Report on the activities of ElCom 2020

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1 Foreword by the President

Werner Luginbühl
President of ElCom

Under the dedicated presidency of former Council of States member Carlo Schmid-Sutter, ElCom has been successfully set up and established as a regulatory authority over the past ten years and today enjoys broad acceptance and a good reputation in the industry and amongst consumers. After taking over the presidency on 1 March 2020, my aim – in cooperation with the Commission and the Technical Secretariat – is to build on these achievements, to maintain them and to ensure the authority is well placed to meet the challenges of the future.

COVID-19 and its impact on the industry
2020 was overshadowed by the coronavirus pandemic. After a long period of time, the countries of the First World have also been hit by a widespread pandemic again with huge economic and major social implications. Many people find this situation difficult to come to terms with because they believed our 'modern' society was invulnerable to such events.

The economic impact on the electricity industry was relatively low in comparative terms. ElCom published a study in May 2020

on the pandemic's impact on the European load. This study showed that the electricity industry in Switzerland was less severely affected by the decline in load attributable to the coronavirus-related lockdown than France, Italy and Spain. During the first lockdown in Switzerland, the fall in consumption on work days stood at around 10 per cent, whereas it amounted to about 17 per cent in France, approximately 20 per cent in Spain and around 25 per cent in Italy. Restricted industrial production and the closure of restaurants and shops were the main reasons for the decline in load.

The financial effects of the decline in consumption for Swiss energy providers differed greatly depending on their procurement strategy. Network operators were able to apply to ElCom for short-term tariff reductions in spring to alleviate the economic consequences for SMEs and industry. Very few companies ultimately took advantage of the opportunity to reduce the tariffs on an intrayear basis.

Coverage differentials in 2011 and 2012
During the year under review, ElCom enabled a major step to be taken towards the conclusion of one of the biggest transactions in Switzerland's recent economic history which concerned the 7,000km-long transmission network with a regulatory value of over CHF 2.5 billion. In accordance with the Electricity Supply Act (ESA), Art. 33, para. 4, the systems of the Swiss transmission network had to be transferred to Swissgrid by 1 January 2013. In a total of 19 decisions concerning the coverage differentials for the tariff years 2011 and 2012, the transfer was completed in the year under review after a complex and protracted process. It is set to be approved by the Commission in early 2021.

Supply security
The situation during winter 2019–20 and the first half of winter 2020–21 was comfortable in terms of supply security. Winter 2019–20 was the mildest since measurements began. Temperatures stood at 3°C above the norm. The subsequent lockdown in March due to the coronavirus pandemic led to an additional reduction in electricity consumption. All nuclear power plants in Switzerland were connected to the grid as planned and the water levels in the reservoirs were always higher than usual during the winter.

With regard to production, ElCom still sees the greatest need for action in the framework conditions for domestic winter production over the medium term. Various factors play a role. As the age of the nuclear power plants increases, there is greater likelihood of unforeseen decommissioning for technical or financial reasons. It is also presently unclear whether the remaining four 2035 (operating life of 50 years) or 2045 (operating life of 60 years) nuclear power stations will be decommissioned. With the expansion rates achieved thus far for production from renewable energy sources, in particular photovoltaic energy, an adequate share of the production lost from nuclear power (around 14TWh) during the winter cannot be replaced within a reasonable period.

In February 2020, ElCom highlighted increasing import risks in the framework paper on winter production whereas subsequent communication focused on the expansion of domestic winter production from 5 to 10TWh by 2035.

In summer 2019, the Federal Council approved the 2050 net-zero target to meet the obligations from the Paris Agreement. This goal requires radical restructuring of energy supply in just under 30 years and will result in growing demand for power for the rapid electrification of the transport and building sectors.

After the consultation procedure on the revision of the Electricity Supply Act and the Energy Act, the federal government determined the benchmarks for the revision of both acts in November 2020. The anticipated additional consumption of electricity for building heat and mobility was taken into account.

The Federal Council wishes to extend contributions to domestic renewable energies through investments until 2035 and enable auctions for large-scale photovoltaic plants, while maintaining the 2.3-Rp/kWh ceiling. It has refrained from introducing new funding instruments, such as sliding market premiums, as this would require additional financial resources. In relation to supply security, an expansion of winter production by 2TWh/a is planned in addition to the strategic reserve. The remaining deficit in the winter is to be met by imports over the medium and long-term. The current self-supply capability of 22 days is also to be guaranteed in future.

ElCom is pleased to acknowledge that a number of its concerns have been incorporated into the bill. The planned strengthening of winter production and acceleration of expansion to maintain self-supply capacity, the reduction of import risks (redispatch requirement) and efficient management of storage power stations are urgently required. However, ElCom believes the proposed targets are not ambitious enough, on one hand, but too optimistic, on the other, in light of the political and economic uncertainty over the feasibility of implementing the planned measures. Energy forecasts indicate that import requirements during the winter will increase to well over 10TWh over the longer term after the decommissioning of the nuclear power plants despite the planned measures.

The dispatch on the revision of the Electricity Supply Act and the Energy Act is to be presented to Parliament in mid-2021.

International developments

Switzerland will have to import an increasing volume of electricity during the winter in future, at least over the medium term. ElCom regards informing politicians about the risks involved in substantial import levels from a current standpoint as part of its statutory mandate of monitoring supply security.

Transport availability and the capacity and willingness of neighbouring countries to export, in particular, are relevant in the assessment of import risks.

Transport availability is influenced by various factors. These include more volatile network operation, the further substitution of taxable production by renewable energies, the expansion of flow-based market coupling to Eastern Europe, the introduction of flow-based market coupling on the intraday market, potential expansion of flow-based market coupling to Italy, compliance with the EU's 70 per cent rule and the introduction of various cross-border platforms in the field of balancing power.

