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# National Report 2019

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# National Report 2019


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

The data/content refer to 31 December 2018 or the reporting period 2018 unless otherwise stated.

## FOREWORD

The Norwegian electricity market is a part of the Nordic electricity market. It opened for competition when the Energy Act came into force 1 January 1991. The regulatory activities are ensured by the Norwegian Water Resources and Energy Directorate (NVE). NVE has played an active role as energy market regulator in the development of network regulation, real market access for all customers, simplified supplier switching procedures, securing security and quality of supply and an efficient regulation of the energy system operation in Norway.

The development of the Norwegian market has been successively followed by similar market changes in the other Nordic countries. A common Swedish-Norwegian wholesale market was established in 1996, and from the beginning of 2000, all of the Nordic countries were included in a common market place. In addition, the Baltic countries became a part of the open and integrated electricity market in 2013, all trading at the common market power exchange Nord Pool. The Nordic/Baltic market is interconnected with the continental European market as well as to Russia with several interconnectors.

Norway is a member of the European Free Trade Association (EFTA) and is a part of the European Economic Area Agreement (EEA). As a consequence the EEA procedures regarding the adoption of new EU legislative acts is applicable to Norway. The Electricity Directive 2003/54/EC and Regulation 1228/2003 was approved in the EEA Committee in December 2005. This report is based on the reporting requirements in Directive 2003/54/EC articles 3(9), 4 and 23 (1/8), and Directive 2005/89/EC article 7.

NVE is a member of the Council of European Energy Regulators (CEER). In 2018, NVE has continued its efforts to contribute to the work of ACER and CEER to obtain a well functional electricity market. The format of the participation of NVE in ACER will be formalised in the EEA agreement, when implementing the third energy market package. NVE is also a member of NordREG, the organisation for the cooperation of Nordic energy regulators.

The Norwegian National Report 2019 is subject to common reporting structures developed by CEER. This report and the National Report of the EU member states will be available on the CEER website www.ceer.eu.

Oslo, 30 July 2019

Ove Flataker
Director
The Norwegian Energy Regulatory Authority

# 1. THE NORWEGIAN WATER RESOURCES AND ENERGY DIRECTORATE (NVE)

The Norwegian Water Resources and Energy Directorate`s (NVE) main statutory objective is to promote socioeconomic development through an efficient and environmentally sound energy production, as well as promoting efficient and reliable transmission, distribution, trade and efficient use of energy.

NVE has the authority to issue regulations on economic and technical reporting, network revenues, market access and network tariffs, non-discriminatory behaviour, customer information, metering, settlement and billing and the organised physical power exchange (Nord Pool). In addition, NVE issues regulations on system responsibility and quality of supply. The Energy Act regulates the main frame of the Norwegian electricity and gas market and NVE has the power to enforce many of the provisions in the Energy Act.

NVE is the national regulatory authority for the electricity market in Norway. NVE has no ownership or economic interests in the electricity industry. NVE is a separate legal entity with its own budget set by the Parliament and has the authority to act within the scope of its competences. A new department for energy market regulation was established in 2013 to in order to prepare for the implementation of the Third Energy Market Package[1].

NVE has a cooperation agreement with the Competition Authority (concerning i.e. market surveillance) and the Financial Supervisory Authority of Norway (concerning the financial markets for electricity derivatives). NVE also has a cooperation agreement with The Directorate for Civil Protection and Emergency Planning. NVE is a member of the Council of European Energy Regulators (CEER) and the organization of the Nordic Energy Regulators (NordREG).

[1] EEA Joint Committee Decision 5 May 2017.

## CONTENT

# 2. MAIN DEVELOPMENTS IN THE ELECTRICITY MARKET

## 2.1 Electricity production and all-time high consumption in 2018

Hydropower production represents 96 percent of the total electricity production in Norway, and the Nordic electricity system is therefore highly influenced by the hydrological situation. The electricity production in Norway was 145.7 TWh in 2018, which represents a reduction of 3 TWh from 2017. In 2018, it was an all-time high electricity consumption of 135.4 TWh. This can partly be explained by increased consumption in the petroleum industry and in the power intensive industry.

Although the annual inflow were at normal levels in 2018, the extreme variations within the year was abnormal. The draught in June and July resulted in a relatively tight hydrological balance, and historically high power prices for the season. The though heavy autumn rain improved the resource situation significantly however, and the yearly average power price in Norway was 43.5 EUR/MWh. This is 35 percent higher than in 2017, and the highest price level since 2010. Another important explanation for the high price level, is the significant increase in prices on coal, gas and CO2-emissions from 2017 to 2018.

## 2.2 Implementing a new, national data hub and smart meters in the retail market

The Norwegian electricity retail market has been subject to substantial changes in the years towards 2019. NVE has developed regulations to facilitate the implementation of a national data hub (Elhub) and smart metering infrastructure (AMI) in order to increase competition and efficiency in the market. The Elhub which is operated by Statnett, was successfully implemented 18 February 2019. Deadline for the smart meter rollout was in the end of December 2018, and at that time 97 percent of the smart meters were installed. The smart meters sends metering data to the DSOs. The meters are also equipped with a Home Area Network (HAN) interface, where end-users can get access to information regarding their own consumption every 2-10 second. The smart meters measures production as well as consumption. The implementation of the Elhub and rollout of AMS will make the exchange of information in the market more efficient and facilitate the use of demand response tools and services.

## 2.3 Interconnectors from Norway to Germany and Great Britain under construction

There are two interconnectors under construction from Norway, both with a capacity of 1400 MW. The North Sea Link to Great Britain is expected to be operational in 2021, and the NordLink to Germany is expected to be operational in December 2020, with test operation until March 2021. In 2018, NVE monitored the development and compliance with the approved license on both interconnectors. NVE has not discovered any situations of non-compliance with the license, but will continue to monitor both of the projects in the future.

## 2.4 Changes in the existing regulation and public consultations in 2018

*Distribution tariffs*

The design of the network tariff is important for the utilisation and development of the network. It also affects the allocation of cost amongst network users. NVE finds that a shift to a more cost-reflective tariff design can improve both the network utilisation and development. This is particularly important given the challenges and possibilities introduced by new technology. We have withdrawn a proposal from 2017 on subscribed capacity as a compulsory tariff model, due to comments and opposition received on the public consultation of the tariff model. A change from volumetric (kWh) to capacity-based kWh/h tariffs is still important to improve the cost-reflectiveness of the distribution system tariff. A public consultation on a new capacity-based tariffs is planned in the autumn 2019.

*Connection charges*

Customers who wish to connect to the electricity network or to increase the capacity on an existing connection, have to pay a connection charge. The charge includes the share of investment costs necessary to invest in new network infrastructure for the increased demand. The charge is based on actual investment costs, and give the customer an incentive to adjust the demand or location to avoid or postpone network investments.

NVE adopted new regulation on connection charges in Q2 2018, which entered into force 1 January 2019. The previous regulation on connection charges was only used for investments on local distribution levels (up to 22 kV), or for investments used by one actor only (e.g. a radial connection to a power plant). The new regulation network charges will in practice be similar on all network levels and thereby strengthen customer protection.

*National data hub - Elhub*

NVE has followed the migration of metering data from the DSOs to Elhub closely. All the DSOs and suppliers were to receive an approval from the Elhub in order to ensure that their ICT systems would be able to communicate with the Elhub. They had to upload migration files containing metering data according to specific quality criteria. All the DSOs gave a complete report of all metering points in their grid area. NVE has ensured that these milestones were according to the criteria, and notified 98 DSOs of enforcement fines if they did not deliver the migration files according to the quality criteria. There were only three DSOs that had to pay an enforcement fine.

*Economic regulation of transmission and distribution networks*

NVE will update the cost functions for the quality scheme “Costs of energy not supplied” (CENS) for households from 2020. We have been working on the update of the cost functions since 2016, when external consultants were hired to conduct a survey of the customers’ willingness to pay for reduced outages. The consultants delivered their report in 2017, and the overall results shows a higher willingness to pay for reduced outages than previously assumed. In 2018, we conducted a public consultation, and decided on new cost functions for “Costs of energy not supplied” for households. The cost functions for the other customer categories were updated in 2015.

The WACC was updated in 1 January 2019, where the risk free rate was reduced from 2.5 to 1.5 percent and the calculation of the credit risk premium were slightly changed. In total, NVE anticipate that these changes will result in a reduction of the WACC by 0.4 percentage points. The WACC was previously changed in 2012, but the financial market has changed since then. Therefore, we hired external consultants in 2016 to assess whether there was a need to adjust the parameters in the WACC formula. The consultants delivered their report in 2017, suggesting changes in several parameters. This report was subject to a public consultation in 2017. We took the feedback from the consultation into account, and presented our suggested changes in a new public consultation in 2018.

### *Network Codes and Guidelines*

In 2018, NVE prepared the implementation of Guidelines on Capacity Allocation and Congestion Management (CACM), Guideline on Forward Capacity Allocation (FCA), System Operation (SO), as well as actively taking part in the development of Guideline on Electricity Balancing (EB). NVE follows and takes active part in the implementation process of the abovementioned guidelines. Furthermore, the proposals for terms, conditions and methodologies adopted according to these network codes/guidelines will be part of Norwegian legislation once the specific network code/guideline is implemented in Norway.

NVE has also been working on the technical requirements of the connection codes on demand connection (DCC), grid connection of generators (RfG) and on grid connection of high voltage direct current systems and direct current-connected power park modules (HVDC). Statnett has reviewed the connection codes in cooperation with the stakeholders and has made preliminary proposals for national specifications.

### *Market Conduct Rules*

In 2017, NVE launched a public consultation on amendments in the Norwegian Energy Act Regulation. These amendments entered into force 1 March 2018, and include provisions against market manipulation and insider trading, and the obligation to publish inside information in the wholesale power market. This represents a step towards harmonising the Norwegian legal basis for market behaviour with the other Nordic countries and Europe. Until now, requirements in the market place license has promoted integrity and transparency in Norway, and the new provisions in the Norwegian Energy Act Regulation will continue to secure the integrity and transparency in the market until the EEA-relevant legislation Regulation (EU) No 1227/2011 on wholesale energy market integrity and transparency (REMIT) is implemented in Norway.

### *Interconnectors from Norway to Germany and to Great Britain under construction*

There are two new interconnectors under construction from Norway, one to Great Britain, the North Sea Link, and one to Germany, the NordLink. Each interconnector will have a capacity of 1400 MW, and are expected to be operational in 2021. In 2018, NVE monitored the development and compliance with the approved license on both interconnectors. NVE has not discovered situations of non-compliance with the license, but will continue to monitor both of the projects in the future.

# 3. THE ELECTRICITY MARKET

## 3.1 Network regulation

### *3.1.1 Unbundling*

In Norway, there is only one TSO, the publicly owned company Statnett, which has been legally unbundled since 1992. In addition, the ownership of the TSO and the publicly owned electricity producer Statkraft has been divided between two different government ministries since 2002. Norway therefore complies with the requirements in the Electricity Directive 2003/54/EC for ownership unbundling.

Today, DSOs with more than 100 000 connected customers in Norway are legally and functionally unbundled. In 2018, the seven DSOs in this category represented approximately 58 % percent of the total connected customers. In addition to the unbundling requirements, these companies are subject to participation in a compliance program according to the Electricity Directive and Norwegian regulation. The participants of the program have to produce an annual report to NVE that enables NVE to monitor the DSOs fulfilment of the regulations regarding legal and functional unbundling.

By the end of 2018, there were 113 Norwegian DSOs[2] with less than 100 000 connected customers. These DSOs are therefore exempted from the regulations regarding legal unbundling. However, in the event of a merger or acquisition, NVE can require a DSO that also has activities in generation or supply to reorganise into separate legal entities. 39 of the DSOs with less than 100 000 customers are organised in a legal entity devoted entirely to managing the grid. All 120 DSOs (with more or less than 100 000 customers) are under regulation concerning neutral and non-discriminatory behaviour when it comes to the DSO's management of the information to customers, supplier switching, metering data and billing. These regulations are subject to supervision by NVE. The majority of the Norwegian DSOs are publicly owned.

