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FOREWORD

The Norwegian electricity market formally 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 with one power exchange in 2013. 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 directives 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 Council of European Energy Regulators (CEER). In 2017, 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 the organization for the Nordic energy regulators, NordREG.

The Norwegian National Report 2018 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 August 2018

Ove Flataker
Deputy Director General
Department of Energy Market Regulation

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1 MAIN DEVELOPMENTS IN THE ELECTRICITY MARKET

1.1 Introduction – About 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 organized 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 generation industry. NVE is separate legal entity with its own budget set by the Parliament and has the authority to act within the scope of its competences. The Department of 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 Council of European Energy Regulators (CEER) and the organization of the Nordic Energy Regulators (NordREG).

[1] EEA Joint Committee Decision 5 May 2017.

1.2 Main developments in 2017

1.2.1 Electricity production and all-time high consumption in 2017

Hydropower production represents 96 percent of the total electricity production in Norway, and the Nordic electricity system is highly influenced by the hydrological situation. The electricity production in Norway was 149.3 TWh in 2017, which is close to the production record of 149.5 TWh in 2016. This is mainly caused by high reservoir levels in the beginning of the year. In 2017, it was an all-time high electricity consumption of 134.1 TWh, although the temperatures where higher than normal. This can partly be explained by increased consumption in the petroleum industry and in the power intensive industry.

In May 2017, Statnett alerted of a tightening of the power situation in the northernmost bidding area, NO4. A cold weather front temporarily increased consumption in the area and at the same time caused delayed snow melting and filling of the hydropower reservoirs. This caused a risk of energy shortage in the northernmost region of Norway. The situation was resolved by delaying work on the transmission grid until the weather situation improved.

1.2.2 Implementing a new, national point of data management, smart meters and the Nordic Balance Settlement in the retail market

The Norwegian electricity retail market will be subject to substantial changes in the years towards 2019. As part of the goal to further increase competition and efficiency in the market, NVE has developed regulations to facilitate the implementation of a national point of data management (Elhub) and smart metering infrastructure (AMI). Elhub will be operated by a subsidiary company owned by Statnett and planned implementation date is Q1 2019. The smart meter rollout has started, and by the end of 2017, 50 percent of the smart meters had been installed. The smart meter rollout is set to be completed by January 2019. These changes will make the exchange of information in the market more efficient and facilitate the use of demand response tools and services.

Nordic Balance Settlement (NBS) is a common imbalance settlement for Finland, Norway and Sweden which was implemented 1 May 2017. The joint NBS is a forerunner in a European context where the Finnish, Swedish and Norwegian imbalance settlement is harmonized and operated by one common company, eSett Oy. NBS is therefore Europe's first cross national imbalance settlement, and an important step towards a more harmonised end-user market in the Nordic countries.

1.2.3 Interconnectors from Norway to Germany and Great Britain under construction

There are two interconnectors under construction from Norway, to Great Britain (North Sea Link) and to Germany (NordLink). Both interconnectors will have a capacity of 1400 MW, and are expected to be operational in 2021, and 2020 respectively. In 2017, NVE monitored the development and compliance with the approved license on both interconnectors, with particular focus on NordLink. This was due to a challenging situation with respect to grid development in Germany, which might affect socio-economic benefits of the interconnector. NVE has not discovered situations of non-compliance with the license, but will continue to monitor both of the projects in the future.

1.3 Changes in the existing regulation and public consultations in 2017

End user distribution tariffs

NVE has proposed a change from volumetric (kWh) to capacity-based kWh/h tariffs to improve the cost-reflectiveness of the lower distribution system tariff. New regulation on tariff-design is planned from 1 January 2021. The design of the network tariff is important for how the network is utilised and developed. It also affects cost allocation amongst network users. It is our belief that shifting to a more cost-reflective tariff design can improve both network utilisation and development. This is particularly important given the challenges and possibilities introduced by new technology.

National point of data management - Elhub

NVE has adopted several changes in the Settlement Regulation in connection with the implementation of the national point of data management (Elhub) and smart metering. NVE has made changes in the regulation on information exchange related to supplier switching, customer change, metering, DSO neutrality, settlement of metering corrections as well as requirements for responsibilities regarding the operation of Elhub. The regulatory changes will enter into force when the Elhub is implemented, currently estimated to go live in Q1 2019.

Economic regulation of transmission and distribution networks

In 2016, NVE decided that the Norwegian TSO (Statnett) should present a public report that describes, and explain the reasons for, the development of the company's costs the last five years. They should also show the expected development of cost the next five years. Further, they should publish a report showing the total costs of larger investment projects completed the last two years and explain any cost variance compared to the budget. These reports will be published biannually, and the first reports from Statnett were published in 2017.

In 2015, NVE updated the cost functions for the quality scheme "Costs of energy not supplied" (in Norwegian "KILE") for all customer categories except households. In 2016, a project was started with the aim of establishing updated cost functions also for this category. External consultants have done a survey of the customers' willingness to pay for reduced outages (up to 72 hours). The consultants delivered their report in 2017, and overall results shows a higher willingness to pay for reduced outages than previously assumed. During 2018, NVE will decide on how to implement these new results into the cost functions for "Costs of energy not supplied".

In 2012, NVE assessed the parameters included in the WACC model. During the years since this review, there has been a development in the financial market that may imply that some parameters in the model should be adjusted. External consultants were hired in 2016 to assess whether there is a need to adjust the parameters in the WACC model. They delivered their report in 2017, suggesting several changes. This report was subject to a public consultation in 2017. During 2018, NVE will decide on how and if the parameters in the WACC model should be adjusted.

Nordic Balance Settlement

Nordic Balance Settlement (NBS) is a common imbalance settlement for Finland, Norway and Sweden which was implemented 1 May 2017. The joint NBS is a forerunner in a European context where the Finnish, Swedish and Norwegian imbalance settlement is harmonized and operated by one common company, eSett Oy. NBS is therefore Europe's first cross national imbalance settlement, and an important step towards a more harmonised end-user market in the Nordic countries.

Network Codes

In 2017, 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).

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, and 2020 respectively. In 2017, NVE monitored the development and compliance with the approved license on both interconnectors, with particular focus on NordLink. This was due to a challenging situation with respect to grid development in Germany that might affect the socio-economic benefits of the interconnector. NVE has not discovered situations of non-compliance with the license, but will continue to monitor both of the projects in the future.

2 THE ELECTRICITY MARKET

2.1 Network regulation

2.1.1 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 2017, the seven DSOs in this category represented approximately 57% 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 2017, there were 135 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 reorganize into separate legal entities. 34 of the DSOs with less than 100 000 customers are organized in a legal entity devoted entirely to managing the grid. All 142 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 that NVE formulate supplementary secondary legislation on legal and functional unbundling. NVE started this work in 2017. In December 2017, the MPs in the Norwegian Parliament proposed a Private Member's Motion to impose functional unbundling only on DSOs with more than 30 000 customers.

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

2.1.2 Technical functioning

Quality of electricity supply

NVE has extensive legal powers on the regulation of the quality of electricity supply. 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), the TSO, electricity producers and end-users regardless of whether they hold a license according to the Energy Act or not. The Norwegian regulation[3] of quality of supply applies to those who wholly or partially own, operate or use electrical installations or electrical equipment connected to the Norwegian power system.