With regard to the capacity and willingness of neighbouring countries to export, it should be noted that Germany may only be able to export to a more limited extent at certain times due to its withdrawal from nuclear energy and gradual withdrawal from coal-fired power generation in winter. Bottlenecks are already occurring today in the event of the non-availability of the French nuclear power plants and the actual availability of the French nuclear power plants from 2030 represents a major unknown factor. It is also assumed large-scale imports from Italy can also be ruled out in future.

In summary, expenditure on redispatch is increasing and the failure of network elements can have major consequences if reserves are too low. Import capacity is increasingly dependent on political decision-making abroad, whether it is EU bodies, such as DG ENER and/or ACER, or regulators/TSO in the CORE and Italy North regions.

The conclusion of an electricity agreement would at least largely eliminate the political risks. It is also clear that the import of electricity under normal circumstances has been reliable and cost-efficient to date. However, operating the system at its limit over a number of years always represents a major risk in view of the huge importance of secure and reliable power supply. In view of these considerations, ElCom recommends the provision of at least as much winter production in Switzerland to ensure that no more than 10TWh has to be imported during the winter.

I hope this report provides a fascinating insight into ElCom's wide-ranging activities.

Werner Luginbühl
President of ElCom

2 Interview with the Director on supply security

After over 13 years as Head of the Technical Secretariat, Renato Tami will leave ElCom at the end of October 2021. Here he casts another critical eye over supply security in Switzerland – today and in future.

Mr Tami, as Director of ElCom you are the supreme authority over supply security in Switzerland. How do you view the situation in general?
While not quite as comfortable as it could be, the current situation is stable. The grids provide a high level of availability and the large power stations are in operation. However, we will face an issue with the withdrawal from nuclear energy if we fail to act in good time by developing alternative sources of power generation and taking advantage of existing power saving potential.

How great is the risk of a shortage of power actually? Why is this considered the greatest civilian threat to the nation, even above a pandemic?
An electricity shortage could cause tremendous damage. The Federal Office for Civil Protection believes such a situation actually represents the greatest risk to Switzerland. The scenario described assumes a power shortfall of 30 per cent lasting for several months during winter. It is estimated this would lead to total damages of over CHF 180 billion. The frequency of the occurrence of such an event is estimated at once in 30 to 50 years. Although the level of awareness is low, the probability of this happening is relatively high.

How much additional power will be required as part of industry, transport and the building sector switching to electrical energy? How much more electricity must be generated and by when?
That's difficult to predict exactly. To provide a rough estimate, we assume that the complete conversion of transport to electric mobility and the building sector switching to heat pumps will result in additional demand of over 20TWh. These figures concern private usage as industry is not yet factored in. Switzerland's total annual consumption currently stands at around 62TWh.

There will also be a certain degree of saving potential through efficiency gains. This is also difficult to quantify from a current standpoint, not least due to the time horizon. Electrical heating systems alone currently consume around 2.8TWh a year.

In light of this situation, will the increase in capacity of 5 to 10TWh previously called for by ElCom be enough?
ElCom's analysis of winter production, which we published in early 2020, does not yet take account of the additional requirements arising from the conversion of industry, transport and the building sector to electricity as relevant figures were not available. If these additional requirements are factored in, you would have to say that 5 to 10TWh will not be sufficient.

Are additional imports required?
Experience over recent years has shown that maximum net imports of 10TWh for our power infrastructure during the winter is still manageable. That is more than double the level we have imported in the past on average during winter in net terms. While regular higher imports would be technically viable, it would place too much strain on the power grid – it would constantly be running at its limit which would be irresponsible for such

key infrastructure. The issue of import risks is also important here. Do other countries abroad have the capacity to provide such levels and would they actually be willing to do so? Regulatory restrictions, such as the EU's 70 per cent rule, could rule out imports.

Renato Tami
Director of ElCom

« A European electricity agreement would not resolve our domestic challenges »

The pandemic has also shown that every country focuses on its own needs during a crisis and only supplies its neighbours if sufficient reserves are available.

Do the framework conditions exist in Switzerland for investment to the extent required?
No, there is urgent need for improvement in this respect. The framework conditions are definitely better in other countries at the moment. Lots of Swiss energy supply companies are investing in plants abroad – large-scale hydropower projects, such as the expansion in the Grimsel Pass, are currently being held up here. The planning and construction of five wind turbines at the Gotthard Pass took 18 years. Politicians need to review existing regulations on water rates, residual water levels and the protection of alluvial areas etc. and to amend them in line with the implementation of the Energy Strategy 2050.

Would an electricity agreement with the EU help us to ensure supply security?
The elimination of regulatory barriers and Switzerland's full integration into the EU single market would certainly help, but would not resolve the problems we must address in Switzerland. Put another way, an electricity agreement with the EU will not generate any additional KWh at all, nor will it improve the conditions for investment. While a European agreement would be a wElCome development, it would not resolve our domestic challenges.

To finish off with here is a personal question for you as the departing Director – what do you hope to see happen in relation to the Energy Strategy 2050?
Personally, I'm a strong advocate of the Energy Strategy 2050 – I firmly believe it's the right and only possible approach. There are nevertheless quite a few additions to address if the Energy Strategy is to succeed. This is where Parliament comes in. The climate and energy management system (KELS) can't simply be shelved without any alternative and the investment framework conditions need to be improved. We need to address these additions if we wish to create jobs here, ensure supply security and strengthen Switzerland's position

3 Supply security

The expansion of renewable energies in Switzerland is progressing at a slow pace. Some of the demand for electricity in winter can be met by wind power plants, such as here in Entlebuch.

3.1 Introduction

In accordance with Article 22, paragraphs 3 and 4, of the Electricity Supply Act, ElCom is responsible for monitoring supply security. If there are signs of a significant threat to the domestic supply in the medium or long term, Article 9 of the above act stipulates that ElCom must propose suitable measures to the Federal Council. These may take the form of efficient electricity usage, the procurement of electricity or strengthening and expanding the electricity networks. Supply security is assured if the desired quantity of energy is available at the necessary level of quality and at reasonable prices across the entire electricity network at all times.