In 2016, an amendment to the Energy Act that imposes legal and functional unbundling for all DSOs, irrespective of size, was approved by the Parliament, and it is expected to enter into force 1 January 2021. Following this decision, the Ministry of Petroleum and Energy requested NVE to formulate supplementary secondary legislation on legal and functional unbundling. NVE started this work in 2017.

2 All network owners that holds a trading company licence, with or without revenue caps. The number of DSOs with revenue caps is 123.

### *3.1.2 Technical functioning*

#### *Quality of electricity supply*

NVE has extensive legal powers on the regulation of the quality of electricity supply. The Norwegian regulation[3] on the quality of supply applies to those who wholly or partially own, operate or use electrical installations or electrical equipment connected to the Norwegian electricity system.

This involves establishing requirements for all parties connected to the Norwegian electricity system. This includes network companies, the performance of any activities subject to competition (production, energy trade and/or supply), Statnett, electricity producers and end-users regardless if they hold a license according to the Energy Act or not.

#### *Voltage Quality*

The Norwegian Quality of Supply Regulation includes minimum requirements for voltage frequency, supply voltage variations, voltage dips, voltage swells, rapid voltage changes, short- and long term flicker since 2014, voltage unbalance and harmonic voltages including total harmonic distortion (THD). If considered necessary, NVE has the power to set minimum requirements for other voltage disturbances, such as transient over-voltages, interharmonic voltages and main signalling voltages.

Statnett and the DSOs have to continuously register dips, swells and rapid voltage changes in their own characteristic high and medium voltage network since 2006. In addition, they have been obliged to register total harmonic distortion (THD)[4] and flicker. The purpose of these required registrations is that Statnett and the DSOs have an obligation to provide information about the expected quality of their network from existing and possible new customers on request. Statnett and the DSOs were also obliged to report the above-mentioned voltage quality parameters (except rapid voltage changes) to NVE since 2014. I.e. the first reporting of voltage quality to NVE was in February 2015. NVE has established a database for all the reported data.

In case of a customer complaint regarding power quality, Statnett and the DSOs will do the necessary investigation in order to verify compliance with the requirements in the regulation. If the complaint concerns voltage quality, and there is not an obvious cause, on-site measurements must be performed according to relevant EMC-standards (The IEC 61000-series). The minimum duration for such measurements is seven days, longer if necessary. The network conditions in the measurement period (coupling picture, load, production and seasonal conditions) must as far as possible reflect the conditions of the network at the time of the complaint. If the measurements prove non-compliance to limits set in the regulation, Statnett and the DSOs must identify the reason for this and identify the responsible party for the violation. The responsible stakeholder must rectify the situation without undue delay. In cases where a customer (end-user, prosumer, producer or other DSOs) is identified as the responsible party,

[3] Norwegian Regulation 30 November 2004 No 1557 on the Quality of Supply in the Power System

[4] A THD-value expresses a value calculated from all the individual harmonic voltages. A THD-value beyond limits gives an indication that one or more individual harmonic voltages may beyond limits. If one or more individual harmonic voltages are beyond limits it can be challenging for users of the grid and may cause malfunction or damage to equipment connected to the grid.

they are exempted from the requirement to rectify if, and only if, no other stakeholder is affected by the voltage violation. If Statnett or the DSOs have done the aforementioned investigations without reaching an agreement with the customer, the case can be brought forward to NVE for decision.

### *Interruptions*

NVE publishes annual statistical reports on interruptions providing continuity of supply levels at a country level, county level, company level, end-user level and voltage levels. Incidents on all voltage levels have been reported since 2014, including voltage levels below 1 kV.

Statnett publishes an annual report on operational disturbances containing reliability levels for the system.

In Norway, the network companies have been obliged to report specific data on interruptions since 1995. In the beginning, the data was reported with reference to specific reporting points in the network. A reporting point used to be a distribution transformer or an end-user connected above 1 kV. Since 2014, a reporting point is defined as an end-user connected to any voltage level, above or below 1 kV. NVE used "Energy not Supplied", (ENS), as input to the incentive based regulation on continuity of supply from 2001. The incentive regulation is based on adjusting the income cap for the utilities due to ENS (CENS, in Norwegian "KILE"), among others. Until 2009, this quality adjusting was based on calculating the amount of energy not supplied, and hence a standardised method for calculating ENS was needed. This was introduced from 2000. During 2001-2008, it was a linear relation between ENS and CENS.

After 2009, a new method for calculating CENS was introduced, which is based on the interrupted power (kW) at a reference point of time and then adjusted for the actual interruption time (hour, weekday and month). Calculation of CENS from 2009 is therefore no longer as straightforward as it was when it could be directly derived from CENS.

Even if ENS is no longer used for calculating CENS, it is still an important indicator when making interruption statistics (for instance for making historical statistics for the reliability of the power supply).

The interruption data also included end-users from 2005. The main reasons for introducing this was to make it easier to understand for non-technical customers and to compare with other countries.

The data is reported according to the following definitions:

- For long (> 3 min) and short (≤ 3min) interruptions (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)
- CENS (from 2009)
- Notified and non-notified interruptions

Common indices with reference to customers are presented in figure 1 & 2. Figure 1 represents long interruptions and figure 2 represents short interruptions (Tables with corresponding figures are enclosed in the appendix).

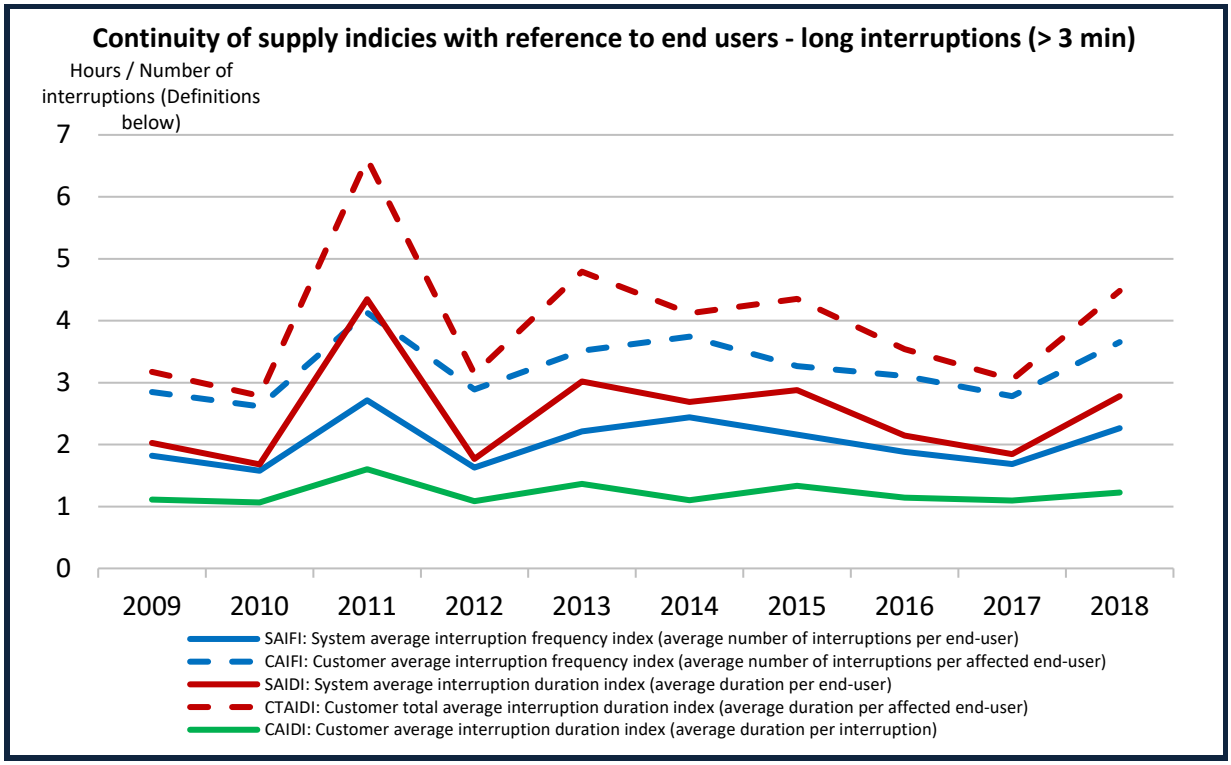


*Figure 1. Continuity of supply indices with reference to end users - long interruptions.*

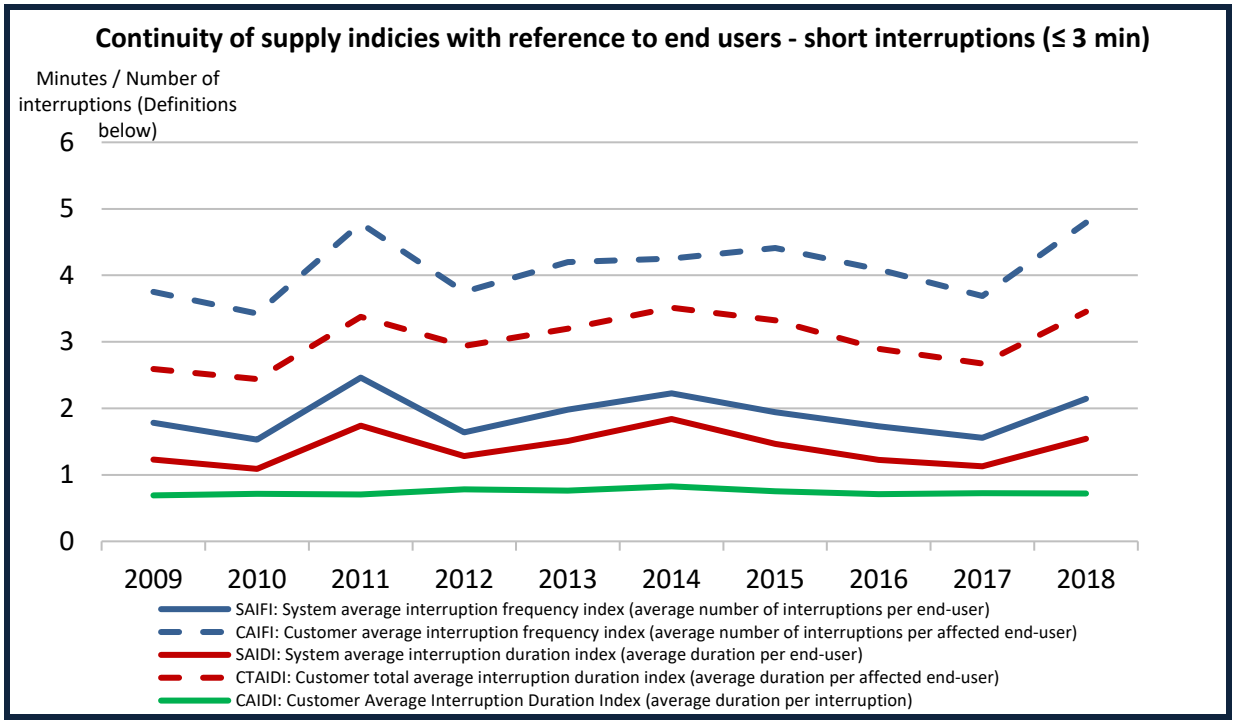


*Figure 2. Continuity of supply indices with reference to end users - short interruptions.*

Reported “Energy not supplied” in Table 1, is divided into 27 end user groups up to 2008. From 2009 the number of end-user groups has been increased to 36.