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, 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 as well, such as transient over voltages, interharmonic voltages and main signalling voltages.

The TSO and DSOs have been required to continuously register dips, swells and rapid voltage changes in their own characteristic high and medium voltage network since 2006. In addition, since 2014, they have been obliged to register total harmonic distortion (THD)[4] and flicker. The purpose of these required registrations is that the TSO and DSOs have an obligation to provide information about the expected quality of their network from existing and possible new customers on request. From 2014, the TSO and DSOs were also obliged to report the above-mentioned voltage quality parameters (except rapid voltage changes) to NVE. 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, the TSO and DSOs have to 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, the TSO and 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, they are

[3] Norwegian Regulation of 30th 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 can be annoying for users of the grid and may cause malfunction or damage to equipment connected to the grid.

exempted from the requirement to rectify if, and only if, no other stakeholder is affected by the voltage violation. If the TSO or DSO have done all of the aforementioned investigations without reaching an agreement with the customer, the case can be brought forward to NVE for decision. Decisions made by NVE are individual decisions that can be appealed to the Norwegian Ministry of Petroleum and Energy.

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.

The TSO (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 energy not supplied (CENS, in Norwegian "KILE"), among others. Until 2009, this quality adjusting was based on calculating the amount of energy not supplied, and hence a standardized 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 plots for the reliability of the power supply).

From 2005, the interruption data also included end-users. The main reasons for introducing this was; (1) easier to understand for non-technical customers and (2) better possibility 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).

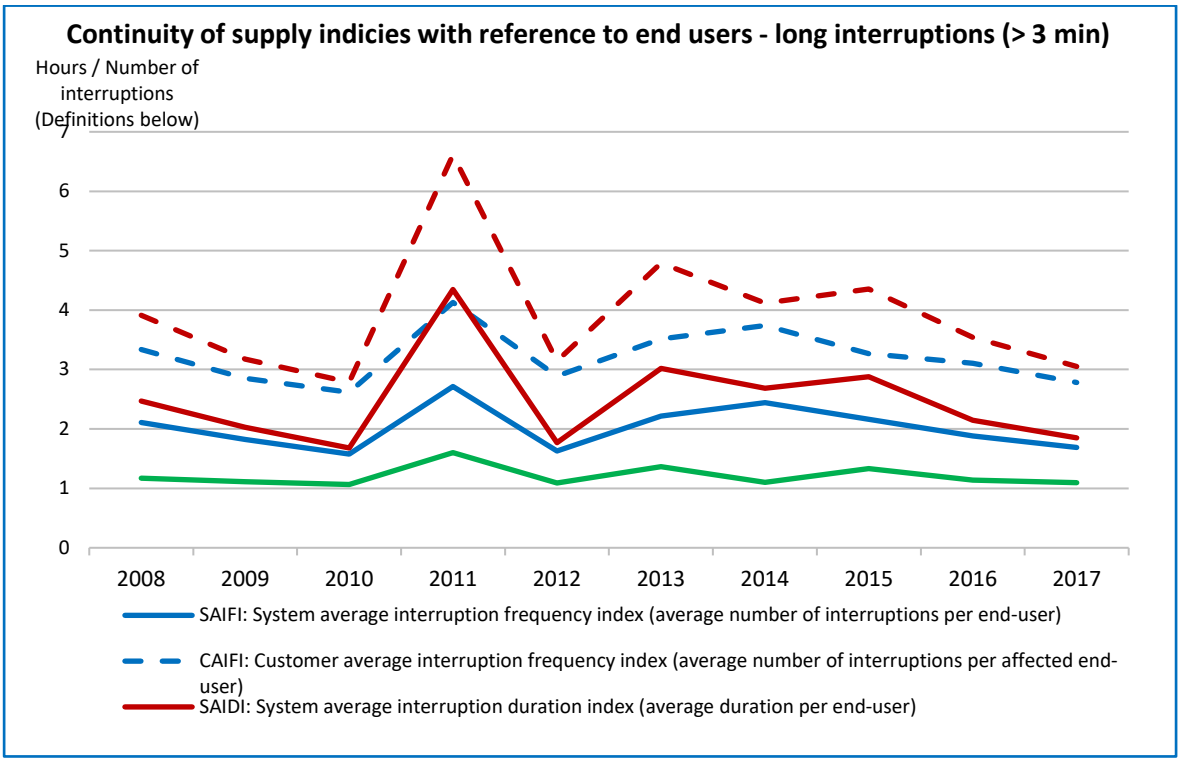


Figure 1. Continuity of supply indices with reference to end users - long interruptions.

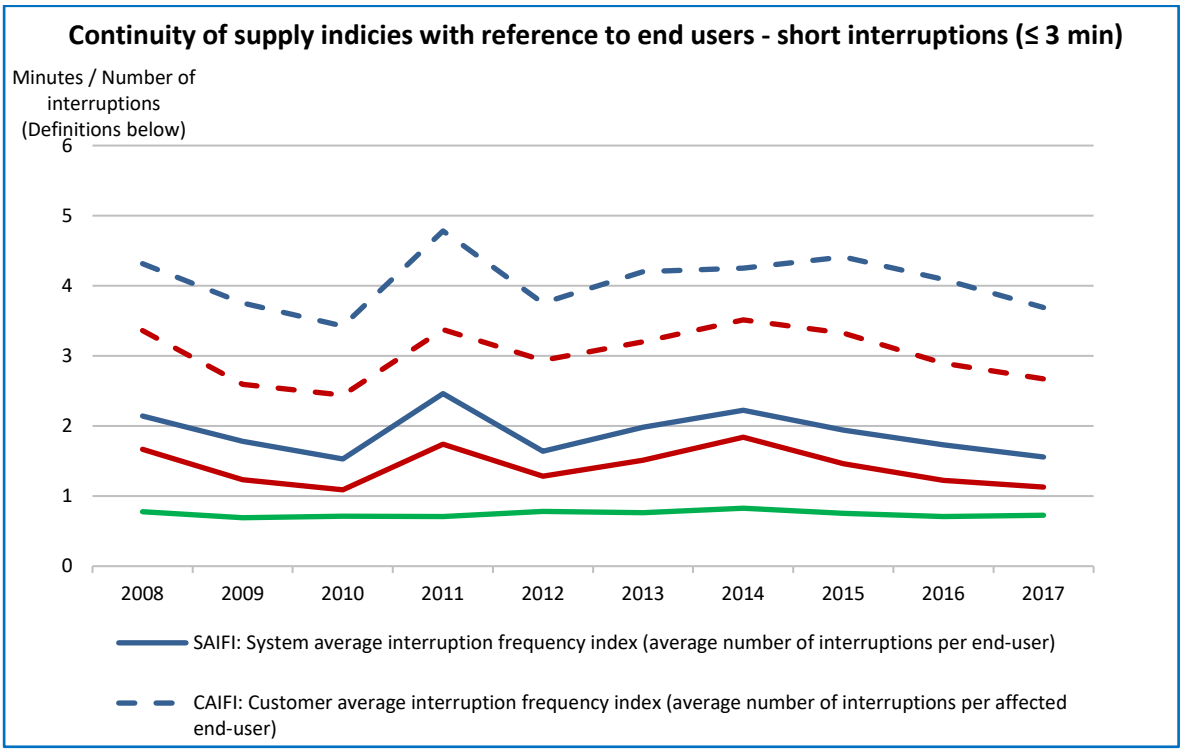


Figure 2. Continuity of supply indices with reference to end users - short interruptions.