Financial analysis of winter production was carried out to assess future supply security in Switzerland and published in a framework paper while the ElCom Adequacy Study 2030 focuses on probabilistic simulations of the supply situation in ten years. A comprehensive report on Switzerland's electricity supply security in 2020 was also drawn up. According to ElCom's interpretation of the results of these analyses, a dedicated expansion of domestic winter production capacity is required to ensure supply security in winter.

3.2 Supply security: review and outlook

In order to fulfil this monitoring mandate, ElCom employs comprehensive monitoring methods to observe medium to long-term supply security. Significant results from these monitoring activities for the year under review are presented in the following sections.

3.2.1 Review of winter 2019–20

Winter 2019–20 was the mildest winter since records began, according to MeteoSwiss. Temperatures stood at almost 3°C above the norm. This meant temperature-dependant power consumption for heating purposes fell. The production availability of the French nuclear power plants was normal and all Swiss nuclear power plants were also connected to the grid as scheduled. There were always high levels in the reservoirs during the winter.

Due to a generally tight situation on the grid in December – in particular for the supply lines in Central Switzerland in the direction of French-speaking Switzerland – and the decommissioning of the Mühleberg nuclear power plant at the end of December 2019, an additional temporary measure was taken in Switzerland with stipulated minimum production at storage power plants in French-speaking Switzerland which was easily achieved thanks to the high level of stored energy available.

There were weather-related disruptions on the transmission network and outages of nine transmission network lines in February due to several storms which resulted in temporary interruptions to supply in parts of the cantons of Schwyz, Uri and Zug. Overall network stability was nevertheless always maintained.

From March, the impact of the coronavirus pandemic led to restrictions in public life and on the economy in Switzerland and Europe. This resulted in a significant reduction in network load which meant Swissgrid, in conjunction with a high level of photovoltaic production, had to intervene several times to counteract surges through the use of high negative balancing power.

3.2.2 Other incidents over the course of the year

Coronavirus had an impact on the electricity industry in other ways too. During the crisis, ElCom organised an exchange of information on supply security at conferences convened at short notice with representatives of the authorities and industry. The following points were addressed:

- The overhauls of the Swiss nuclear power plants (as in France, see following section) had to be postponed in some cases due to the pandemic. The availability of key operational staff at the Swiss nuclear power plants was monitored by ENSI and SUVA and was ensured at all times. The reactors have to be shut down if the minimum staff levels are not met.
- The pandemic also affected the 24/7 operation of the transmission network. Swissgrid went into pandemic operation from early March 2020, whereby only staff from the two control centres and critical operational staff were on site for the operation of the plants. A key factor in network maintenance is the availability of the power plants. Various overhauls of installations on the transmission network were therefore postponed due to the deferred overhaul timeframe for the (nuclear) power plants. It was also observed that the balance groups caused higher balance deviations due to the unusual load situation. Swissgrid therefore increased the amount of balance power in reserve to counter this development.

- Switzerland's control zone is not completely congruent with national borders. There are also areas abroad which are supplied by Swiss power supply companies (so-called enclaves). Solutions had to be found for network operations staff due to the initial closure of the borders. This issue was resolved with the competent authorities abroad.

EA summary of the coordination activities and findings was presented to the competent authorities and Parliament in the form of a report in the middle of the year. The report also contained calculations for a pandemic scenario which were carried out as part of the ElCom Adequacy Study 2030.

Unrelated to the pandemic, a transmission tower in the canton of Vaud toppled over in the middle of the year. This put two 220kV lines out of operation until repair work was completed around two months later. Overall network stability was ensured at all times. Sabotage was established as the cause of the tower falling. The inquiries of the investigating authorities into the offence are still ongoing.

3.2.3 Situation in winter 2020–21

Winter began with a cold October and the initial onset of winter at the end of the month, but November turned out to be extremely mild. All five nuclear power plants in Switzerland were connected to the grid and the reservoirs were at a high level at the beginning of winter.

In contrast, a generally tight supply situation was reported in France in winter 2020–21. This was due to the coronavirus-related delays in overhauls of French nuclear power plants which generally take place over the course of the whole year in France, leaving little room for external disruptive factors. Refuelling was also affected by the delayed overhauls. The overhauls were repeatedly rescheduled to ensure the highest possible availability of the French nuclear power plants during winter. There was nevertheless very low availability of the French nuclear power plants during the winter months of January, February and March 2021. France reported that there could be local supply shortages in conjunction with a severe cold spell during the winter months despite provisions and requirements-based implementation of national countermeasures. The network coverage situation in France (depending on the temperature and availability of the nuclear power plants) can also cause load flows and problems on the Swiss transmission network which could necessitate countermeasures by Swissgrid and close coordination activities with the neighbouring TSOs, in particular RTE (Réseau de Transport d'Electricité).

In view of this situation, the supply situation for the rest of the winter in Switzerland was not tight either. In terms of energy, the main disruptive factor was the supply situation in France, but the reservoirs were still at an average level by the end of January 2021. With regard to the network, the unscheduled load flows remain an issue, but Switzerland is generally better placed to intervene in tight network situations thanks to the trilateral redispatch solution.

3.3 Unscheduled flows

In an interconnected network, the actual (physical) flow of electricity never corresponds exactly to the traded and scheduled flows. The deviation between physical and trade flows through the transmission network as an unscheduled flow, e.g. up to 30 per cent of the quantity traded from Germany to France physically flows through Switzerland at present.

The introduction of flow-based market coupling in the Central Western Europe region, excluding Switzerland, significantly increased trading capacities from Germany to France, which in turn causes some bottlenecks in the Swiss network, particularly in winter.

