MW]	License/permit given, not yet built [MW]
Wind power	435	1.3	4 MW	100	158	2800
Hydro power	29 954	124.4	240 MW	439	688	1145
Thermal power	1 049*	7.4	280		0	1720

### Actual investment commissioning during 2010 (\* Does not include 300 MW capacity in gas-fired mobile reserve plants)

Notes on thermal power: The capacity figure does not include 300 MW capacity in gas-fired mobile reserve plants. The mean annual generation for thermal power is given as the maximum annual generation. Only half of the added capacity is available until 2015/2020 (Mongstad power plant).

Net increase in hydropower generation capacity during 2010 has been about 240 MW. During 2010 18.4 MW wind power has been commissioned, but 14 MW has been decommissioned

## A description of the role of regulatory or other authorities

### Authorisation criteria for new generation investments and long term planning

For all new projects (wind power plants, gas power plants, hydro power plants, power lines, transformers) a development licence must be granted. For all projects NVE considers the project economy, public and private interests and environmental issues.

The regulatory authority has delegated responsibility for power system studies to an appointed concessionaire in a given grid area. The main task of the work on the power system studies is to contribute to a socio-economic rational development of the regional grids and the national grid. In this connection the energy carriers in question are for stationary energy usage. The

<sup>4</sup> This does not include 300 MW reserve capacity reserved for use in highly critical power situations only.

power system studies will continue to be an important base document in the regulator NVEs handling of the applications for a concession to erect an energy plant or installation. This is especially of importance regarding applications for the larger overhead line projects.

### **Implicit and explicit incentives**

In special regional areas with constraints in transmission capacity Statnett has introduced a “grid efficiency phasing-in tariff”. This will give a reduced grid leasing tariff on new production facilities localised within certain areas, compared with the current level, for a period of 15 years. The criteria to get the phasing-in tariff, is that new production must be established within those areas and within those energy volumes where it is documented that new production will bring efficiency gains for the grid.

### **Progress in major infrastructure projects**

The 580 km, 700 MW cable between Norway and the Netherlands (NorNed) was commissioned May 2008. The cable is a part of the regulated asset base and incomes for the TSOs in both countries.

The 25 km 420 kV OH line from Nea eastwards to the border with Sweden was commissioned October 2009. The OH line is also renewed from the border to Järpströmmen in Sweden by Svenska Kraftnät. The new OH line removes a bottleneck by replacing the existing 300 kV OH line, which is an upgrade from 220 kV and cannot be upgraded further.

A new 140 km DC cable between Norway and Denmark, Skagerak IV, was granted licence June 2010. The transmission capacity will be 700 MW. The cable is expected to be in commission in 2014. There is also licence applications for a DC cable to Germany with capacity of 1400 MW sent in 2009/2010, expected commissioned in 2016/18.

### **The TSO processes for planning new network**

The grid system planning process in Norway is made compulsory from the regulator through power system studies. The country is divided in 17 regional planning areas where one of the DSO's has the responsibility of coordinating the planning process among the DSO's in the area, and make a regional grid development study.

In the national grid the TSO (Statnett) has the responsibility for the planning process and issuing of the national grid study. The yearly updated grid studies are submitted to the regulator (NVE) for consent. The study period for the grid development is minimum 10 year. The measures to improve upon the grid are only a part of a study that also covers other topics as energy and plant statistics, security of supply, spare parts situation, environmental, economical and technical presumptions, specific circumstances for the area, description of the existing grid, operating conditions, tariffs and future grid development.

The studies must describe bottlenecks, and how operational situations may create and influence congestion situations in the grid. Measures to reduce or eliminate congestions in the grid are one of the goals of the study. When applying for a concession to build, the applied solution must be part of the latest grid study submitted to the regulator.



## 5. Public Service Issues

Public Service Issues (PSI) are in general taken care of in acts, regulations and the contracts between the customer and each network company / electricity supplier. The utilities common association and the Office of the Consumer Ombudsman have negotiated standard agreements which set up a balanced set of conditions. There are separate agreements for connection and use of the grid system, and electricity supply. Some utilities practices may be at variance with these agreements.

Regarding labelling of primary energy source, the requirements have been implemented in regulation and came into force from the 1<sup>st</sup> of January 2007.

The obligations set out in Annex A are fulfilled in the Norwegian system. Reference is made to the updated table of correspondence as submitted to the Authority by letter of 7<sup>th</sup> of April 2008 from the Ministry of Petroleum and Energy (MPE).

To secure appropriate treatment of vulnerable customers, all distribution companies in Norway have an obligation to be supplier of last resort. In addition, the social security system takes care of those unable to pay for necessities.

Customers are protected from disconnection when life or health is at risk. If the social services have guaranteed for the payment of the customer, disconnection is prohibited. There are no data available on the number of disconnections in Norway.

In Norway there are no regulated prices for electricity supply. The electricity market is fully open for all customers, and the prices are set in the market. All network companies are regulated with an income cap, covering all cost elements. Customers can file complaints regarding the tariffs to the regulator.

To ensure transparency of the terms and conditions of supply contracts, the network companies have an obligation to act in a neutral and transparent manner. Further on the network tariffs are regulated, in addition to the income cap mentioned above.

Most suppliers use the standard supply contract which is made through negotiation between the branch organisation Energy Norway and the consumer ombudsman.

The Norwegian Parliament grants annually a certain amount of support to reduce network tariffs for certain customers. The aim of the arrangement is to directly reduce the tariffs for customers in areas of Norway with high distribution costs. The arrangement do not influence on the incentives in the income regulation described above. The criteria for allocation is average cost per kWh, measured as total income cap in the network company divided on delivered energy measured in kWh. The scope of this arrangement is dependent on the annual budgets decisions of the Parliament.

According to regulations managed by the Norwegian Competition Authority, all electricity suppliers are obligated to publish their prices on certain standard products/contracts offered to household customers at a Website hosted by the Norwegian Competition Authority for price comparison.

Further, all suppliers are obliged to state the price on the products/contracts they are offering in a certain way according to regulations managed by the consumer ombudsman.

Change of supplier has been free of charge for all customers since 1997.