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 some 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

Figure 3 shows the development of energy not supplied in parts per thousand (‰) relative to the energy supplied for the last 19 years in Norway.

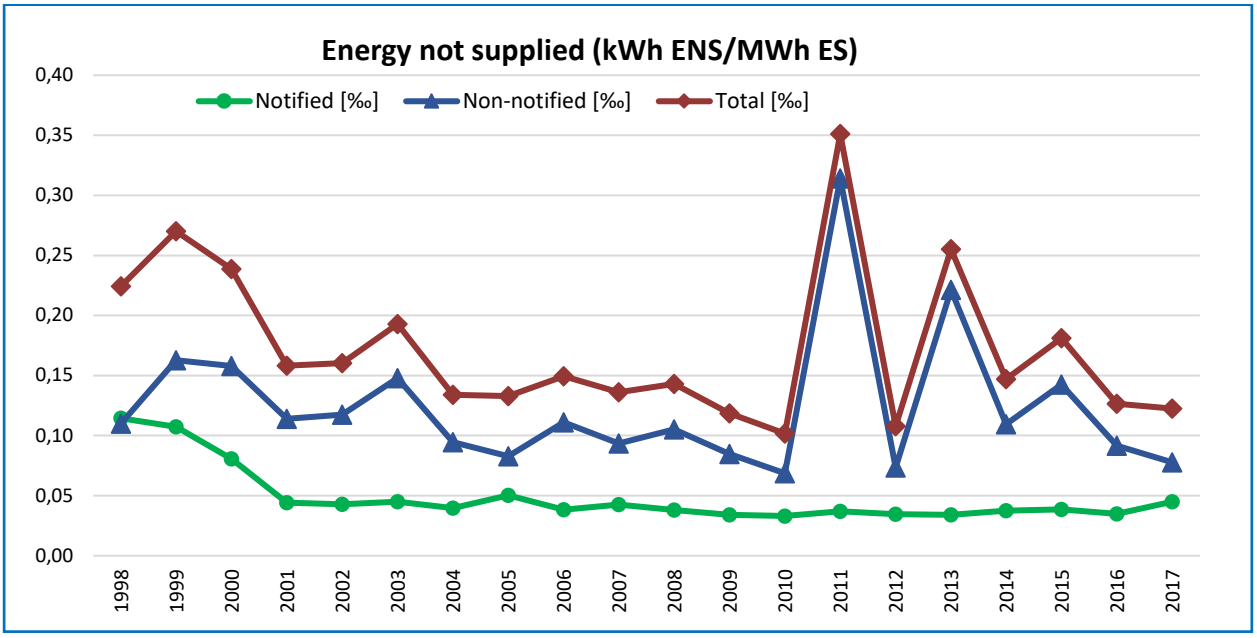


Figure 3. Energy not supplied (ENS) in per thousand relative to the energy supplied (ES) to end users in Norway since 1996.

In 2017 all the indicators on continuity of supply presented in figure 1 and 2 decreased compared to 2016. This means that the end-users were affected by fewer interruptions and the outage time per interruption

decreased. This can be explained by less hurricanes and thundershowers than in previous years. 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. The outage time per interruption was lower than in 2013, as seen on the values of System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI) for long interruptions in figure 1. 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 for Statnett.

Norway is a part of an integrated Nordic balancing energy market for manual frequency restoration reserves (mFRR), known as “the Nordic regulation power market”. The Nordic area (except DK1) is synchronised and the Nordic TSOs therefore collectively operates the Nordic area as if it were a single control area. The Nordic balancing energy market for mFRR shares a common merit order list, where the most efficient resources are utilized, for upward or downward regulation. In this 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 mFRR price varies close to the Day-ahead clearing price. In periods with upward regulation, the regulation price will typically be above the day-ahead price and below the day-ahead price in periods with downward regulation.

According to Norwegian regulation, the TSO has the obligation to make sure that there are sufficient reserves in the power system at all times. The required national levels are determined in the Nordic system operation agreement. The level is based on the dimensioning fault of the system, which currently is 1200 MW in Norway. In addition, Statnett consider it necessary to procure 500 MW mFRR to handle regional congestions and imbalances. In order to fulfil the requirement for mFRR, Statnett operates a balancing capacity option market for mFRR (called “RKOM”) to make sure there are sufficient upward regulation on the merit order list of the balancing energy market. The RKOM is operational during wintertime, typically from October to April, and has a weekly and a seasonal product. Through RKOM, market participants are compensated for guaranteeing that they will provide upward regulation bids to the Nordic regulation power market.

Statnett has also been given a license for the responsibility of the balance settlement, which 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 harmonize rules and regulations. According to this

model, the consumption balance is settled according to a single price, 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 their imbalance reduce or increase the system imbalance.

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 a common Nordic end-user market, was successfully implemented in May 2017.

2.1.3 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 (132 – 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 2017 there were 123 network companies owning and operating regional distribution and/or distribution network, some also owning minor parts of the transmission network.

Revenue Cap model

NVE regulates the distribution system operators (DSOs) and the TSO 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 concerns operators of all electricity networks. Statnett is benchmarked together with other European TSOs[5], while the other network operators 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 RC for the coming year in November, and the network companies set their tariffs accordingly. All data, benchmarking results and revenue cap calculations, are published 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 RC for one year will only differ due to differences between estimated and actual electricity prices, inflation and WACC. In addition to this, any errors in the companies' costs or technical data discovered after the notification are corrected in the final RC.

The RCs are calculated 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. the deviation between expected and actual costs for 2015 will be corrected in the RC for 2017). The total cost deviation is distributed among the companies using their share of the sectors total regulatory asset base. This mechanism does not apply to the regulation of Statnett.

5 e3Grid2012 European TSO Benchmarking Study

Allowed Revenue

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

Furthermore, 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. Excess or deficit revenue for a given year is calculated 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. As revenue generated from congestions are considered a part of Statnett's actual revenue, these revenues thereby reduces the base for tariffs that can be collected from Norwegian customers. However, costs related to removing congestion are also part of the tariff base, which implies that the congestion revenue is used in order to finance investments to eliminate congestion. NVE decides an excess/deficit revenue balance every year for each company. The decision is made approximately one year after the RC is set, when the companies have reported their actual costs in the RC-year. The balance is to be adjusted 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. NVE annually audits a selection of the companies to reveal any possible cross subsidies.

New cost report from Statnett

During 2015, NVE published a report describing the overall regulation of Statnett, focusing on the economic regulation. It also included a statement from Statnett of their latest cost-development. During the last ten years Statnett has increased their costs extensively, mainly due to the need of large, new investments. In 2016, NVE decided that Statnett shall present a public report biannually where they describe the main cost developments.

In 2017 Statnett published their first cost report. The report shows both the cost development during the past five years and the reasons for the increased costs, and forecasted cost development for the coming five years. In addition, Statnett describes the development in costs for larger investment projects, from the estimated costs in the license application to the actual capitalized costs. Statnett will publish the next cost report in 2019. Here we will ask them to compare the forecasted cost development to the actual cost development, and explain the deviation between them.