Long-standing efforts on the part of Swissgrid and ElCom are slowly starting to bear fruit. The problem is now also being acknowledged by Switzerland's neighbouring countries. As a short-term measure, the transmission network operators and regulators of France, Germany and Switzerland then developed a solution for the winter of 2019–20 which called for a trilateral redispatch. Under this solution, if unscheduled flows from the day-ahead market cause an overload, Swissgrid can simultaneously instruct France and Germany to increase or reduce their production in order to relieve the bottleneck in Switzerland. This instrument has been available to Swissgrid since December 2019. These unscheduled flows did not cause major problems in 2020, probably also due to the generally lower load as a result of the coronavirus pandemic.

At the same time, work is being done to devise a permanent solution that not only targets the symptoms. To this end, Swissgrid and ElCom are in contact with the committees of the CORE (for the Swiss northern borders) and ITN (for the border with Italy) capacity calculation regions and the EU. The goal is to ensure that flows in the various countries can be factored into the capacity calculations in a balanced way so that unscheduled flows of this nature only cause bottlenecks in exceptional circumstances. Switzerland should also be taken into account in future in the methods related to the capacity calculation e.g. redispach and countertrading. The aim is to conclude technical agreements with the countries from these two capacity calculation regions. Such agreements are also required from an EU perspective for Switzerland's neighbouring countries to take the flows with Switzerland into account in their respective 70 per cent target.

While this process is relatively well advanced with ITN, some progress and reconciliation with CORE was also achieved in 2020, but a solution is still not a realistic prospect in the short-term and far from guaranteed long-term either.

Another problem of unscheduled flows that jeopardise system security is presented by the platforms for trading balancing power which have been in operation since 2020. If Switzerland is not involved in these platforms, unscheduled electricity flows occur near to the time of supply for which no effective countermeasures currently exist. This will also be a major issue in 2021.

3.4 Cyber security

Electricity networks are increasingly controlled and monitored using smart information and communications technology. These systems offer the network operator more control options and enable more efficient system operation as well as the provision of new services. However, this increasing networking of information technology increases threats, such as the risk of hackers penetrating the electricity network and compromising the availability[1], integrity[2] and confidentiality[3] of data or damaging technical installations. Such an incident could lead to considerable financial damage and, above all, to reputational damage on the part of the network operator concerned. In extreme cases, a large-scale power outage according to the scenarios of the Federal Office for Civil Protection (FOCP) could lead to injuries or even deaths as well as environmental damage. This makes cyber security a key issue in ensuring supply security. For example, the office network of ENTSO-E fell victim to a cyber attack in the year under review. This system is not connected to the operational systems of the TSOs. Swissgrid nevertheless deactivated connections with ENTSO-E until the IT systems affected had been restored for security reasons.

According to Article 22 paragraph 3 of the Electricity Supply Act, ElCom is responsible for monitoring the electricity markets with a view to ensuring secure and affordable supply in all parts of Switzerland. This implicitly includes information technology risks and therefore also regular monitoring of the state of network operators' cyber security.

For this reason, ElCom decided in 2018 to provide an overview of the status of organisational and technical cyber security measures at the 92 largest network operators. ElCom summarised the results of this survey in its 'Cyber Security 2019' report and formulated recommendations on the basis of this report. It does not examine the status of the entirety of their cyber security measures. Instead, it focuses on risk management, raising employee awareness and dealing with external service providers, as well as fundamental issues relating to network architecture and the detection of cyber incidents. The recommendations only apply to the topics examined. The following recommendations therefore only apply to the subject areas examined, which ElCom based on existing standards and industry documents.

Increasing interconnection means that cyber security is continuing to grow in importance. ElCom wElComes the efficient, risk-based implementation of the Association of Swiss Electricity Companies (VSE) industry documents 'ICT Continuity', 'Handbuch Grundschutz für Operational Technology in der Stromversorgung' (Handbook on Basic Protection for Operational Technology in Electricity Supply) and 'Richtlinien für die Datensicherheit von intelligenten Messsystemen' (Guidelines for the Data Security of Intelligent Measurement Systems) in accordance with the FOCP's CIP guidelines. ElCom also requires that these be implemented. Based on the results of the survey, ElCom considers the improvement of organisational measures, in particular the development of guidelines and training programmes, and the protection of operation technology (OT) as well as guaranteeing supply through a redundant system to be of central importance. ElCom wElComes the efforts to establish an industry computer emergency response team (CERT) in line with the principle of subsidiarity.

1 Availability means that the systems and data to be protected can be accessed and used by an authorised entity upon request.

2 Integrity means the correctness and completeness of the processed data and the correct functioning of the systems.

3 Confidentiality refers to the protection of systems and data against unauthorised access by persons or processes.

3.5 Quality of supply

3.5.1 Network availability

The quality of supply is to some extent defined by the degree of network availability. In Switzerland, the development of network availability has been closely monitored since 2010. For this purpose, ElCom uses the two internationally recognised indices, SAIDI (System Average Interruption Duration Index) and SAIFI (System Average Interruption Frequency Index). SAIDI quantifies the average duration of interruptions per end consumer, while SAIFI indicates the average frequency of interruptions per end consumer. Figures concerning all unscheduled interruptions that last longer than three minutes and occur as the result of natural phenomena, human error, operational problems or external influences, are integrated into the calculations for both indices.

For the purpose of monitoring network availability, ElCom evaluates interruptions to supply from the 95 largest Swiss network operators, which account for 88 per cent of the country's energy turnover via their networks. In 2019, the 95 largest network operators experienced 5,780 unscheduled interruptions (cf. Table 1), a slight increase compared to the previous year. However, the number of interruptions on its own is not sufficient to make reliable conclusions regarding network availability. It is only when this figure is combined with the duration of interruptions and the number of end consumers that are affected that such an evaluation can be made.