*Table 1. Energy supplied and continuity indicators in Norway, long interruptions.*

| Year | Energy supplied [GWh] | Energy not supplied - notified interruptions [GWh] | Energy not supplied - non-notified interruptions [GWh] | Energy not supplied in total [GWh] |
|---|---|---|---|---|
| **1996** | 98 571 | 16.3 | 13.8 | 30.1 |
| **1997** | 101 987 | 15.4 | 20.2 | 35.6 |
| **1998** | 106 228 | 12.2 | 11.7 | 23.8 |
| **1999** | 106 525 | 11.4 | 17.3 | 28.8 |
| **2000** | 104 193 | 8.4 | 16.5 | 24.9 |
| **2001** | 108 361 | 4.8 | 12.3 | 17.1 |
| **2002** | 107 814 | 4.6 | 12.7 | 17.3 |
| **2003** | 105 572 | 4.8 | 15.6 | 20.4 |
| **2004** | 109 459 | 4.3 | 10.3 | 14.7 |
| **2005** | 111 804 | 5.6 | 9.3 | 14.9 |
| **2006** | 106 385 | 4.1 | 11.8 | 15.9 |
| **2007** | 109 712 | 4.7 | 10.1 | 14.8 |
| **2008** | 109 570 | 4.2 | 11.4 | 15.6 |
| **2009** | 107 052 | 3.6 | 8.9 | 12.6 |
| **2010** | 111 041 | 3.7 | 7.5 | 11.2 |
| **2011** | 107 045 | 4.0 | 33.2 | 37.2 |
| **2012** | 110 698 | 3.8 | 8.0 | 11.8 |
| **2013** | 112 118 | 3.8 | 24.9 | 28.7 |
| **2014** | 114 441 | 4.3 | 12.5 | 16.8 |
| **2015** | 116 062 | 4.5 | 16.5 | 21.0 |
| **2016** | 117 684 | 4.1 | 10.8 | 14.9 |
| **2017** | 116 608 | 4.5 | 9.1 | 14.3 |
| **2018** | 120 986 | 5.0 | 15.1 | 20.1 |

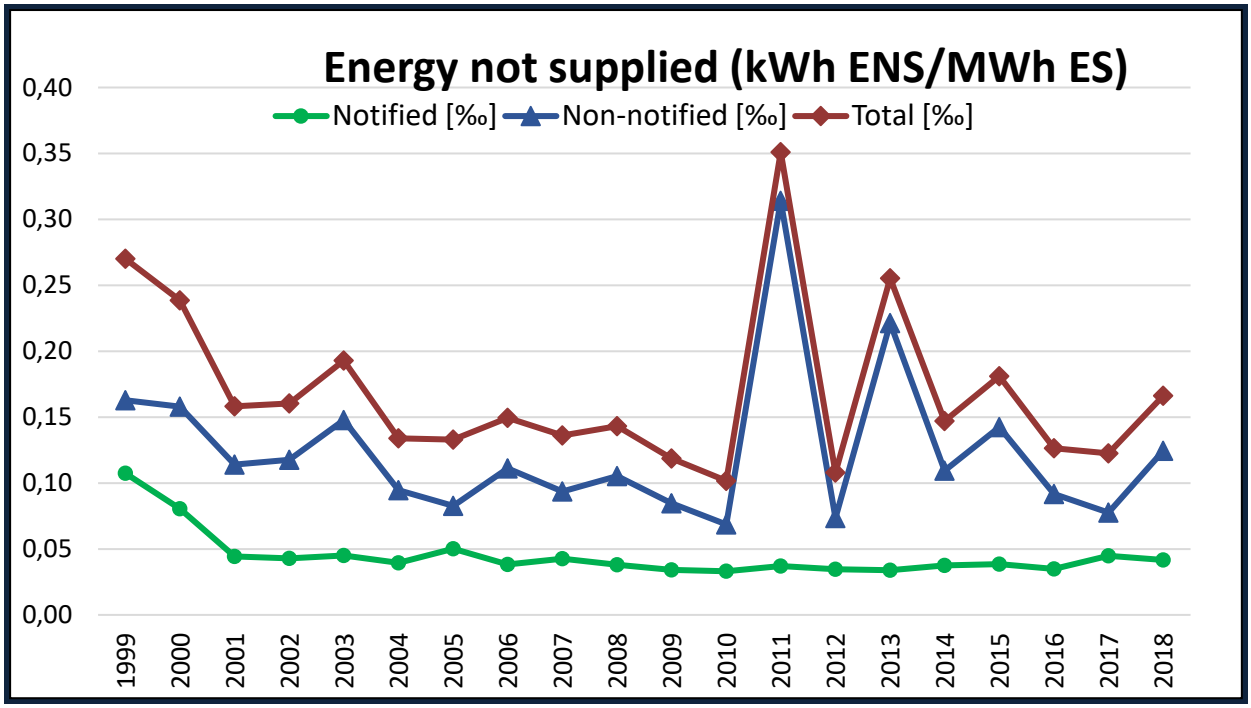


*Figure 3. Energy not supplied (ENS) in per thousand relative to the energy supplied (ES) to end users in Norway since 1999.*

In 2018 all the indicators on CENs presented in figure 1 and 2 increased compared to 2017. This means that the end-users were affected by more interruptions and the outage time per interruption. In 2003, 2006, 2011 and 2013, several hurricanes caused a high amount of energy not supplied. The amount of energy not supplied in 2014 was lower than in 2013, although storms in the Northern part of Norway and thundershowers in the summer caused a higher number of interruptions per customer. In 2015, the number of interruptions per customer was lower than in 2014, but the average interruption duration increased. This may be due to fewer interruptions caused by thundershowers and more interruptions caused by wind during storms. Interruptions due to storms with heavy wind normally takes longer time to repair than interruptions due to thundershowers.

### *Balancing market and balance settlement*

Statnett holds a license for the system operation responsibility. This obliges Statnett to ensure physical balance between power production and consumption in the operational hour. In performing these tasks, the Nordic balancing market is an important instrument.

Norway is a part of an integrated Nordic balancing energy market for manual frequency restoration reserves (mFRR), known as “the regulating power market”. The Nordic area (except DK1) is a common synchronous area, and the Nordic TSOs therefore collectively operate the Nordic area as one single load frequency control area. In the regulation power market, generators and consumers can, subject to a minimum bid size requirement of 10 MW, submit bids to provide the TSOs with regulating power to balance the system. The submitted bids form a common merit order list, and the bids at the lowest price for upward or downward regulation are activated depending on the TSOs’ needs. In this way, the balancing resources are utilized in the most efficient way.

The mFRR balancing energy price varies close to the day-ahead clearing price. The balancing energy price will typically be above the day-ahead price in periods with upward regulation, and below the day-ahead price in periods with downward regulation.

According to Norwegian regulation, Statnett has the obligation to make sure that there are sufficient available balancing reserves in the power system at all times. The level is based on the dimensioning fault of the system, which is currently 1200 MW in Norway. In addition, Statnett procures 500 MW mFRR to handle regional congestions and imbalances. To fulfil the requirement for available mFRR, Statnett operates a balancing capacity option market for mFRR (called “RKOM”), to make sure there is sufficient upward regulation on the merit order list. The RKOM is operational during wintertime, typically from October to April, and contracts are made both on weekly and seasonal level. Through RKOM, market participants are compensated for guaranteeing that they will provide upward regulation bids to the regulating power market.

Statnett has also been given a license for the responsibility of the balance settlement. The licence obliges Statnett to ensure a financial balance in the balancing market, by acting as a clearinghouse for the Norwegian part of the balancing market. The purpose of the balance settlement is to settle the differences between the executed trades against the actual input or offtakes from the power network.

In 2009, the four Nordic countries implemented a common model for settlement of imbalances, a so-called one-and-a-half price settlement, in order to harmonise rules and regulations. According to this model, the consumption balance is settled according to a single price, which is based on the marginal

price of the activated mFRR balancing energy. The production balance is, however, settled according to two different prices, the Day-ahead clearing price or the marginal price of the activated mFRR balancing energy, depending on whether the imbalance contributes to reducing or increasing the net system imbalance, respectively.

In recent years, NVE has in cooperation with the Swedish regulator EI (Energimarknadsinspektionen) and the Finnish regulator EV (Energiavirasto), worked with the TSOs to prepare for a common Nordic Balance Settlement (NBS) through a joint company. The NBS, which is an important step towards harmonised Nordic end-user markets, was successfully implemented in May 2017. The Danish TSO, Energinet, joined the NBS in 2018.

### *3.1.3 Network tariffs for connection and access*

The Norwegian electricity network is characterised as transmission (400kV-132 kV) and distribution (132kV – 240V). Distribution is further differentiated as regional distribution (132kV – 22kV) and local distribution (22kV – 240V) for regulatory purposes. Statnett is the only Transmission System Operator (TSO) and is responsible for the transmission tariffs. By the end of 2018, there were 119 network companies owning and operating regional distribution and/or distribution network, some also owning minor parts of the transmission network. Tariffs shall be structured in accordance with regulation 1999-03-11 no. 30; Regulations governing financial and technical reporting, income caps for network operations and tariffs.

#### *Revenue Cap model*

NVE regulates the distribution system operators (DSOs) and Statnett using an incentive based revenue cap (RC) model. The RCs are set annually, based on a yardstick formula of 40 percent cost recovery and 60 percent cost norm resulting from benchmarking exercises. The regulation model covers operators of all electricity networks. Statnett is benchmarked together with other European TSOs, while the DSOs are benchmarked in a model based on Data Envelopment Analysis (DEA): one model comparing companies operating in the regional distribution network and one model comparing companies operating in the local distribution network. The DEA-results are adjusted using regression analysis in order to account for different geographical challenges between the companies. The models also take differences in network structure and operating environments into account.

NVE notifies the RCs for the coming year in November (t-1), and the network companies set their tariffs accordingly. In February the year after which the RCs applied for (t+1), we calculate the final RCs. We publish all data, benchmarking results and revenue cap calculations on our web page once the calculations are finished. This is to increase the transparency of the methodology and data used in the calculation of the RC. In principle, the notified and the final RCs for one year will only differ due to differences between estimated and actual electricity prices, inflation and WACC. In addition, we correct any errors in the companies' costs or technical data discovered after the notification in the final RCs.

NVE calculates the RCs based on expected total costs using inflation adjusted cost data from two years prior. The deviation between the expected total costs and the actual total costs for all companies in one year is included in the RC calculation two years later (e.g. we correct for the deviation between expected and actual costs for 2016 in the RC for 2018). We distribute the total cost deviation among the companies using their share of the sector's total regulatory asset base. This mechanism does not apply to the regulation of Statnett.

### *Allowed Revenue*

The companies set their tariffs based on their allowed revenue, which includes the revenue cap, costs related to property taxes, approved R&D costs and tariffs paid to other regulated networks. In order to remove the time lag in the cost of capital recovery, we add the difference between actual cost of capital (depreciations and return on assets) in the RC year and the capital costs from two years back to the allowed revenues.

Any Costs of Energy Not Supplied (CENS) during the year are deducted from the allowed revenues. CENS is a measure of the value of lost load for the customers. The CENS arrangement provides an incentive for network operators to have a socio-economic maintenance and investment level in order to minimize power outages.

The revenue compliance is subject to regulatory control. We calculate excess or deficit revenue for a given year as the difference between actual collected revenues and allowed revenues for that year. Actual collected revenues include tariff revenues from customers, congestion revenues and revenues from system operations. Since we consider revenues generated from congestions as part of Statnett's actual revenue, they contribute to reducing the base for tariffs that Statnett can collect from Norwegian customers. However, the costs related to reducing the congestion are also part of the tariff base, which implies that the congestion revenues is used to finance investments to eliminate congestion. We decides an excess/deficit revenue balance every year, approximately one year after the RCs are set. At that time, the companies have reported their actual costs for the RC-year. The DSOs should adjust this balance towards zero over time, through tariff changes. Excess revenues must be reimbursed to the customers, while deficit revenues may be recovered.

According to the economic regulation of network companies, transactions within a vertically integrated company and transactions between a network company and other companies in the same corporation needs to be based on competitive market conditions. Further, the national regulator may impose a specific method for cost allocation between areas of operation in vertically integrated companies. We annually audit a selection of the companies to reveal any possible cross subsidies.