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 on tariff structure. The tariff level is fixed in a non-discriminating way that stimulates efficient utilization and development of the network. Tariffs can be differentiated 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. Since 2010, all houses, apartments and vacation homes are to be metered and settled individually.

According to the regulation on tariff structure, tariffs consist of a usage- dependent energy component set 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 usage-dependent tariff components.

Transmission network tariffs

The Norwegian TSO levies a local charge for marginal losses to all users of the system. The marginal loss factors are recalculated weekly in order to reflect changes in system conditions. In measurement points with both output and input, loss rates shall be symmetrical around zero. In areas with a production surplus, input has a positive loss rate and outtake a negative loss rate, and vice versa. The marginal loss rates in the transmission network are administratively restricted to 15 percent.

Consumption in the transmission network is charged with an energy component based on marginal network losses and a fixed component that depends on proximity to power production plants and the amount of load that can be disconnected in a given response time.

Distribution network 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 network company are to prepare separate tariffs for high-voltage and low-voltage. 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.

In 2017 a household customer paid an average NOK/kWh 0.43 (€/kWh 0.046) and a fixed component of NOK/year 2089 (€/year 223.9) including VAT and consumer tax. The corresponding numbers in 2016 were NOK/kWh 0.41 (€/kWh 0.044) and NOK/year 1967 (€/year 210.86). Excluding taxes a household consumer paid an average of NOK/kWh 0.19 (€/kWh 0.02) and NOK/year 1730 (€/year 185.5).[6]

6 NOK 1 = EUR 0.1072

Tariffs for production

Producer tariffs consist of an energy component that varies with the customer's current input, and a fixed component. The tariff is independent of the recipient of the power.

The energy component depends on the producer's current input of energy. The energy component is calculated individually for each separate input point, and 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. In 2017, the fixed component was NOK/kWh 0.13, which included a G-charge of NOK/kWh 0.11 and NOK/kWh 0.02 for costs related to ancillary services. Settled production volume is based on the power plant's median annual output the last ten years. For power plants with installed capacity below 1 MW, settled volume is maximum 30 percent of installed load capacity multiplied by 5 000 hours.

Tariffs for prosumers

Since March 2010, NVE has given a general dispensation to simplify the processes related to end-use customers that generate electricity for their own consumption, and in some hours have a surplus ("prosumers"). The dispensation simplifies the process of selling surplus electricity back to the network. The dispensation implies that the local network company can purchase the surplus electricity and a simplified input tariff. It is not mandatory for the network company to offer the suggested arrangement to prosumers. The dispensation does not apply to generation that requires licensing or producers that supply electricity to other end-users.

In 2014, NVE initiated work on incorporating provisions regarding prosumers in the current regulation. Suggestions for regulation of prosumers have been on public consultation in 2014 and 2015. The changes entered into force 1 January 2017.

Tariffs for connection

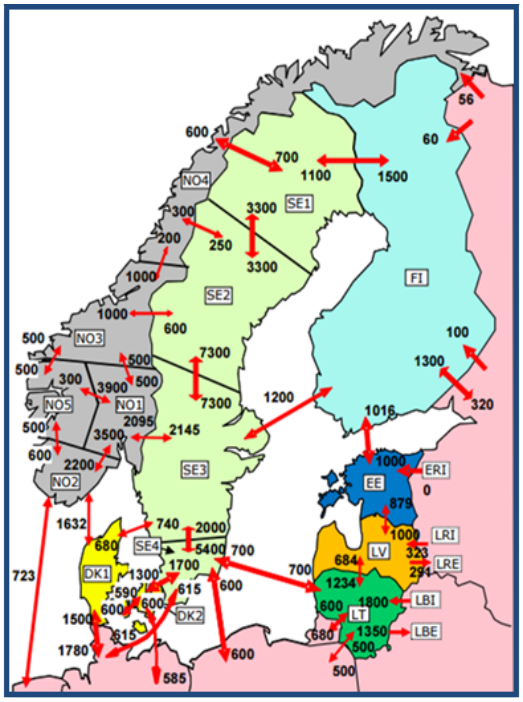
Network companies may require a connection charge to cover the costs of connecting new customers to the network or cost of reinforcing the network for existing customers. The connection charges are "semi-deep" because it is not allowed to set connection charges for investments in the meshed network. 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 15 complaints and disputes regarding tariffs and connection charges in 2017.

2.1.4 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. Countertrade is used, when necessary, to handle congestions between bidding zones, while special regulation is used within a bidding zone, i.e. the TSO is using the balancing market reserves, but can deviate from merit order list and use a bid within the bidding zone with the appropriate location.



In 2017, 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).

Figure 4. Price areas in the Nordic countries in 2017. Source Statnett

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 below shows the average transmission capacity on the interconnectors that has been available to the market in relation to maximum capacity (grey), in 2017 and 2016.

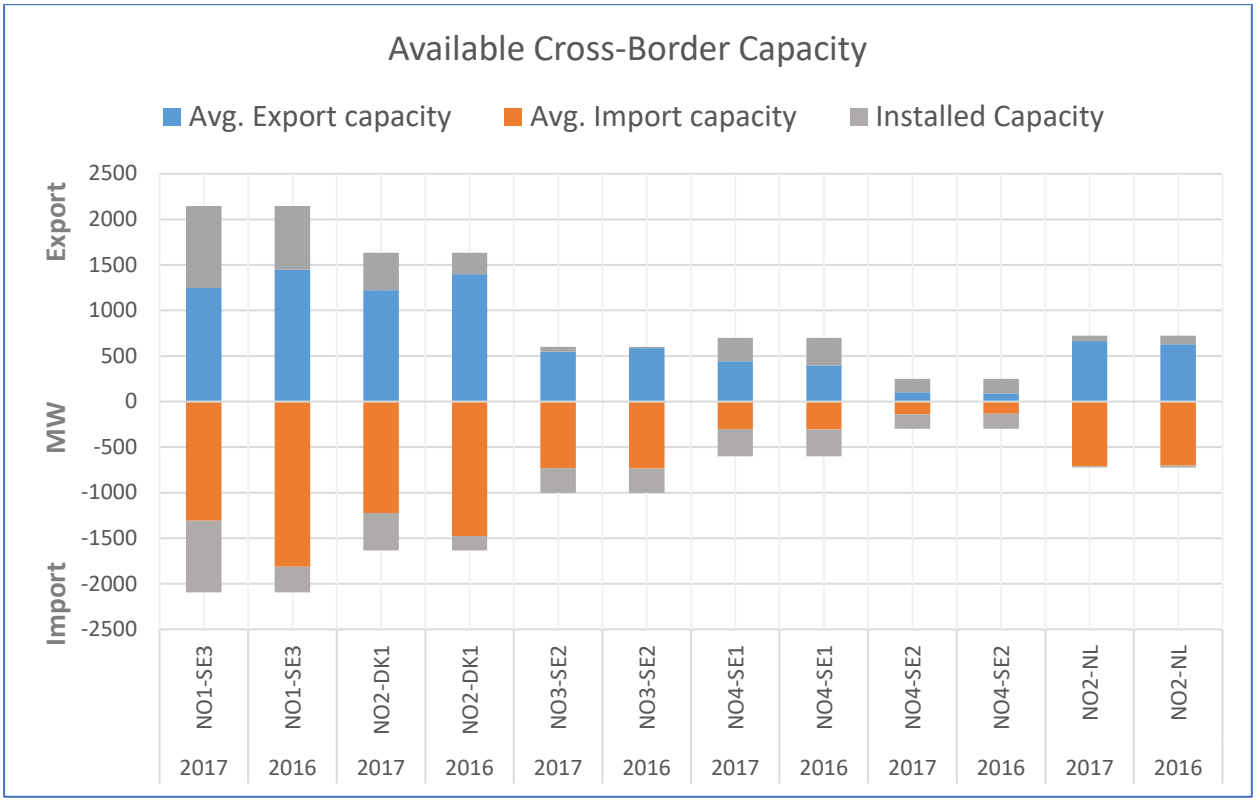


Figure 5. Available capacity in 2017 and 2016 for export and import as a portion of installed capacity for each cross-border interconnector. Source: Nord Pool Spot and SKM Syspower.