	2016	2017	2018	2019	2020[1]	Unit
Interruptions	4,328	4,814	6,495	5,780		Number
SAIDI	9	10	14	8		Minutes per end consumer
SAIFI	0.20	0.21	0.27	0.17		Interruptions per end consumer

1 The data relating to supply security in 2020 will be published in June 2021 on ElCom's website.

Table 1: Development of supply quality in Switzerland from 2015 to 2019 (unscheduled interruptions only)

In 2019, the average duration of unscheduled interruptions per end consumer was 8 minutes. This figure represents a nationwide improvement of six minutes compared to the previous year. The average frequency of unscheduled interruptions per end consumer in 2019 was 0.17, which was higher than in the previous year. Network availability remains extremely good in Switzerland. The lower SAIDI and SAIFI figures in 2019 are primarily attributable to the absence of extraordinary natural phenomena. The high quality of supply in Switzerland is also confirmed in international comparisons. According to the 'CEER Benchmarking Report 6.1 on the Quality of Electricity and Gas Supply', Switzerland is among those countries with the highest quality of electricity supply in Europe.

3.5.2 Import capacity

Alongside network availability, the available import capacity is also a key factor for Switzerland's electricity supply security. The Swiss electricity sector can also conclude transactions on the European market through import and export capacity and take advantage of its competitiveness. ElCom therefore monitors the development of available cross-border net transfer capacity, which comprises import NTC and export NTC.

NTC indicates the level of transport capacity that can be used by traders for cross-border commercial exchanges with neighbouring countries, both for imports and exports, without infringing the safety standards. Swissgrid defines the level for the four Swiss borders together with the operators of the neighbouring transmission networks. The proportion of the import and export capacity of the Principality of Liechtenstein, which belongs to control zone Switzerland, is included in the calculation of the import and export capacity from Austria.

Table 2 presents an overview of the trend in available import capacities, including for all borders as a group, for the neighbours to the north, as well as for each of the individual borders between Switzerland and its neighbouring countries. Looked at on an hourly basis, the NTC can be more volatile than reflected by average import and export figures shown for the year.

IMPORT NTC (MW)	2016	2017	2018	2019	2020
Total	**6,962**	**6,987**	**6,756**	**6,657**	**6,982**
Neighbours to the north (AT, DE, FR)	5,245	5,265	5,034	4,936	5,260
France	2,974	3,007	2,772	2,678	2,944
Germany	1,468	1,501	1,396	1,343	1,264
Austria	803	757	866	915	1,052
Italy	1,717	1,722	1,722	1,721	1,722

Table 2: Available import capacity (NTC) for Switzerland, 2016 to 2020 (average of hourly NTC for the year)

Because the exchange of energy with neighbouring countries primarily takes place via the 380kV network, but imported electricity is supplied to end customers in Swiss distribution networks via the 220kV network, it is the available capacity of the coupling transformers (380/220kV) above all that determines Switzerland's maximum possible import capacity. Along Switzerland's northern border, import capacity from France in 2020 rose slightly (but remained below 3,000MW on average), but declined further from Germany on average which was nevertheless offset by the increase in import capacity from Aust-

ria whose wholesale market was decoupled from the German market in October 2018.

Conversely, import capacity from Italy remained relatively stable on average between 2016 and 2020. In normal circumstances this is still less relevant to Switzerland's supply security than the import capacity on the northern border. However, as the markets become more volatile and Germany and France, to some extent, phase out their nuclear and coal-fired power plants (Fessenheim nuclear power plant was permanently decommissioned in 2020) but also in view of the decommissioning of the Mühleberg nuclear power plant (in December 2019), imports from Italy will become more important in future too. Measures to increase import capacity from Italy have already been introduced and are likely to enter into effect from spring 2022.

3.5.3 Export capacity

In view of the high transit flows through Switzerland (from north to south), the available export capacity, particularly to Italy and France, is also an important factor for the network and supply security of Switzerland and its neighbouring countries (see Table 3). Moreover, the extent of this export capacity to Italy has a major impact on the utilisation of Switzerland's import capacity on its northern borders with France, Germany and Austria.

EXPORT NTC (MW)	2016	2017	2018	2019	2020
Total	**9,262**	**9,129**	**8,769**	**7,933**	**8,658**
Neighbours to the north (AT, DE, FR)	6,276	6,207	6,115	5,415	5,928
France	1,125	1,180	1,184	1,163	1,136
Germany	4,000	4,000	3,888	3,491	3,708
Austria	1,151	1,027	1,043	761	1,084
Italy	2,986	2,922	2,654	2,518	2,730

Table 3: Trend in Switzerland's export capacity (NTC) 2016 to 2020 (average of hourly NTC for the year)

In 2020 export capacity to Italy remained lower on average than in 2016 and 2017, but higher than in 2018 and 2019, not least because of frequent capacity reductions ordered by Italy's TSO to ensure stability on Italy's domestic network, especially during periods of low consumption in Italy (e.g. on weekends, during Easter or summer holidays), but also because Italy was the first European country to be severely hit by the coronavirus pandemic. This quickly plunged the country into an economic crisis which led to reduced network load and lower power consumption.

In 2020, the export NTC to Germany was lower than in 2016 to 2018 but higher than in 2019. Conversely, export capacity to Austria almost returned to the level of 2016 and reached almost 1100MW on average.

The calculation of export capacity to Germany was changed to a new, more accurate method in the course of 2020. ElCom provided extensive support with the introduction of this new method. NTC for import and export with load-flow-based scenarios will be further optimized in future as part of European cooperation. Overall, such scenarios will enable the gradual integration of the national markets with a view to creating a European electricity market to optimise the challenging management of the limited availability of Switzerland's cross-border capacities.

3.5.4 Retrofitting decentralised energy generation plants

Many of the photovoltaic systems (PV systems) installed in the Swiss control zone and in the entire interconnected European network are configured so that they switch off completely if the frequency reaches 50.2Hz. This suddenly eliminates a relevant amount of electricity generation from the grid and behaviour such as this could endanger the system. In order to contain this problem, steps must be taken throughout Europe (including in the Swiss control zone) to ensure that no further systems are connected to the grid unless they comply with the necessary protection settings.