### *Tariff determination*

The tariff requirements and calculation methodology are subject to NVE regulation. All network companies are responsible for determining tariffs within their income cap according to the regulation of the tariff structure. The regulation set a number of requirements for the structure of tariffs. This includes;

- Network companies shall offer non-discriminatory and objective tariffs and conditions
- Tariffs shall give price signals about effective utilisation and development of the network
- Any differentiation of the tariff must be based on network related criteria that are objective and verifiable.

All tariffs are based on costs referring to the consumer's connection point. An agreement with the network company at the point of connection provides access to the entire network system and the power market. All houses, apartments and vacation homes are to be metered and settled individually since 2010.

According to the regulation on tariff structure, tariffs consist of a consumption based energy component based on marginal network losses, and a fixed annual amount per customer. The fixed component covers customer-specific costs and network costs that are not covered by the consumption based tariff components.

### *Transmission network tariffs*

The transmission network tariff consists of a variable energy component and a fixed component, set by the Statnett.

The energy component reflects the load each customer puts on to the network system when drawing power from it or feeding power into it. System load is reflected through marginal loss rates calculated for each connection point in the transmission network. The marginal loss rate is symmetric around zero for feeding and drawing power at each individual connection point. In areas with a production surplus, feeding (production) has a positive loss rate and drawing (consumption) a negative loss rate, and vice versa. The marginal loss rates in the transmission network are administratively restricted to ±15 per cent. Separate marginal loss rates are calculated for daytime, night time and weekends, and recalculated weekly in order to reflect changes in system load. The marginal loss rates are published on Statnett's website and distributed to the customers on Fridays before the start of a new week. Area prices available on Nord Pool Spot are used to calculate the energy component.

For the fixed tariff components, there is a distinction between feeding into (production) and drawing (consumption) of power. Cost allocation and differentiation between customer groups must take place in accordance with network-based, objective and non-discriminatory criteria.

### *Distribution tariffs*

Consumers in the distribution network are charged a fixed component that covers customer-specific costs and a share of the other fixed costs in the network. The energy component for customers without maximum demand metering in the distribution network may in addition to network losses also cover a share of the other fixed costs in the network.

The network companies calculate separate tariffs for high-voltage and low-voltage connections.

*Table 2. Average tariffs for a household customer*

| | 2017[5] | | 2018[6] | |
|---|---|---|---|---|
| | incl. VAT and consumer tax | excl. VAT and consumer tax | incl. VAT and consumer tax | excl. VAT and consumer tax |
| Energy component | 0.43 NOK/kWh (0.046 €/kWh) | 0.19 NOK/kWh (0.02 €/kWh) | 0.44 NOK/kWh (0.046 €/kWh) | 0.20 NOK/kWh (0.021 €/kWh) |
| Fixed component | 2089 NOK/year (223.9 €/year) | 1730NOK/year (185.5 €/year) | 2328 NOK/year (242.4 €/year) | 1930 NOK/year (201 €/year) |

[5] NOK1= EUR 0.1072
[6] NOK1= EUR 0.1042

### *Tariffs for production*

Tariffs for production are independent of the recipient of the power. As for other tariffs, the tariffs for production consist of an energy component and a fixed component.

The energy component varies with the customer's current feeding (production), and is determined based on marginal network losses in the whole network system.

The fixed component for producers connected to the transmission level, set by Statnett, is normative for the fixed component for producers connected to the regional and distribution networks. There has been no change in the production tariff from 2017 to 2018. The fixed component for 2018 was 0.013 NOK/kWh, which included a G-charge of 0.011 NOK/kWh and 0.002 NOK/kWh for costs related to mark-up for system operation. Average annual production the last ten years is used to calculate the tariff for each production unit. Tariffs for 2018 were based on data for the period 2007-2016. For producers with installed capacity below 1 MW, settled volume was maximum 30 percent of installed load capacity multiplied by 5 000 hours.

### *Tariffs for prosumers*

All consumers have a right to produce their own electricity and to sell surplus electricity. The network companies have a general obligation to connect prosumers and receive their production. Prosumers feeding in less than 100 kW are not charged the fixed component for production.
Prosumers choose their own electricity supplier that supply their need for electricity and buy surplus electricity from the prosumer. In 2018 there were about 2000 prosumers in Norway.

### *Connection charges*

Until 2019 network companies were to decide a connection charge to cover the costs of connecting new customers to the network or to cover the costs of reinforcing the network for existing customers. The connection charges were "semi-deep" because it was not allowed to set connection charges for investments in the meshed network. The objective of the connection charge is to make the customer responsible for the costs related to a new connection or an upgrade of the customer's existing network connection. Costs not covered by the responsible customer, but by the network company will increase the network company's allowed income, and hence, be dispersed to all customers through increased tariffs.

NVE has handled and settled 16 complaints and disputes regarding tariffs and connection charges in 2018.

### *3.1.4 Cross-border issues*

#### *Allocation of capacity and congestion management*

According to Norwegian regulation, the TSO has been granted duties and responsibilities regarding congestion management. The TSO is responsible for establishing bidding zones in order to handle large and long lasting congestions in the transmission network and in the case of expected scarcity of energy within a specific geographical area.

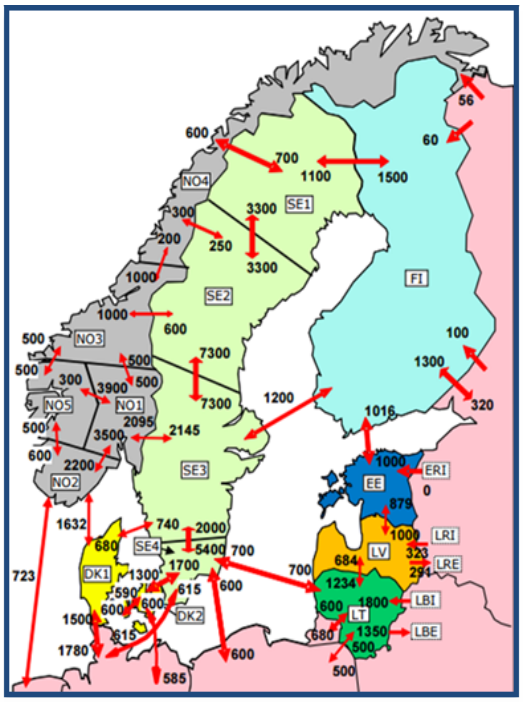


*Figure 4. Price areas in the Nordic countries in 2018. Source Nord Pool.*

In 2018, there were five bidding zones in Norway. The bidding zones are NO1 (Eastern Norway including Oslo), NO2 (Southern Norway), NO3 (Middle Norway including Trondheim and Molde), NO4 (Northern Norway), and NO5 (Western Norway including Bergen).

The TSOs are responsible for determining the maximum permitted limits for transmission capacity (trading limits) between the Nordic bidding zones according to the Available Transmission Capacity (ATC/NTC) method. The relevant TSO does also agree on transmission capacity with their counterpart on borders going out of the Nordic region.

Further, the TSOs are responsible for publishing trading limits for each border for the next day, two hours before gate closure of the Day Ahead market. Hence, these trading capacities are published 10:00 AM on the web site of Nord Pool (NP).

Cross-border electricity exchange is determined through the market coupling, which has implicit auctioning. This is the case for all borders within and adjacent to Norway and means that a large consumer who buys electricity on NP buys it from the market rather than a specific producer. Further all bilateral agreements that involve trading volume between bidding zones must be submitted to NP. Norway has cross-border interconnections with Sweden, Denmark, the Netherlands, Russia and Finland. However, towards Finland there is only a small interconnection that is not a Day-ahead corridor. The interconnection to Russia is a connection to the hydro power plant *Boris-Gleb* and only used for import.

Due to fluctuations in the power situation, technical failures and maintenance, the available transmission cross-border capacity in Norway varies over time.

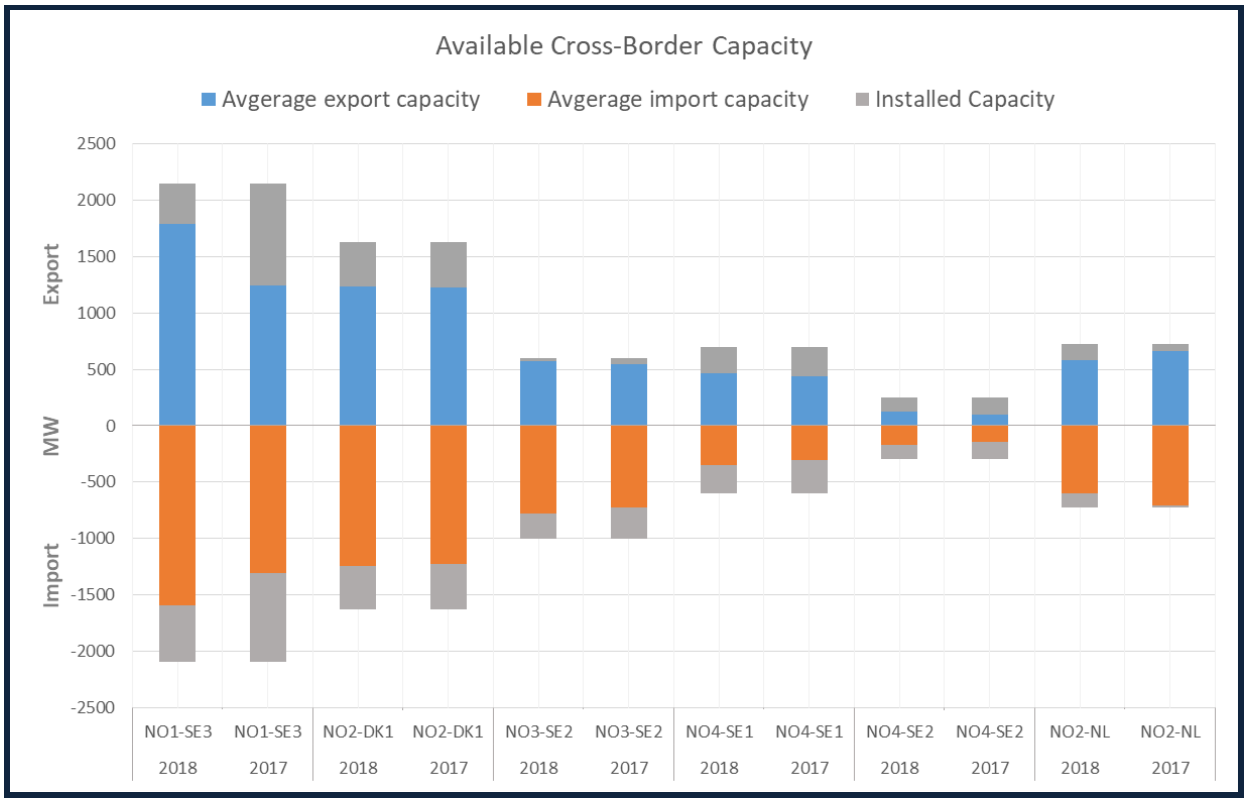


*Figure 5. Available capacity in 2018 and 2017 for export and import as a portion of installed capacity for each cross-border interconnector. Source: Nord Pool Spot and SKM Syspower.*

The capacity available to the market on Norway's largest interconnection between eastern Norway (NO1) and central Sweden (SE3) was significantly increased from 2017 to 2018. The improvement was due to the completion of the maintenance work on the subsea cables in the inner Oslofjord. As shown in Table 1, the export capacity increased by 25 percentage points from 2017 to 2018, whereas the import capacity increased by 14 percentage points.

The available capacity on the subsea cables between southern Norway (NO2) and Netherlands (NL) was around 80 percent in 2018, a reduction of 11-15 percentage points compared to 2017. The reductions was a result of maintenance activity in the grid, and a failure in a substation during the summer.

The last three years, there have been several periods with reduced transfer capacity between the northernmost areas in Norway and Sweden (NO3, NO4, SE1, SE2) as a result of voltage upgrade of the Norwegian grid. Even though there were periods with reduced capacity in 2018, the available capacity was significantly higher than previous years.