The capacity available to the market on Norway's largest interconnection between NO1 and SE3 was significantly reduced in 2017 compared to the year before. The export capacity was reduced by 9.3 percentage units and the import capacity was reduced by 24 percent of the total capacity. The main reason behind the reduction was increased maintenance activity in the grid in 2017.

Likewise, the available capacity on the subsea cables between area NO2 in southern Norway and Western Denmark (DK1) was reduced to 75 percent. This represents a 10.7 percent reduction in available export capacity and 15.4 percent in import capacity. The decline in available capacity can be explained by three months of construction work on the SK2 (350 MW).

Table 1: Annual prices in the Norwegian Elspot areas, €/MWh

	Availablility of interconnectors				Change in percentage units, 2016 to 2017.	
	2017		2016			
Connection	Export	Import	Export	Import	Export	Import
NO1-SE3	58 %	62 %	67 %	86 %	-9.3	-24.0
NO2-DK1	75 %	75 %	86 %	90 %	-10.7	-15.4
NO3-SE2	91 %	73 %	98 %	73 %	-6.6	-0.5
NO4-SE1	63 %	50 %	57 %	51 %	6.6	-0.6
NO4-SE2	40 %	47 %	35 %	44 %	5.8	2.3
NO2-NL	92 %	98 %	87 %	97 %	4.5	0.9

Available capacity on the other interconnectors were relatively stable compared to 2016. Work on upgrading the transmission grid from 300 to 400 kV in NO4 continued in 2017, but had less impact on the available inter-connection capacity than in 2016.

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.

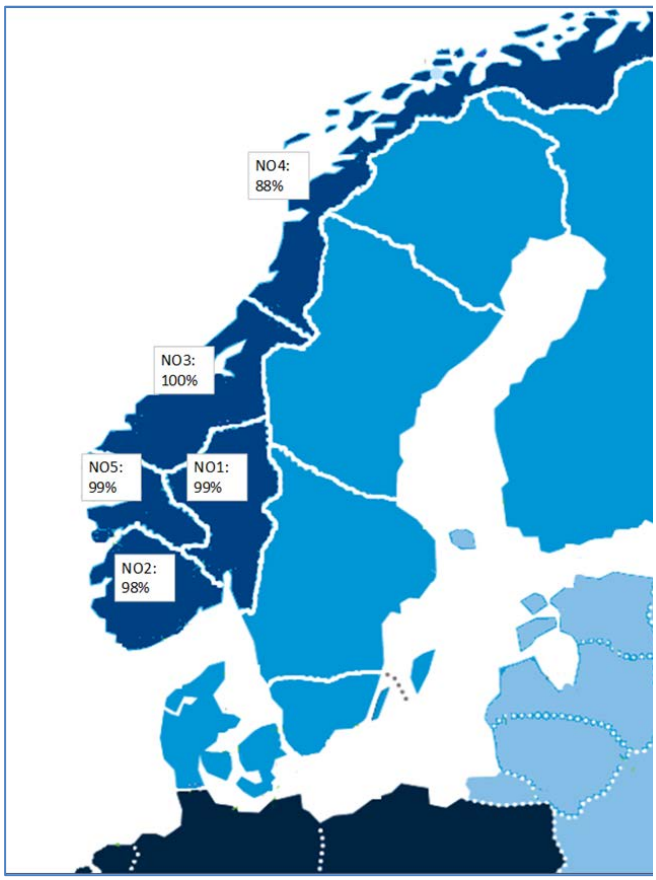


Figure 6. Prices in the Norwegian price areas, in percentage of the system price.

Figure 6 depicts prices in the Norwegian bidding zones areas as percentages of the Nordic System price. The System price denotes the unconstrained market-clearing price for all bidding zones in the Nordic countries (more information about the System price can be found in the chapter "Competition in the wholesale market"). The higher the difference in the price in the bidding zone from the System price, the higher the congestion based on the ATC- congestion and capacity allocation.

The price levels for the Norwegian bidding zones were on average close to the system price, which shows that the decline in available capacity did not affect price differences in a substantial way. The northernmost bidding area, NO4, experienced some "lock-in" of power production and thus had a lower price at 88 percent of system price. Upgrading of the transmission lines from 300 to 420 kV will increase the capacity between NO4 and the rest of the Nordic power system.

2.1.5 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. Figure 6. Prices in the Norwegian price areas, in percentage of the system price.

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 2017, 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 has also monitored the implementation of the Nordic Balance Settlement (NBS) to ensure that DSOs were sufficiently prepared when NBS went live on 1 May 2017. Additionally, NVE monitored the DSOs preparations for data transfer to Elhub.

In 2017 NVE audited three Norwegian DSOs directly on AMS security. The general impression is that Norwegian DSOs are doing well within ICT-security and take their responsibility seriously.

Electricity suppliers

NVE monitored the presentation of prices of green certificates on all electricity suppliers' we pages. This was done to ensure transparency in pricing of products across all suppliers.

2.2 Promoting Competition

2.2.1 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), organizes 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 2017 was 373.7 TWh. This volume constitutes a market share of 90.6 percent of the region's total consumption. 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 Nordic, Baltic and German Intraday traded volume on the NP platform was 6.8 TWh in 2017.

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 organized 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 502.5 TWh in 2017, compared to 761.3 TWh in 2016. The total clearing turnover for the Nordic financial power contracts was approximately 1 058.6 TWh in 2017 (1 432.3 TWh in 2016), which is a multiple of the underlying physical power traded and indicates a liquid market in electricity derivatives.

2.2.1.1 Price monitoring

NVE monitors the price developments by analysing and publishing weekly and quarterly reports of the Norwegian and Nordic electricity market development. 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 7 below shows the development in the daily Nordic System price in 2017 and 2016. The annual System price at 29.1 EUR/MWh in 2017, was 9 percent higher than in 2016. The maximum monthly average system price at 32.28 EUR/MWh occurred in February. This is a relatively low winter price, which reflected the energy scarcity in the hydropower reservoirs, rather than high price spikes due to high load.

The minimum system price occurred in June at 24.61 EUR/MWh, which is seasonally the norm with snow melting, high hydropower production and falling consumption. The hydropower reservoirs provided flexibility that even out the prices throughout the year of 2017.