ElCom therefore issued Directive 1/2018 on 6 March 2018 and published it on its website. Additionally, a retrofit programme was initiated in a letter sent to distribution network operators on 15 June 2018, which addresses the issue of existing PV systems shutting down in response to over-frequency. This was initially limited to PV systems with a connected capacity of ≥ 100kVA (Retrofit 1), since this approach would achieve a great impact quickly but with relatively little effort.

The target set by ElCom of a maximum of 200MVA output from non-compliant PV systems was not met with the Retrofit 1 programme. At the end of 2019, ElCom therefore decided to extend the Retrofit programme to all PV systems with a connected capacity of over 30KVA (Retrofit 2). The Retrofit 2 programme was launched in January 2020 and obliges network operators to ensure the compliance of the PV systems concerned in their network area by the end of 2022 at the latest.

3.6 System services

In order to guarantee supply security, sufficient capacities have to be available for the production of electricity, and there have to be adequately dimensioned transmission and distribution networks for supplying energy to end customers. Since electricity cannot be stored in the network, the quantity of energy fed into the grid must always be equal to the quantity that is taken out of it. Despite the high-quality production and consumption forecasts provided by energy suppliers, precise planning for this purpose is not pos-

sible. This means that even minor deviations from the targeted quantities have to be balanced on an ongoing basis.

As a rule, this balancing process is performed by adjusting the production of electricity to the current level of consumption. This constant balancing of production and consumption calls for power plants whose production can be efficiently regulated. The balancing power provided by these power plants is purchased in a market-based procedure, and the associated costs have to be passed onto end customers via the system services tariff, which is used for charging for other services that are required for the safe operation of the network, including balance management, self-contained start and independent operation capability, voltage stability and compensating active power losses. However, balancing power represents the most important segment of system services in financial terms. In the year under review, the costs for balancing power amounted to around CHF 49 million and were thus lower than they have ever been before. Figure 1 shows the development of prices for balancing power over the past five years. The increase in 2016 was attributable to the tense supply situation in Switzerland during the winter. A comparison over a period of several years indicates that the prices for balancing power have fallen since 2016.

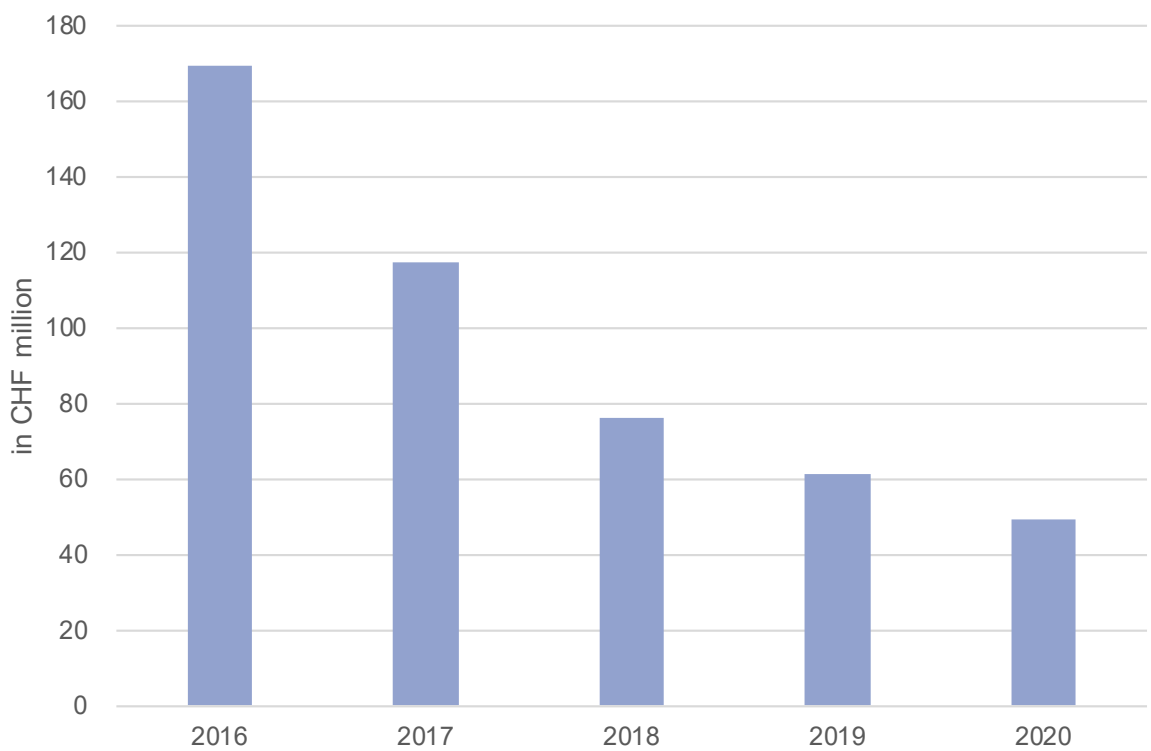


Figure 1: Development of the price of balancing power from 2016 to 2020

Since 2016, Swissgrid has been procuring a portion of the balancing power for the spring in advance. This assures the availability of water reserves while also increasing planning security for the operators of storage power plants. Advance procurement is important for risk management and for the players involved to gain a better understanding of their specific roles. In the year under review, costs related to advance procurement amounted to around CHF 12 million which meant they were lower than those incurred in 2019 of around CHF 16 million.

In 2019 and 2020, Swissgrid developed the balancing products to increase liquidity. Changes were made to how secondary balancing power is purchased in 2019. Secondary balancing power had been purchased as a symmetrical product until mid-2018, meaning that the provider had to offer the same amount of positive and negative secondary balancing power. The switch to an asymmetrical product now makes it possible for providers to only offer positive or only negative secondary balancing power. This also enables Swissgrid to make more targeted purchases of the quantities needed. The way in which primary balancing power is purchased was also changed in the year under review. This is now procured daily in six four-hour blocks. To further increase liquidity, balancing products will also be purchased to a lesser extent via international platforms, namely primary balancing power (FCR) and, since October 2020, also tertiary balancing energy (Replacement Reserve).