*Table 3. Annual prices in the Norwegian Elspot areas, €/MWh.*

| | 2018 | | 2017 | |
|---|---|---|---|---|
| Connection | Export | Import | Export | Import |
| NO1-SE3 | 84 % | 76 % | 58 % | 62 % |
| NO2-DK1 | 76 % | 77 % | 75 % | 75 % |
| NO3-SE2 | 95 % | 78 % | 91 % | 73 % |
| NO4-SE1 | 67 % | 58 % | 63 % | 50 % |
| NO4-SE2 | 49 % | 58 % | 40 % | 47 % |
| NO2-NL | 81 % | 83 % | 92 % | 98 % |

The available capacity on the subsea cables between the area of southern Norway (NO2) and western Denmark (DK1) was stable from 2017 to 2018. As the year before, the reductions was due to maintenance activity in the grid

### *Price differences*

The division of bidding zones reflects physical structural congestions (transmission constraints) in the grid. The relevant TSOs set cross-zonal transmission constraints daily for the next day, between all zones, in both directions. Capacity given to the Day Ahead market is physically firm, i.e. guaranteed and upheld by the TSO. A consequence of having multiple bidding zones is that different zones can have different wholesale prices, reflecting the underlying supply and demand given the grid constraints. A system without bidding zones, on the other hand, would have required the TSOs to use more resources on redispatch measures. In turn, this would have resulted in increased costs for system operation and, all else equal, increased grid tariff. Lack of bidding zones is also likely to have affected the TSOs possibility to operate the grid within acceptable security limits.

An efficient wholesale market with bidding zones reflecting grid topology will yield efficient price signals for both generators and consumers alike. The wholesale price is an important input both in the short run, e.g. planning of next days' generation or consumption, and in the long run e.g. for seasonal planning of maintenance as well as for investment purposes e.g. where to build power plants and where to place large consumption units.

The wholesale market price is also important for the TSO when considering grid reinforcement or investing in new infrastructure. The price differences indicate the marginal benefit of expanding capacity between these zones. Consistently large price differences indicate a large potential welfare gain if the cross-zonal capacity is increased.

## *3.1.5 Compliance*

### *DSOs*

NVE monitors network companies and ensures compliance with the neutrality criteria and other relevant regulations according to the Energy Act. NVE has the authority to use sanctions such as for example fines

in cases of non-compliance. DSOs with more than 100 000 customers participates in a compliance program in order to ensure neutrality vis-à-vis power suppliers and retail customers. NVE also encourages DSOs with less than 100 000 customers to maintain similar procedures.

According to the Electricity Directive 2003/54/EC, network and supply companies can be bundled if the number of customers (both residential and business customers) does not exceed 100 000. To avoid cross-subsidisation and discrimination of electricity suppliers, NVE regulates these bundled companies. The neutrality criteria requires a clear separation of monopoly network activities and activities related to electricity production and sales. Further, the DSOs have a responsibility to give the retail market customers sufficient relevant information about supplier competition in the market.

In 2018, NVE monitored the webpages of all DSOs to ensure that the information they publish about electricity suppliers is in compliance with the neutrality rules. NVE issued a fine of 500 000 NOK to one DSO was for violating the neutrality rules on their website.

NVE also monitored the DSOs preparations for data transfer to Elhub. NVE notified 98 DSOs of enforcement fines if they did not meet the quality criteria set for the data they transferred to Elhub.

### *Electricity suppliers*

In 2018 NVE audited six Norwegian suppliers reporting to strompris.no, the national website for price-comparison, for deviation from prices on the supplier's own web-pages. NVE also monitored the presentation of prices of green certificates on all electricity supplier's webpages. This was done to ensure transparency in pricing of products across all suppliers. Deviation was found at six of the 100 monitored suppliers.

## 3.2 Promoting Competition

### *3.2.1 Wholesale markets*

The Norwegian wholesale electricity market has been an integrated part of the Nordic market since the mid-1990s, and from 2014, a part of the European market coupling. The Nordic electricity exchange, Nord Pool (NP), organises and operates the Day-ahead and Intraday markets based on implicit auctions. Trading capacities not utilized in the Day-ahead market are made available in the intraday market.

The Day Ahead market at NP covers all bidding zones of Norway, Sweden, Denmark, Finland, Estonia, Latvia and Lithuania. Total Day-Ahead traded volume in these areas at NP in 2018 was 396 TWh. A high number of market participants and high market shares indicate good liquidity and a well-functioning market, which in turn contributes to the participants' confidence in the price formation at NP. The NP intraday market which includes the Nordic, Baltic, German, UK, the Netherlands, Belgium, France and Austria, had a total traded volume of 8.3 TWh in 2018[7].

NP is also responsible for the System price calculation. The System price is the underlying price reference for financial trading and hedging contracts in the Nordic market. The System price denotes the unconstrained market clearing price for all bidding zones in the Nordic countries. For most bidding zones, there is a high correlation between the area prices and the System price, enabling market participants to hedge directly towards the System price.

The main market for price hedging is the financial market organised by Nasdaq OMX (NOMX) and the Financial Supervisory Authority regulates the market place. The Exchange listed derivatives refers to both the Nordic System price and bidding zone prices. Different combinations of listed derivatives represent both zonal and cross-zonal hedging opportunities covering all Nordic bidding zones. NOMX also offers derivatives of German, Dutch and UK electricity, carbon emissions and electricity certificates. NOMXs Nordic power contracts (on order book) amounted to 412.1 TWh in 2018, compared to 502.5 TWh in 2017. The total clearing turnover for the Nordic financial power contracts was approximately 951.9 TWh in 2018 (1 058.6 TWh in 2017), which is a multiple of the underlying physical power traded[8].

#### *3.2.1.1 Price monitoring*

NVE monitors the price developments by analysing and publishing weekly and quarterly reports of the Norwegian and Nordic electricity market. These reports contain a description of wholesale electricity prices, both System price and price differences across price areas, the hydrological situation, power generation, consumption, and cross border exchange.

Figure 9 show how the weekly temperatures developed through 2017 and 2018 compared to normal. The spring months were colder than normal in 2018, which resulted in relatively high electricity consumption for heating purposes this period. The summer, on the other hand, were significantly warmer than normal.

[7] https://www.nordpoolgroup.com/message-center-container/newsroom/exchange-message-list/2019/q1/nord-pool-sees-new-record-volumes-in-2018/
[8] https://business.nasdaq.com/trade/commodities/products/monthly-market-reports.html

In total, the electricity consumption in Norway increased by 2.5 TWh compared to 2017, to an all-time high 135.4 TWh in 2018. Electrification of the society, especially in the petroleum sector, contributed to the higher consumption.

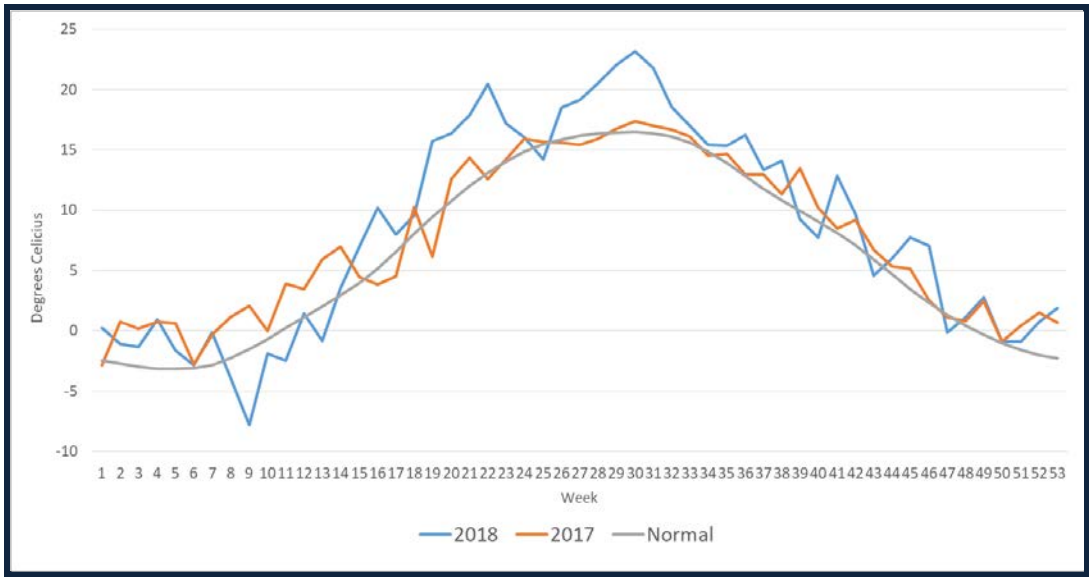


*Figure 6. Average weekly temperatures for Norway and Sweden in 2018 and 2017 compared to normal. Source: SKM Syspowe*

Figure 6 shows the development of the Norwegian hydro reservoir levels in 2018 and 2017. In the beginning of 2018, the hydro reservoir level was 69.6 percent, which is 1.7 percentage points above normal. The cold period in March and April, however, resulted in high power production and draining of the reservoirs. Further, the draught in June and July resulted in significantly lower inflow to the hydro reservoirs than normal. At the tightest, the hydrological balance in Norway were 27 TWh below normal. Heavy rainfall through the autumn improved the hydrological situation, and the reservoir levels ended up only 6.1 percentage points below normal.

The Norwegian power production ended at 145.7 TWh in 2018, a reduction of 2.5 TWh compared to 2017.

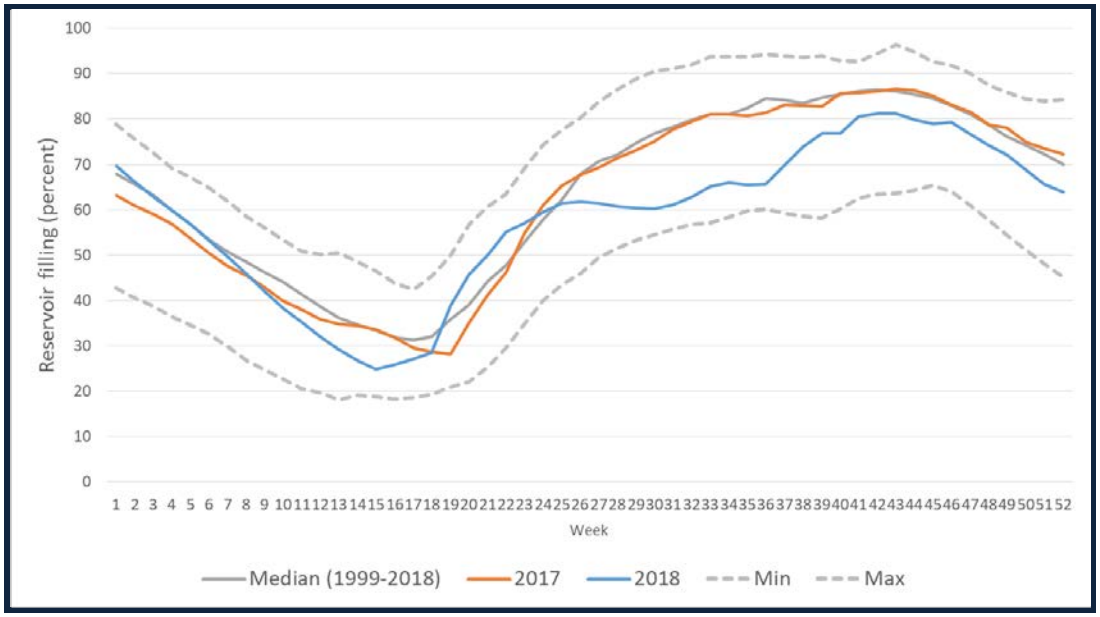


*Figure 7. Hydro reservoir levels in Norway. 100 percent represents 84 TWh storage capacity. Source: NVE*

Table 4 shows the annual average area prices in 2018 and 2017. The annual System price in 2018 was 43.5 EUR/MWh which represents a percentage change of 49 percent since 2017. The main reason behind the higher price level in 2018 was the significant increase in fuel prices (coal and gas) and prices on CO2-emmisions throughout 2018. In addition to this, the hot and dry summer contributed to a further price increase.