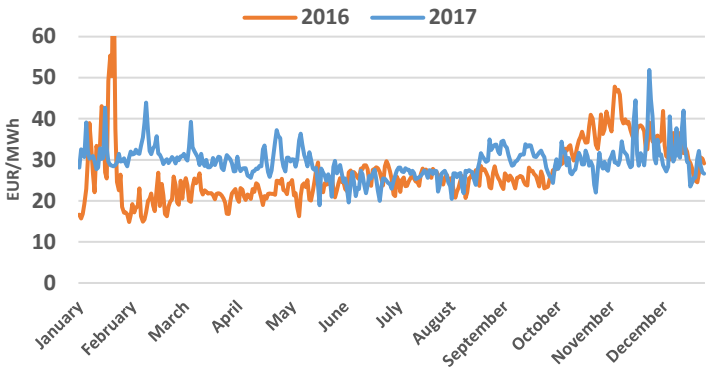


Figure 7. Nordic System price 2017 and 2016, EUR/ MWh.

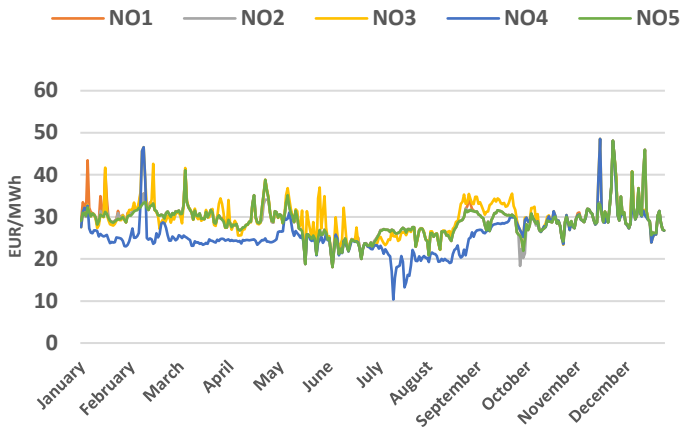


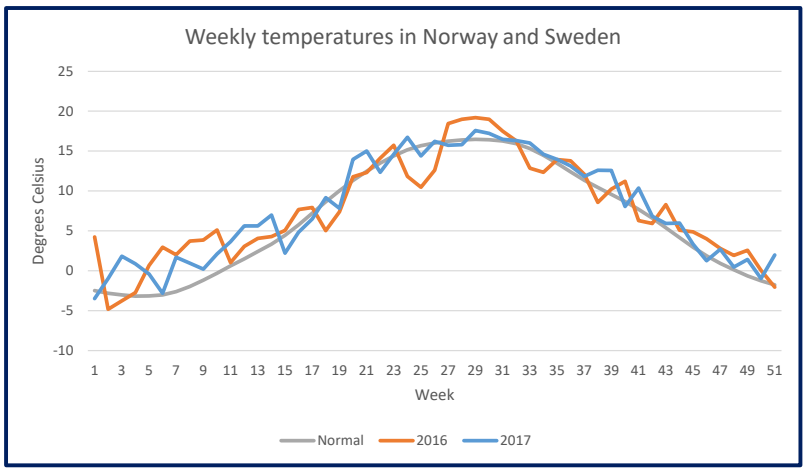
Figure 8 shows the price development in the Norwegian 5 bidding zones during 2017, and table 2 (below) shows the annual area prices. In 2017, there was an increase in the prices in all the Norwegian bidding areas compared to 2016. However, grid limitations caused the prices in NO4 to diverge from the rest of Norway.

Figure 8. Price development in Norwegian bidding zones in 2017. Source: Nord Pool Spot and SKM Sypower.

Table 2: Annual prices in the Norwegian Elspot areas, €/MWh

€/MWh	2017	2016	Change
System price	29.41	26.91	9 %
East Norway (NO1)	29.04	26.17	11 %
South West Norway (NO2)	28.83	25.15	15 %
Mid Norway (NO3)	29.53	28.69	3 %
North Norway (NO4)	25.73	25.05	3 %
West Norway (NO5)	28.84	24.91	16 %

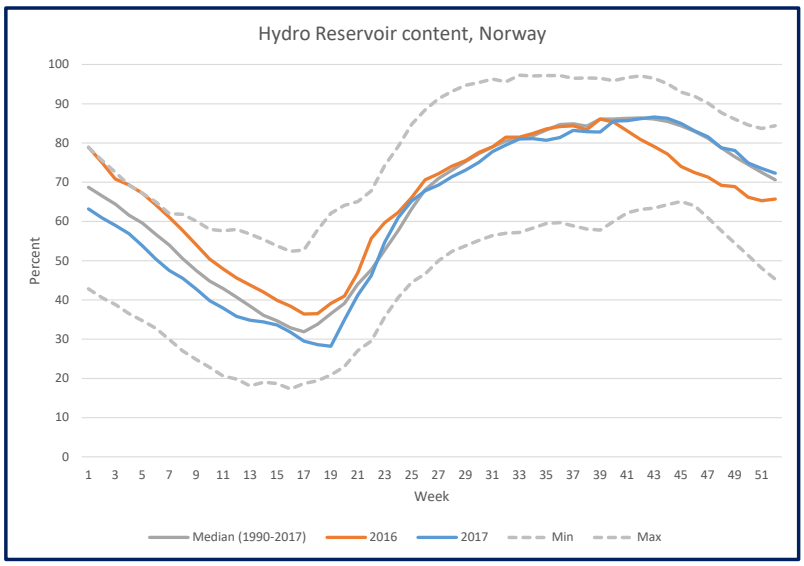
The price development at NP can be explained by changes in fundamental factors such as variation in precipitation, hydro reservoir levels, inflow, wind and temperature. The figures 9 and 10 below show the weekly developments of temperature and hydro reservoir levels.



The temperatures of 2017 were higher than normal, with an average of 1.2 Celsius above 2016. This contributed to less electricity consumption for heating purposes, but increased consumption in the oil and gas and power intensive industries, resulted in a total increase in consumption of 1 TWh, to an all-time high 134.1 TWh in 2017.

Figure 9. Average weekly temperatures for Norway and Sweden in 2017 and 2016 compared to normal. Source: SKM Syspower

In the beginning of 2017, the hydro reservoir level was 63.2 percent, which is 5.5 percentage units below normal. This is substantially lower than the record high reservoir levels at the start of 2016, and the initial difference in available energy for hydropower production is the main explanation of the increase in power prices.



After the snow melting season, both reservoir level and power prices was at the same levels in 2017 and 2016.

The autumn rain and precipitation contributed to normal reservoir levels in 2017, as opposed to the drought at the end of 2016. High inflow from snow melting and rain resulted in a high level of hydropower production of 143 TWh last year, which is close to the record high production in 2016.

Figure 10. Hydro reservoir levels in Norway. 100 percent represents 84 TWh storage capacity. Source: NVE

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.

2.2.1.2 Monitoring the level of transparency, including compliance with transparency obligation

Rules governing market conduct on the organized market place

Nord Pool (NP) holds a market place license issued by NVE, which obliges NP to perform market surveillance to monitor the behaviour of market participants trading at NP. The other countries in Nord Pool's market area have implemented REMIT[7] so that enforcement of market behaviour rules lies with the National Regulatory Authority. During 2017 NVE prepared a change to national regulation to take the enforcement of market behaviour rules into public law. This change entered into force 1.3.2018. So that during 2017 market behaviour rules were enforced by Nord Pool.
NP regulates market conduct through the NP Rulebook. The rulebook is a set of private law agreements. All market participants are required to adhere to the standard terms for participation in the NP Rulebook:

Bidding behaviour:

- The standard terms for trading in the physical markets include rules for bidding.