4 Networks

Switzerland's high-voltage grid is over 6,000km in length which is roughly the distance between Bern and New York.

4.1 Facts and figures relating to Switzerland's electricity networks

The Swiss electricity network extends over a total length of 210,205 kilometres, which is around five times the circumference of the Earth. Of this, the local distribution networks (network level 7) account for 71 per cent, while Swissgrid's national transmission network accounts for just over three per cent. As part of regular cost accounting reporting, ElCom surveys the Swiss electricity networks according to various equipment classes each year. The number of network operators in Table 4 refers to the network operators that have provided information on the equipment classes. In recent years, there has been a slight increase in the quantity of installations at the plants in most categories. As expected, the number of overhead lines and mast transformer stations has fallen as a result of progress in cabling, while the number of cables and transformer stations has increased. The electricity network grew by three per cent between 2015 and 2019. In 2019, there were just under 5.7 million end consumer measurement points and just over 5.6 invoice recipients. According to the Federal Statistical Office (FSO), there were just over 0.6 million companies in Switzerland (2018) while the population of Switzerland stood at just under 8.6 million (2019). Population growth between 2015 and 2019 was just over three per cent.

Type of installation	2015	2016	2017	2018	2019	Unit
Pipe system, high voltage (NL 3), medium voltage (NL 5) and low voltage (NL 7)	119,621	119,277	120,509	122,616	124,941	km
Cable, high voltage (NL 3)	1,911	1,924	1,992	1,906	2,053	km
Cable, medium voltage (NL 5)	33,870	34,044	34,675	35,307	36,433	km
Cable, low voltage (NL 7)	77,590	78,011	79,269	80,029	82,179	km
Cable, connection to household (NL 7)	53,931	54,240	55,011	57,091	58,891	km
Supply line and cable (NL 1)	6,750	6,629	6,590	6,652	6,717	Line-km
Overhead line, high voltage (NL 3)	6,904	6,738	6,791	6,777	6,788	Line-km
Overhead line, medium voltage (NL 5)	10,590	10,061	9,784	9,458	9,346	Line-km
Overhead line, low voltage (NL 7)	10,653	11,621	8,150	7,663	7,899	Line-km
Substation, NL 2, NL 3, NL 4 and NL 5	963	893	1,056	819	825	Quantity
Transformer, NL 2	146	148	151	145	147	Quantity
Switching field, NL 2[1]	165	159	164	167	163	Quantity
Transformer, NL 3[2]	78	79	77	76	76	Quantity
Switching field, NL 3[1]	2,606	2,577	2,600	2,586	2,680	Quantity
Transformer, NL 4	1,143	1,142	1,150	1,143	1,153	Quantity
Switching field, NL 4[1]	2,078	2,011	2,078	2,163	2,929	Quantity
Transformer NL5[2]	190	75	72	73	74	Quantity
Switching field, NL 5[1]	28,226	30,836	29,934	30,685	39,486	Quantity
Transformer station, NL 6	53,405	53,024	53,144	53,730	54,850	Quantity
Mast transformer station, NL 6	5,748	5,402	5,457	5,265	5,487	Quantity
Cable distribution box, low voltage (NL 7)	174,897	174,377	174,917	177,430	182,325	Quantity
Measurement points (all consumers)	5,452,650	5,512,743	5,573,672	5,635,760	5,779,344	Quantity
No. of network operators	649	643	636	630	632	

1) Switching fields encompass the upper and lower field at the respective network level, except in the case of network level 2, for which the upper switching field is allocated to network level 1 in accordance with Article 2, paragraph 2 of the Electricity Supply Ordinance.

2) Despite the fact that transformation generally takes place on the even network levels, transformation also happens on odd levels in certain cases – such as to balance out different voltage series within the same network levels (e.g. at NL 3, between 110 and 50kV).

Table 4: Installations in the Swiss electricity networks

The total value of the Swiss electricity network is just under CHF 21.7 billion. Around 90 per cent of this is attributable to the distribution network. The residual value of the installations in the distribution network has increased slightly by around CHF 0.4 billion compared to the previous year, while at the same time the revenue from end consumers for the use of the distribution network (excluding fees and payments to the state and charges for renewable energy) remained at the same level as in the previous year at CHF 3.5 billion.

The following figures show for the distribution network how ownership and network use revenues are divided according to the size of the companies. In both figures, the 100 largest network operators are divided into groups of ten, and all the remaining operators are grouped together in a separate category (Rest). The ten largest companies (dark blue) therefore own just under 42 per cent of all declared assets (Figure 2). This is about the same as the next 90 companies. The approximately 530 small network operators (Rest – shown in light blue) have a share of 15 per cent, roughly on a par with five years earlier.

A similar distribution can be seen in network use remuneration (Figure 3). The ten largest (dark blue) received 44 per cent of all proceeds, roughly on a par with five years earlier. The share of the remaining group of small network operators (light blue) fell slightly and stands at 14 per cent.