*Table 4. Annual prices in the Norwegian Elspot areas, €/MWh. Source: SKM Syspower.*

| EUR/MWh | 2018 | 2017 | % Change 2017-2018 |
|---|---|---|---|
| System price | 43,9 | 29,4 | 49 % |
| East Norway (NO1) | 43,6 | 29,0 | 50 % |
| South West Norway (NO2) | 43,2 | 28,8 | 50 % |
| Mid NorWay (NO3) | 44,0 | 29,5 | 49 % |
| North Norway (NO4) | 43,7 | 25,7 | 70 % |
| West Norway (NO5) | 43,0 | 28,8 | 49 % |

Figure 8 below show the development in the daily Nordic System price in 2018 and 2017. As illustrated in the figure, the prices increased throughout 2018 and the minimum monthly average occurred in January at 33 EUR/MWh. Unlike the seasonal norm, the maximum monthly average System price at 52 EUR/MWh occurred in July and August. The hot and dry summer contributed to the high prices.

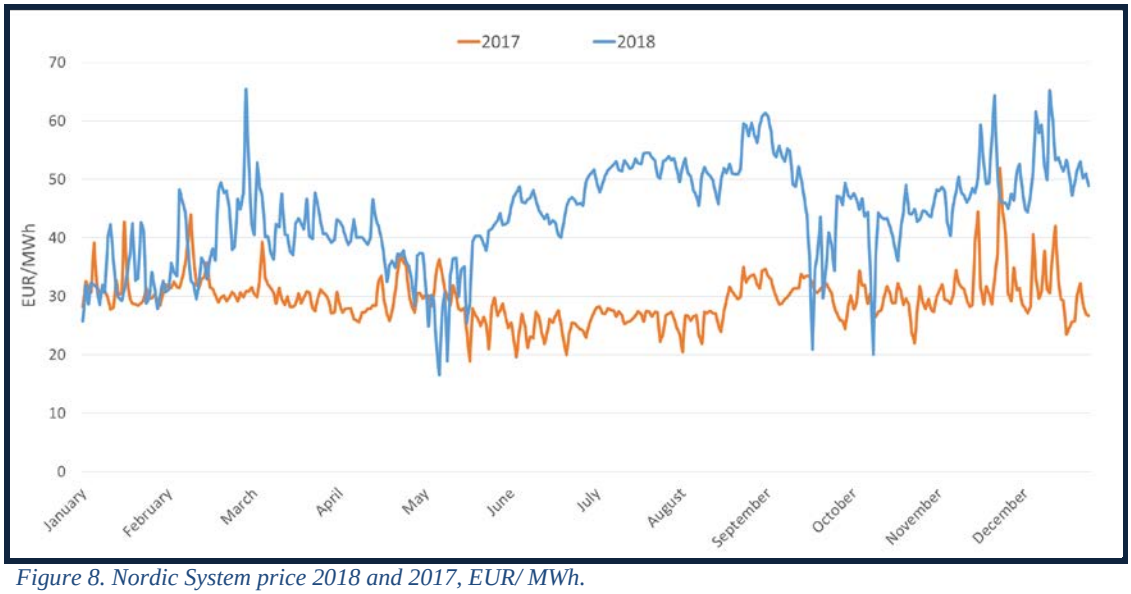


*Figure 8. Nordic System price 2018 and 2017, EUR/ MWh.*

Figure 9 show the price development in the five Norwegian bidding zones in 2018, and table 2 show the annual average area prices. As for the System price, the higher prices on fuels and CO2-emmisions contributed to higher power prices in Norway in 2018. Furthermore, the dry summer resulted in a tighter hydrological balance, and increased prices, in July and August.


*Figure 9. Price development in Norwegian bidding zones in 2017. Source: SKM Sypower.*

With regard to price monitoring in the wholesale market, NVE supports the Norwegian Competition Authority in monitoring Norwegian generators' bidding behaviour at NP. Price differences that can't be

explained as price-taker behaviour is investigated by looking at the different participants' bidding in the market place. As a part of this process, NVE has the mandate to collect information about the bidding from NP and production plans from the TSO.

#### *3.2.1.2 Monitoring the level of transparency, including compliance with transparency obligation*

##### *Rules governing market conduct on the organised market place*

Prohibitions of market manipulation and insider trading, requirements on disclosure of inside information and market surveillance was implemented in the Norwegian energy legislation and entered into force 1.3.2018.

The other countries in Nord Pool's (NP) market area have implemented REMIT[9] so that enforcement of market behaviour rules lies with the National Regulatory Authority. Since similar provisions now are implemented as part of the Norwegian energy legislation, Norway now have harmonised regulatory requirements with our neighbouring energy markets.

The rules are enforced by NVE. We have developed a tool for market surveillance and investigation to ensure that the market participants comply with the rules.

Further, also according to Norwegian energy legislation, the Norwegian TSO (Statnett) may suspend orders/bids in balancing markets when it is obvious that the price setting is not efficient.

According to the Norwegian energy legislation, a market place arranging transactions in wholesale energy products (e.g. NP – Intraday and Day Ahead markets, Statnett – balancing services) is required to establish and maintain effective arrangements and procedures to identify breaches of the prohibitions of insider trading and market manipulation. When the market place reasonably suspects a breach, it shall notify NVE without further delay.

The requirement is similar to REMIT art. 15, and in 2018 the Nordic NRAs carried out a common PPAT review to assess NPs compliance with the requirements on market surveillance.

Furthermore, regulations given in the Norwegian Competition Act regarding abuse of dominant position and prohibition of co-ordinated actions may apply. These regulations are under the competence of the Norwegian Competition Authority. NVE present assessments of the market situation for physical electricity to the Competition Authority.

##### *Transparency in the wholesale market*

According to the Norwegian energy legislation, market participants are required to publish inside information on a publicly available platform. The Transparency Regulation[10] (TR) is not yet implemented in Norway. However, market participants are encouraged to disclose information in accordance with the regulation, even if the information is not considered as inside information.

The Norwegian TSO (Statnett) complies with TR.

9 EU No 1227/2011 on Wholesale Energy Market Integrity and Transparency ('REMIT')

10 COMMISSION REGULATION (EU) No 543/2013 on submission and publication of data in electricity markets

In addition, NP publishes a range of market data per market time unit (per hour):

**Elspot (Day Ahead market)**

- System price
- Prices per bidding zone
- Volumes – buy and sell volumes per area
- Available transmission capacities between bidding zones within the exchange area, and on interconnectors to continental Europe
- Flow between bidding zones and on interconnectors to continental Europe

**Elbas (Intraday market)**

- Prices
- Flows
- Available transmission capacities
- Total Scheduled flow

**Regulating power (Balancing market)**

- Volumes for up or down regulation per bidding zone
- Prices per bidding zone
- Special regulation volume (congestion management)
- Automatically activated reserves

**Power system data**

- Production
- Consumption
- Exchange
- Hydro reservoir

### *3.2.2 Retail markets*

The Norwegian Energy Act states that any entity engaged in physical trading, generation and/or distribution of electric energy in Norway is required to hold a trading license. NVE has through the Energy Act been given the authority to provide such licenses, and is delegated the power to issue supplementing regulation through terms and conditions of the licenses whenever necessary. The licensing regime is light and transparent and does not represent an undue barrier to competition or entry in the market. The trading license is the basis for NVEs supervision and regulation of market actors through the Energy Act regulation. A trading license is required to become a balance responsible party and to trade at a power exchange.

At the end of 2018, 478 companies were holding a trading license. The current licensing period lasts from 1 January 2015 to 31 December 2020. Of the companies that had a trading license in 2018, 139 were electricity suppliers supplying residential customers, while 137 were DSOs.

Since the liberalization of the electricity market in 1991, the number of residential customers with a supplier different from the incumbent supplier has increased. However, most incumbent suppliers still have a dominant position within their local network area. On average, the dominant supplier has a market share of about 70 percent of residential customers within its own network area. This share has been stable for several years.

Following the launch of Elhub and experience from the voluntary combined billing regime implemented in 2016, NVE also aims to implement a mandatory combined billing regime, effectively creating a customer centric supplier model in the Norwegian market. In 2018, NVE commissioned a report to investigate the impact of several regulatory changes demanded by the new model on innovation in the retail market.

NVE is considering new regulations requiring separate branding of supply and distribution businesses. Separate branding is assumed to increase the competitive pressure in the end-user market by making it easier for end-user to identify electricity suppliers and DSOs. However, rebranding also comes with a cost that must be weighed against the benefits of a more efficient market. NVE commissioned a report to investigate these costs. The costs are higher if the market actors (suppliers) rebrand than if the monopolies (DSOs) do it. However, the benefits in terms of more efficient competition in the end-user market may be higher if suppliers rebrand. Additionally, the potential cost advantage from free-riding on the branding of the local distribution company disappears.

#### *3.2.2.1 Monitoring the level of prices, the level of transparency, the level and effectiveness of market opening and competition*

The Norwegian Consumer Council (Forbrukerrådet) operates the Norwegian price comparison tool, which contains information about all offers available in the market. It ranks contracts according to the estimated total cost of energy including network tariffs and taxes. NVE advises customers in the retail market to use the price comparison website whenever they choose a supplier, and all DSOs are obliged to inform their customers about the price comparison tool.

NVE regulates the collection of information for Forbrukerrådet's price comparison tool under the Energy Act regulations. When developing the regulations for collecting information for Forbrukerrådet's price comparison tool, a key principle for NVE was to ensure that all contracts in the market are presented in the price comparison tool.

There are no regulated prices in Norway. Customers who have not yet chosen a supplier shall, the first six weeks, be served by their local DSO (supplier of last resort) at a price that is maximum øre/kWh 5 excl. VAT (or øre/kWh 6.25 incl. VAT) above spot price. After 6 weeks, the supplier of last resort is obliged to set the price in a way that gives an incentive to the customers to find a supplier in the energy market.

NVE publishes an overview of the retail market prices on a weekly basis, comparing the average price of the three standard types of contracts the past week, and by presenting an estimation of the average accumulated electricity cost for the customers so far this year. The data are collected from the Norwegian Consumer Council and Nord Pool. The data are published in a weekly report on NVE's website, and are regularly referred to by the public media. NVE also publishes similar retail market data in a quarterly report on the energy market.

As of January 2012, a mandatory support scheme to stimulate increased investments in the production of electricity from renewable energy sources was in place in Norway. The electricity producers included in the support scheme receive one electricity certificate for each megawatt hour of renewable electricity generated. At the same time, electricity suppliers and certain electricity users are obliged to purchase electricity certificates for a specified proportion of the volume of electricity they deliver or use. The electricity certificates are traded in a common Norwegian-Swedish market, and the price of electricity certificates is determined by supply and demand. The consumers of electricity finance the scheme, as the supplier's costs of purchasing the certificates are added to the electricity price.

Electricity suppliers are required to refer to NVEs website to inform their customers about the costs imposed by the electricity certificate obligation.

In 2018, electricity consumers paid for electricity certificates amounting to 15.3 percent of their total electricity consumption. This share will steadily increase towards 2020 where it reaches its peak at 18.9 percent of the total annual electricity consumption. The actual additional cost paid by the consumers in 2018 due to the introduction of the system was determined by the price of the electricity certificates, which varied according to supply and demand. On average, a customer paid an additional 2.2 øre/kWh (including VAT) due to electricity certificates in 2018. This means that a household using 20 000 kWh of electricity in 2018, paid a total cost of approximately 440 NOK (including VAT).