Market surveillance:

- Both NP and NOMX are obliged to provide an internal market surveillance.
- The market surveillances of NP and NOMX cooperate to monitor the participants' behaviour to ensure an efficient financial and physical power market. Regular meetings and information exchange between the physical and financial market surveillance teams ensure monitoring and disclosure of possible cross market manipulation.
- NP Market surveillance must ensure that market participants adhere to the rules to maintain the markets confidence in the exchange. The Rulebook for trading at NP regulates market conduct in the physical market with regard to disclosure of price relevant information, misuse of insider information and market manipulation.

Furthermore, regulations given in the Norwegian Competition Act regarding abuse of dominant position apply. These regulations are under the formal 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 NP' market conduct rules, participants and clearing customers shall disclose any information regarding:

(a) Any outage, limitation, expansion or dismantling of capacity of 100 MW or more for one Generation Unit or Consumption Unit, or 100 MW or more for one Production Unit with an installed capacity of 200 MW or more, up to three (3) years forward, including updates of such information;

(b) Any outage, limitation, expansion or dismantling of capacity in the transmission grid affecting cross zonal capacities by 100 MW or more, up to three (3) years forward, including updates of such information;

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

(c) Any outage, limitation, expansion or dismantling of capacity in the transmission grid affecting power feed-in and/or consumption by 100 MW or more, up to three (3) years forward, including updates of such information;
(d) Any information that is likely to significantly affect the prices of one or more derivatives based on Products if made public.
(e) Any Inside Information not covered by sub-paragraph (a) to (d) above

MCR also provides an interpretation of what "inside Information" means, and NP's interpretation is harmonized with the definition of "inside information" in REMIT.

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

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

2.2.2 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 2017, 469 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 2017, 145 were electricity suppliers supplying residential customers, while 142 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.

2.2.2.1 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 2017, electricity consumers paid for electricity certificates amounting to 13.7 percent of their total electricity consumption. This share will steadily increase towards 2020 where it reaches its peak at 19.7 percent of the total annual electricity consumption. The actual additional cost paid by the consumers in 2017 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 2.4 øre/kWh (including VAT) due to electricity certificates in 2017. This means that a household using 20 000 kWh of electricity in 2017, paid a total cost of approximately 480 NOK (including VAT).

Figure 11. Average price development for the spot contract in the five Norwegian bidding zones

The figure above shows the average price development throughout 2017 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.

2.2.2.2 Recommendations on supply prices, investigations and measures to promote effective competition

The Norwegian retail market for electricity will face substantial changes in the coming years. 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 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 are expected to provide real-time consumption data and price signals that 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 2017 there were 550 800 supplier switches resulting in a switching rate of 18.8 percent for household customers.

In order to learn more about why consumers are active or inactive in the market, NVE commissioned a report investigating Norwegian household consumer knowledge of the electricity market. The report was based on a survey, in-depth interviews and focus groups. The survey asked general questions about renewable energy and the Norwegian disclosure. The participants were also asked about the roles of the DSOs and the suppliers in the Norwegian market.

The report found that consumers have a varying degree of knowledge about their electricity consumption and the electricity market. The three most common reasons why the consumers are with their current power supplier and on their current contract are as:

- The consumer is satisfied with their current contract
- It was the cheapest contract on offer when they entered the contract
- The consumer wanted a local power supplier.

60 percent of consumers have changed their power supplier. Among those who have never changed their supplier, 15 percent have changed their contracts.

Cyber Security in Advanced Metering Systems

In 2017 NVE has prepared 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 2017 NVE supported the Norwegian Electro technical Committee (NEK) in their work on a guideline for a harmonized security-solution for smart meter's HAN-interface (Home Area Network). The guideline is meant to promote a solution complying both with requirements to standardization and harmonization as well as privacy laws.

NVE also participated in the work on CEERs internal cybersecurity report and factsheet on the general data protection regulation (GDPR), hosted security workshops and gave lectures on different national security events.

2.3 Security of supply

2.3.1 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

Statnett did not purchase energy options in 2017, after the commissioning of the Ørskog-Sogndal line. The line increased transmission capacity by 500 MW from NO5 to NO3.

Electricity peak demand

Domestic gross energy consumption was all-time high at 134.1 TWh in 2017 (133.1 TWh in 2016), despite higher temperatures. This 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 23 246 MWh/h in 2017, which is 1.2 GW below the peak electricity demand record in 2016.

Table 3. Peak demand for the last 10 seasons.

Year	Weekday	Date	Hour (CEST)	Demand [MWh/h]
2007	Wednesday	14.12.2007	8	21 588
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	24 485
2017	Thursday	09.02.2017	8	23 246

Currently available generation capacity

The total installed generation capacity was 33 814 MW. Available generation capacity during a cold winter is estimated to approximately 26 500 MW by Statnett.

Table 4. Current generation fuel mix. 2017

	Installed capacity 31.12.2017 [MW]	Mean annual generation 31.12.2017 [TWh/y]	Net capacity added in 2017 [MW]	Under construction on 31.12.2017 [MW]	License/permit given, not yet built [MW]
Wind power	1 188	3.6	324	1630	5512
Hydro power	31 948	134.3	277	995	3187
Thermal power	633	3.5	0	0	0
Solar Power	45	0.04	18	N/A	N/A
Total	33 814	141.5	619	2 625	8 699

The hydropower generation capacity increased by approximately 277 MW in 2017. The amount of wind power under construction as of 31.12 2017 was 1 630 MW. According to NVEs estimates, the total accumulated solar power in Norway was to 45 MW in 2017. This represents an increase of 66% compared to 2016.

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.

2.3.2 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 2020. In addition, Statnett and the National Network in the UK have signed a cooperation agreement with the aim of commissioning the DC cable North Sea Link between Norway and UK in 2021. The cable to 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. An application for the technical specifications has been submitted to NVE. The Ministry of Petroleum and Energy is awaiting an application for a trading license of the interconnector. If licence is granted, North Connect could be commissioned by 2022.

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 have started in 2017.

Voltage upgrades in Mid Norway
An important step towards the next-generation main grid is to increase the grid voltage from 300 to 420 kV, referred to as a voltage upgrade. This will be done by converting existing 300 kV power lines and substations, or by replacing old low-capacity lines with new ones.

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 of between 750 to 915 million euros.

Ofoten-Balsfjord

The 150 km 420 kV OH line for Ofoten to Balsfjord was commissioned in 2017. This line improved the security of supply in the North of Norway. Expected load growth and RES integration will benefit from this investment.

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 Finnmark. Expected load growth and RES integration will benefit from this investment. It is expected to be commissioned in 2019, and thus this investment is moved forward compared to last year.

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 14.5 billion euros. 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.

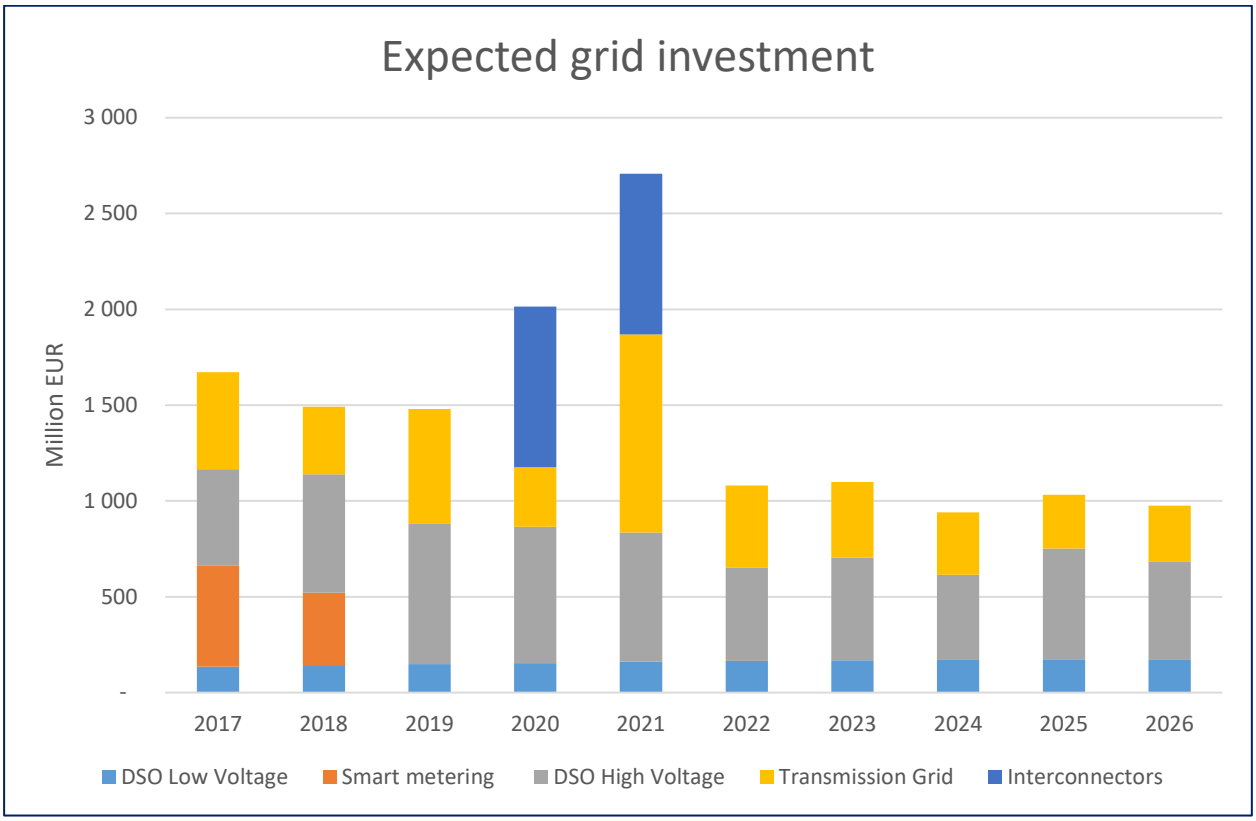


Figure 12. Expected investment levels in the Norwegian network. 1 EUR = 9,3 NOK in 2017.

In the period after 2022, it is expected that the network investment levels will normalize at approximately 1 billion euros each year, but the need for further investments is possible.

2.3.3 *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).

3 THE GAS MARKET

Although Norway is a large gas producer, only 985 GWh[8] (2017) 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 also use injected tail gas from LNG production facilities. There is no transmission network in Norway as defined in EUs third Natural Gas Directive[9].

NVE is 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[10], and to have separate accounts for distribution, LNG and storage.

In 2017, NVE was preparing a proposal for a new regulation for gas distribution in order to prepare for the implementation of the above-mentioned Natural Gas Directive into Norwegian law. The proposal for a new regulation shall be in compliance with the Natural Gas Directive and adapted to local market conditions. In this proposal, NVE will propose a system to fix or approve tariffs, or the tariff methodologies. Further, third party access to gas distribution networks will also be addressed. NVE sent the proposal to the Ministry of Petroleum and Energy in January 2018.

8 Based on information from the gas suppliers.

9 Directive 2009/73/EC of the European parliament and of the council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC.

10 With an exception for small facilities.

4 CONSUMER PROTECTION AND DISPUTE SETTLEMENT IN THE ELECTRICITY MARKET

4.1 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 2017, the Norwegian Parliament granted MNOK 10 to reduce network tariffs for customers in areas with the highest distribution costs.

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.

4.2 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, 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 2017, the Norwegian Electricity Appeal Board received 617 written complaints and reached a decision in 47 cases.

Appendix

Table 6. Continuity of supply indices with reference to the end users as regards long interruptions in Norway

	SAIDI [hours]	SAIFI	CTAIDI [hours]	CAIDI [hours]	CAIFI
2005	2.3	1.9	2.9	1.2	2.4
2006	2.6	2.1	4.6	1.3	3.4
2007	2.4	2.0	3.6	1.2	3.1
2008	2.5	2.1	3.9	1.2	3.3
2009	2.0	1.8	3.2	1.1	2.9
2010	1.7	1.6	2.8	1.1	2.6
2011	4.3	2.7	6.5	1.6	4.1
2012	1.8	1.6	3.1	1.1	2.9
2013	3.0	2.2	4.8	1.4	3.5
2014	2.7	2.4	4.1	1.1	3.7
2015	2.8	2.1	4.4	1.3	3.3
2016	2.1	1.9	3.5	1.1	3.1
2017	.,8	1.7	3.0	1.1	2.8

Table 7. Continuity of supply indices with reference to the end users as regards short interruptions in Norway

	SAIDI [minutes]	SAIFI	CTAIDI [minutes]	CAIDI [minutes]	CAIFI
2006	1.4	1.8	3.0	0.8	3.8
2007	1.4	1.9	3.0	0.8	3.9
2008	1.7	2.1	3.3	0.8	4.3
2009	1.2	1.8	2.6	0.7	3.8
2010	1.0	1.4	2.4	0.7	3.4
2011	1.8	2.6	3.3	0.7	4.8
2012	1.3	1.6	2.9	0.8	3.8
2013	1.6	2.0	3.2	0.8	4.2
2014	2.0	2.4	3.5	0.8	4.2
2015	1.5	1.9	3.3	0.8	4.4
2016	1.2	1.7	2.9	0.7	4.1
2017	1.1	1.6	2.7	0.7	3.7

Table 8. Energy supplied and some continuity indicators in Norway, regarding 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	16.8	15.8	32.6
1997	101 987	16.5	24.0	40.5
1998	106 228	13.9	13.6	27.6
1999	106 525	11.8	19.0	30.8
2000	104 193	8.9	18.1	27.0
2001	108 361	5.1	14.2	19.3
2002	107 656	4.9	15.0	19.9
2003	105 145	4.9	16.9	21.8
2004	109 306	4.4	11.6	16.0
2005	111 804	5.7	9.9	15.6
2006	106 380	4.1	11.7	15.8
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	107 055	4.0	33.2	37.2
2012	110 698	3.8	8.0	11.8
2013	112 118	3.8	24.7	28.6
2014	114 527	4.3	12.4	16.6
2015	115 110	4.5	16.4	20.9
2016	117 640	4.1	10.8	14.9
2017	116 608	5.2	9.1	14.3

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