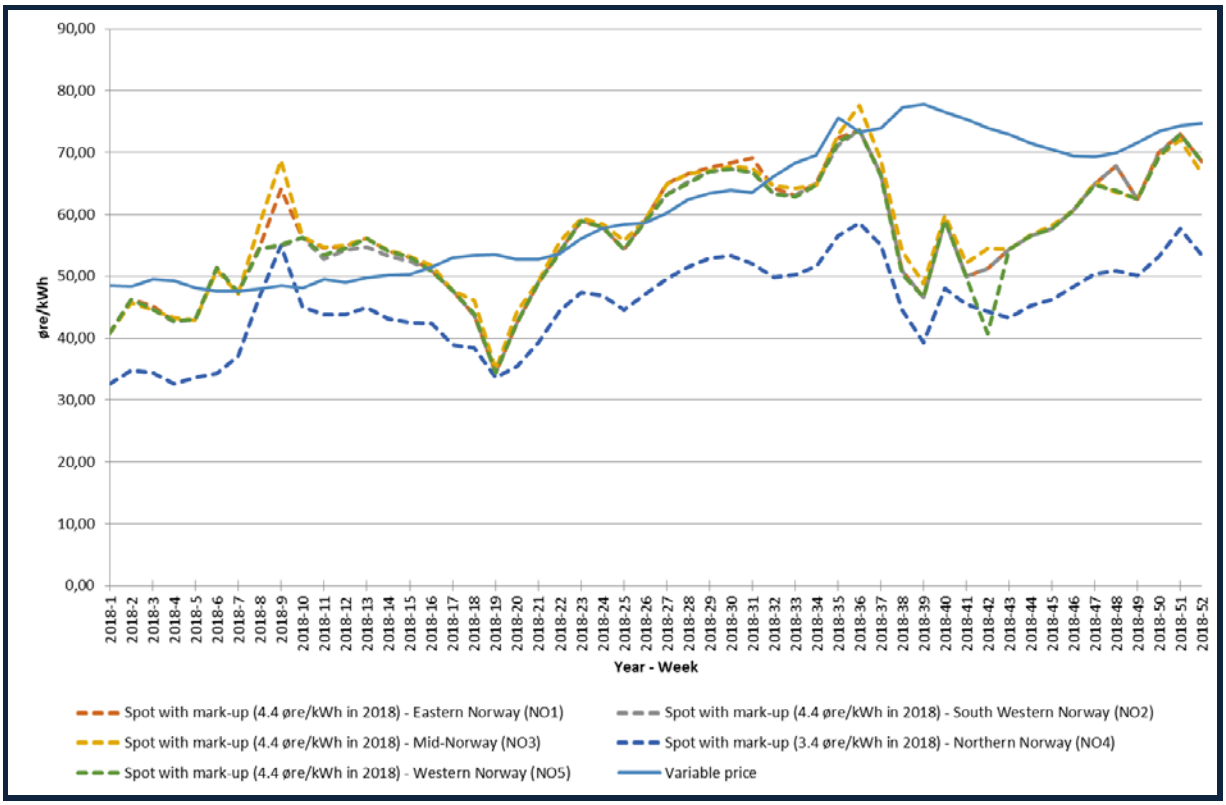


*Figure 10. Average price development for the spot contract in the five Norwegian bidding zones.*

The figure above shows the average price development throughout 2018 for the spot contracts in the five Norwegian bidding zones of the Nord Pool Spot power exchange, together with the variable contract. These two contract types are common, but customers can freely choose from a wide range of other contract types, for instance variable contracts with a price cap or price guarantee, contracts bundled with other products (gift certificates, airline mileage bonuses, etc.) or contracts including guarantees of origin.

The listed prices in the figure include VAT and a mark-up of øre/kWh 4.4, except for the el-spot area Northern Norway, where the price excludes VAT and includes a mark-up of øre/kWh 3.5. The mark-ups are calculated by NVE to represent an average mark-up for spot-price contracts offered in the market. The mark-up used for contracts in Northern Norway is lower as this area of Norway is exempted from VAT on electricity.

In the retail market, general competition legislation (The Norwegian Competition Act and the competition rules applicable through the EEA Agreement) apply, and the Norwegian Competition Authority has full responsibility. The physical power exchange, Nord Pool AS, operates under a market place license issued by NVE pursuant to the Norwegian Energy Act. The marketing of electricity contracts are regulated by the Norwegian Consumer Ombudsman.

#### *3.2.2.2 Recommendations on supply prices, investigations and measures to promote effective competition*

The Norwegian retail market for electricity will face substantial changes in 2019. As part of the goal to further increase competition and efficiency in the market, smart hourly metering (AMI) and a national point of data management (Elhub) will be implemented. The targeted implementation for Elhub is Q1 2019 and the smart meter roll-out is set to be completed by 1 January 2019. The implementation of Elhub will standardize the exchange of hourly metering data, simplifying the communication of metering data in the chain between DSOs, suppliers and consumers. NVE considers active, well-informed consumers to be key for the Norwegian retail market. Smart meters provide real-time consumption data, and price signals through dynamic price contracts give incentive for energy efficiency and peak load management, by enabling consumers to adjust consumption to price variations.

NVE is also assessing the implementation of a customer centric supplier model for the Norwegian retail market, in accordance with NordREG recommendations. The implementation of a customer centric model should simplify the retail market for consumers and is considered a step towards the further harmonization of Nordic retail markets for electricity. The model under consideration by NVE includes a mandatory combined billing regime, which will simplify the market structure and make it easier for consumers to engage in the electricity market.

In general, NVE aims at identifying and reducing the barriers that keep consumers from being actively involved in the retail market. By providing information about the national price comparison web site and presenting a compilation of average retail market prices on a weekly basis, NVE encourages consumers to ensure that their contracts are among the most competitive ones.

One of the investigations NVE carries out in order to monitor the efficiency of the retail market, is a quarterly survey of the number of supplier switches and the market shares of dominant suppliers in the retail market. These data are collected from a group of DSOs that combined represents approximately 90 percent of the retail market (measured by the number of metering points), and a quarterly report is published on NVEs web site. In 2018 there were 642 700 supplier switches resulting in a switching rate of 21 percent.[11]

In 2017 NVE started a project to further develop our retail market monitoring. In 2018, Oslo Economics assisted NVE in designing indicators for improved monitoring of the retail market and implementing them into a spreadsheet-tool for analysis. Oslo Economics recommend primarily to apply the retailers' margin in absolute value and profitability as indicators, and to monitor the competition by following the development in the indicators over time. NVE will consider the recommendations in the report and conclude on which indicators to implement and how to implement them.

In order to learn more about why consumers are active or inactive in the market, NVE, in cooperation with the other NordREG countries, commissioned a report investigating the Nordic household consumer's knowledge of the electricity market. A web survey was conducted in September 2018 among a representative sample of 6,000 Nordic electricity customers; 1,500 respondents from Denmark, Finland, Norway and Sweden. All respondents participated in the decision-making regarding the electricity contract of their household. The survey shows that 26 per cent of electricity customers have been active and signed an electricity contract in the past year. Furthermore, 16 per cent have compared contracts in

[11] Incl. both household and non-household customers

the past year without switching and are so-called “aware customers”. 58 percent have neither switched nor compared contracts in the past year or more, and are, hence, considered “inactive” customers.

The share of active customers is highest in Finland. Norway and Finland have the highest shares of aware customers. Amongst those, that have neither signed nor compared electricity contracts the last year (so-called inactive customers), the most common reasons given for not switching/comparing are satisfaction with current contract and small financial gains. The Nordic energy regulators (NordREG) will now analyse the results of the survey and use it as one of many inputs when the retail markets in the Nordic region are developed further.

### *Cyber Security in Advanced Metering Systems*

In 2018 NVE sent two proposals for more detailed security requirements for advanced metering systems (AMS) in the Security and Emergency Preparedness Regulation and the Metering and Settlement Regulation. The proposed amendments clarify the range of the DSOs responsibility when it comes to security in AMS solutions.

In 2018 NVE organised cyber security workshop for DSOs, and represented CEER in a working group set up by the European Commission for making inputs to a network code on cyber security.

## 3.3 Security of supply

### *3.3.1 Monitoring balance of supply and demand*

The large share of hydropower production makes the Norwegian power system vulnerable to variations in inflow and precipitation. Norway has detailed regulations and means for handling critical energy situations and energy rationing. NVE is the national energy rationing authority, but it has not been necessary to activate energy rationing in Norway.

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

#### *Market information and monitoring*

Both the Norwegian TSO and NVE analyses the possible development in the energy and power balance. When it comes to monitoring the market development NVE publish regular reports describing the development.

#### *In strained operational situations or during operational disturbances*

Through the Norwegian regulation on system operation, the TSO is granted duties and responsibilities to require mandatory participation in the balancing market, require regulation of power production (even when not part of the balancing market), and to require load shedding. Load shedding may be ordered manually, however, load shedding also occurs by the use of automatic system protection schemes. System protection schemes in the transmission network can only be installed and operated based on decisions made by the TSO.

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

Statnett is responsible for the operation of the power system, also in the case of extreme situations. NVE is head of the preparedness and emergency planning of the power supply, and is also the rationing authority. Regulations relating to power system operation regarding handling of extreme situations came into force 1 January 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 is obliged to inform NVE of the findings. NVE approves of different measures with conditions before they enter into force. Permanent- and operational costs for the different measures are handled within Statnett's revenue cap.

According to Norwegian regulation, Statnett can develop different remedial actions within the terms of the regulation on system operation based on the following set of terms:

- To reduce risk of electricity rationing
- Must be effective for handling of extreme situation, and at the same time not influence the electricity market or investment decisions within the production or the network
- Maintain TSO neutrality and independent position in the power market
- Contribute to a socio-economic handling of extreme situations and to maintain the efficiency of the physical power market
- Take into consideration the already existing flexibility in production, transmission and consumption

Since the commissioning of the Ørskog-Sogndal line in 2016, Statnett have not purchased any energy options. The line increased the transmission capacity from NO5 to NO3 by 500 MW.

### *Electricity peak demand*

Domestic gross energy consumption was all-time high at 135.4 TWh in 2018 (134.1 TWh in 2017). The increase can be explained by higher consumption in all sectors, especially in the petroleum industry as well as in the power intensive industries.

The Norwegian peak demand normally occurs in the winter season. The peak electricity demand was 24 108 MWh/h in 2018, which is only 0.3 GW below the peak electricity demand record from 2016.

*Table 5. Peak demand for the last 10 seasons. Source: Statnett.*

| Year | Weekday | Date | Hour (CEST) | Demand [MWh/h] |
|---|---|---|---|---|
| 2008 | Thursday | 14.02.2008 | 9 | 21 589 |
| 2009 | Monday | 05.01.2009 | 8 | 21 984 |
| 2010 | Wednesday | 06.01.2010 | 8 | 23 994 |
| 2011 | Monday | 21.02.2011 | 8 | 22 129 |
| 2012 | Wednesday | 05.12.2012 | 8 | 23 443 |
| 2013 | Wednesday | 23.01.2013 | 8 | 24 180 |
| 2014 | Thursday | 22.01.2014 | 9 | 23 489 |
| 2015 | Wednesday | 04.02.2015 | 8 | 22 530 |
| 2016 | Thursday | 21.01.2016 | 8 | 24485 |
| 2017 | Thursday | 09.02.2017 | 8 | 23246 |
| 2018 | Thursday | 01.03.2018 | 8 | 24108 |

### *Currently available generation capacity*

The total installed generation capacity in Norway was 34 720 MW as of 31.12.2018. Available generation capacity during a cold winter is estimated to approximately 26 500 MW by Statnett. This estimate is from 2017. The wind power generation capacity increased by 506 MW from 2017 to 2018, whereas the hydro power generation capacity increased by 428 MW. The amount of wind power under construction was 2036 MW by the end of 2018.

*Table 6. Generation fuel mix as of 31.12.2018. Source: NVE and Multiconsult.*

| | Installed capacity (MW) | Mean annual generation (TWh/y) | Net capacity added (MW) | Under construction (MW) | License/permit given, (MW), not yet built |
|---|---|---|---|---|---|
| Wind power | 1695 | 5,3 | 506 | 2036 | 3005 |
| Hydro power | 32257 | 134,9 | 428 | 935 | 1916 |
| Thermal power | 700 | 3,5 | 0 | 0 | 0 |
| Solar Power | 68 | 0,06 | 23 | N/A | N/A |
| Sum | 34720 | 143,8 | 957 | 2971 | 4921 |

### *Monitoring balance of supply and demand in the national market, the level of expected future demand and envisaged additional capacity being planned or under construction*

NVE has delegated the responsibility for power system planning in Norway to 17 owners of the distribution network (33 – 132 kV) that are responsible planning the distribution network in 17 specific areas. The Norwegian TSO is responsible for operation and planning of the national transmission network (132 kV-420 kV).

Every second year, the responsible utilities in the distribution planning areas and Statnett make an updated regional network development plan. The timeframe for the network development plan is minimum 20 years. The plan must describe the present network, future transmission and distribution conditions together with anticipated measures and investments. The plan includes presentations of statistics with characteristics of generation, transmission and consumption of electricity, and includes conditions that are of importance and relevance for the development of the power system in the designated area. Simplified socio-economic analysis must be presented for all network investments that require environmental impact assessment (EIA). The main objective of power system studies is to contribute to a socioeconomic rational development of the regional distribution networks and the transmission network.

The plan is submitted to NVE for consent. NVE monitors the level of expected future demand and envisaged additional capacity. The network development plan is also important in NVE's evaluation of the applications for a license to build energy plants or network installations.

### *3.3.2 Monitoring investment in generation capacities in relation to SoS*

#### *Authorization criteria for new generation investments and long term planning*

For all new projects (wind-, gas – and hydro power plants, power lines, transformers) a license to build and operate must be granted. NVE considers the economy, public and private interests and environmental issues for every project.

NVE delegates the responsibility for power system studies to an appointed licensee in a given network area. The main task is to contribute to a socio- economic rational development of the distribution and transmission network. In this respect, the energy carriers in question are for stationary energy usage. The power system studies will continue to be an important base document in NVE's handling of the applications for a license to build or expand an energy plant or installation. This is especially of importance regarding applications for the larger overhead line projects.

#### *Progress in major infrastructure projects*

Nordlink and North Sea Link
In October 2014, Statnett, was granted licenses to build two HVDC cables to Germany and UK respectively, each with a capacity of 1400 MW. Statnett is in cooperation with the German TSO (Tennet) developing the NordLink cable to Germany, which is expected to be commissioned in March 2021. In addition, Statnett and the National Network plan to complete North Sea Link in 2021. This interconnector between Norway and UK started construction in 2018.

NorthConnect
A company owned by Vattenfall, ECO, Lyse and Agder Energi is planning a new interconnector between Norway and Scotland with a capacity of 1400 MW. Applications for construction and foreign trade licenses have been sent to the Ministry of Oil and Petroleum (MOPE). MOPE has assigned NVE with delivering an assessment of the applications. NVE will deliver this in 2019. If licences are granted, NorthConnect could be commissioned by 2024.

Greater Oslo Grid Plan
A series of licenses have been given to Statnett to replace older cables and lines and ensuring security of supply to the Oslo region. Construction on new lines started in 2017.

Western Corridor
Statnett is planning voltage upgrades in the Southern and Western transmission grid from 300 to 420 kV. This will enable renewable integration, increase security of supply and result in numerous of applications for licenses in grid segments and transformers, with expected total costs from 750 to 915 million euros.

Fosen
New 420 kV-lines in mid Norway (Fosen) in order to facilitate new wind production. Expected in operation by 2019.

Balsfjord-Skaidi

The 300 km 420 kV OH line for Balsfjord to Skaidi was granted license in 2015. This line will improve the security of supply in Finmark. Expected load growth and RES integration will benefit from this investment. It is expected that the work will be completed to Alta (Skillemoen) in 2021 and Skaidi in 2023.

*Expected future demand and envisaged capacity for the next 5 years and 5-15 years*

The total investment in grid development over the next decade is estimated to 14.8 billion euros. Compared to last year, the Norwegian TSO have postponed some of the investments in the transmission grid from 2021 to 2023 and 2024. Except from this, the expectations are relatively stable from 2017 to 2018.

The historically high network investment level will ensure a reliable power supply, facilitate renewable projects and industrial and commercial development throughout Norway. Norway and Sweden have a mutual agreement of installing 28.4 TWh of new renewable energy within 2021 with financial aid through a green certificate market. This will together with the installation of smart metering in all Norwegian households by 2019 and new HVDC cables to Germany and UK cause a high level of investment in the distribution and transmission network in Norway in the coming years, as illustrated in Figure 12.

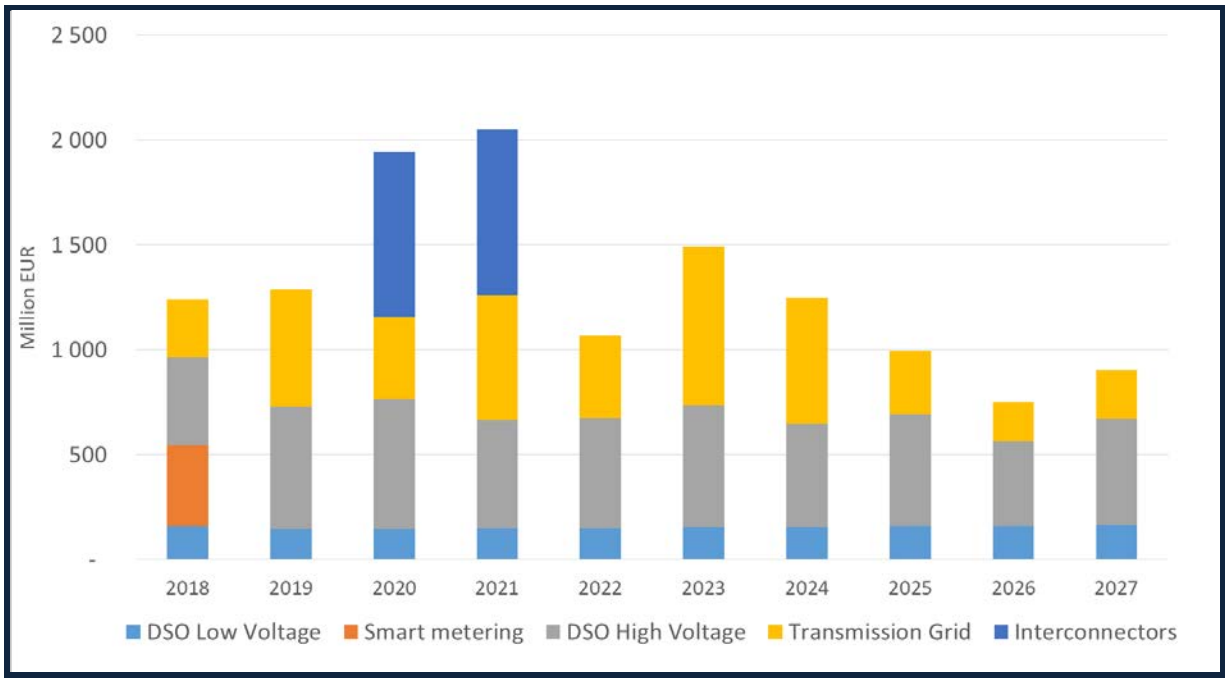


*Figure 11. Expected investment levels in the Norwegian network. 1 EUR = 9.6 NOK in 2018.*

### *3.3.3 Measures to cover peak demand or shortfalls of suppliers*

*The quality and level of maintenance of the networks*

The CENS arrangement referred to in chapter 2.1.2 is the main regulatory tool to ensure a proper level of maintenance of the networks. In addition, NVE carries out audits on companies regarding operation and maintenance. The quality of the maintenance is monitored on these audits.

*Measures to cover peak demand*

Peak demand is handled by utilizing the balancing markets and the flexibility in the system. To ensure sufficient balancing resources to cover peak demand Statnett has developed a marked for acquiring balancing resource options (RKOM).

## 4. THE GAS MARKET

Although Norway is a large gas producer, only 1015 GWh (2018) is distributed in gas distribution networks. The Norwegian gas market is small and is expected to remain small.

There are two regional areas with gas distribution networks in Rogaland in the southwestern part of Norway. Both are connected to the upstream pipelines from Kårstø gas processing plant, and they use injected tail gas from LNG production facilities. There is no transmission network in Norway as defined in EUs third Natural Gas Directive.

We (NVE) are the national regulatory authority for gas distribution. The current regulation is based on a light-handed approach because of the limited scope and the exception from third-party access (TPA) due to emerging markets conditions. In the current regulation, it is necessary to obtain a license to introduce gas infrastructure such as gas transmission or LNG facilities in a new region, and to have separate accounts for distribution, LNG and storage.

We have been advising the Ministry in developing a new regulation which includes third-party access and regulated tariffs adapted to local market conditions. The Ministry sent their proposal on a public consultation in December 2018. The consultation process ended in March 2019.

# 5. CONSUMER PROTECTION AND DISPUTE SETTLEMENT IN THE ELECTRICITY MARKET

## 5.1 Consumer protection

*Network companies are obliged to connect customers within their license area.*

The electricity market is open for all customers, and the prices are set in the market. By contractual law, the suppliers are required to provide the customers with the terms and conditions for the chosen electricity contract. All suppliers are obliged to show the price for the contracts they offer in a certain way according to regulations managed by the Norwegian Consumer Ombudsman. Further, the suppliers are obliged to inform the customer about any price changes deviating from the agreed price before the price change takes place. Change of supplier has been free of charge for all customers since 1997.

To strengthen the consumer's position in the retail market, the DSOs are by regulation obliged to provide the customers with information regarding both network issues and electricity supply issues. The DSO must provide the customers with information regarding the terms and conditions of the electricity supplied by supplier of last resort, and give the customers easy access to their consumption data by giving access to a web service and putting information in the invoice, etc. Further, they are obliged to provide the customers with neutral information on how to choose a supplier, which suppliers are available in the given network area, information about the national price comparison web site, and contact details to the Norwegian Electricity Appeal Board.

To make sure network companies do not abuse their power as monopolists, they are regulated with a revenue cap in addition to regulations regarding tariff structure. In previous years the Norwegian Parliament granted funds to reduce network tariffs for customers in areas with the highest distribution costs. The sum was gradually reduced and 2018 was the first year when no funds were allocated to this purpose.

The DSO is the supplier of last resort mainly to ensure that the customer is supplied with electricity, even if they have not signed a contract with an ordinary supplier. The price charged by the supplier of last resort is designed to give the customer an incentive to choose an ordinary supplier. However, the DSO, as the suppler of last resort, has a high threshold for disconnecting a customer unable to handle the electricity bills, and has to make sure customers are protected from disconnection when life or health is at risk.

Though there are no particular measures in the Norwegian Energy legislation aimed at protecting vulnerable customers, they are protected through Norway's well-developed general welfare system. When the social services have guaranteed for a customer's payment, disconnection is prohibited.

## 5.2 Dispute settlement

NVE has been authorized to monitor compliance with, and take decisions according to the Energy Act and regulations laid down in accordance with the Act. NVE handles complaints and disputes regarding network regulation and tariffs, customer compensations for outages over 12 hours, quality of supply, metering and

settlement, billing, supplier switching, neutrality and non-discrimination, system operation and the obligations and powers of the TSO.

The Norwegian Electricity Appeal Board assists customers regarding complaints related to contracts for network connection, network use and/or electricity supply that have not been settled between the customer and the electricity supplier and/or the DSO. All companies that have received a trading license from NVE under the Energy Act are included in the scheme. The Board consists of two representatives appointed by the Norwegian Consumer Council, and two representatives appointed by electricity suppliers. The Board is managed by a legal professional. In 2018, the Norwegian Electricity Appeal Board received 798 written complaints and reached a decision in 73 cases.

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