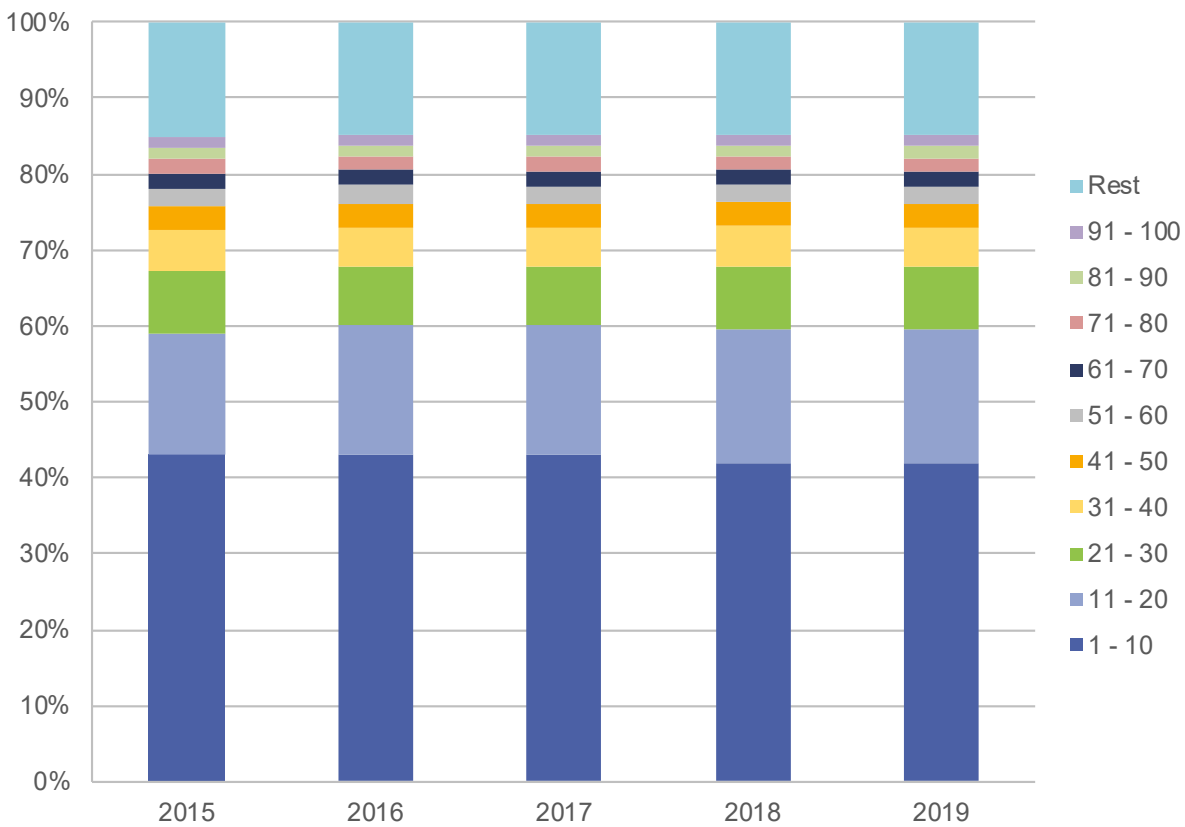


Figure 2: Proportional holdings in the distribution network by company size

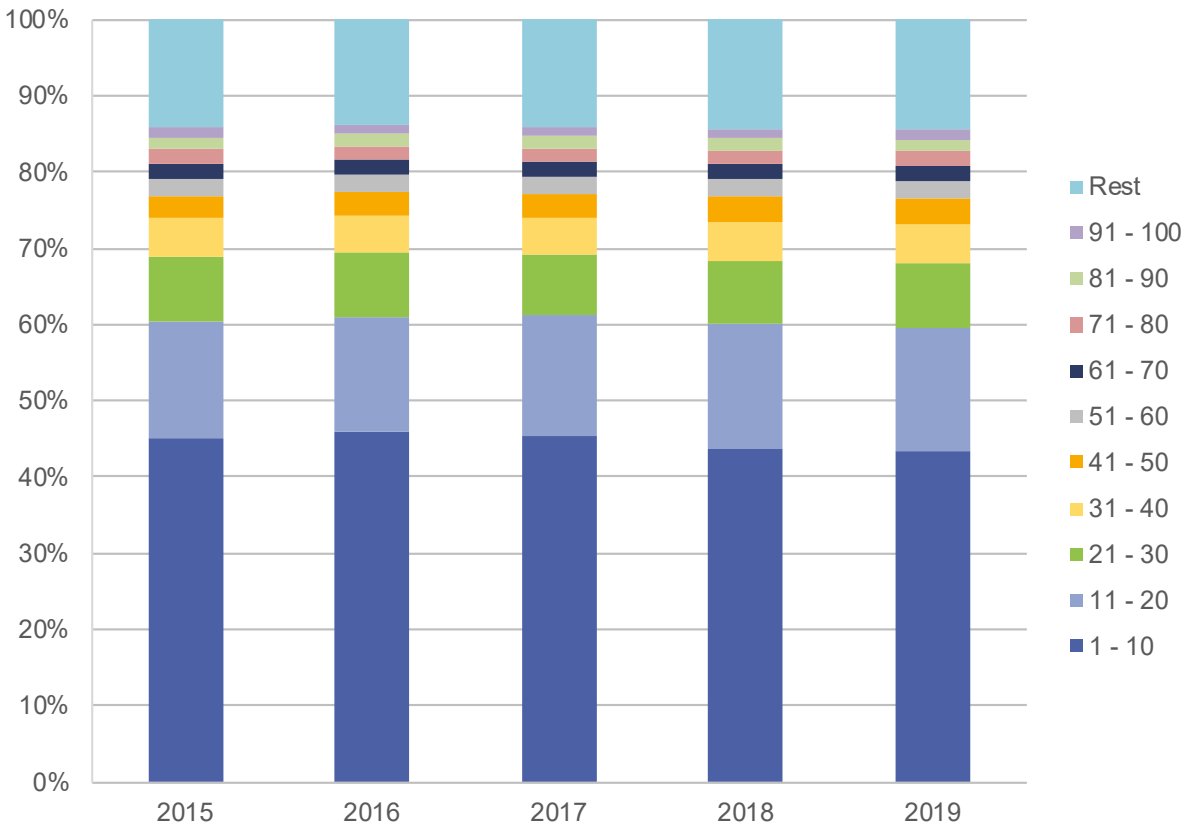


Figure 3: Proportion of network utilisation revenue (distribution network) by company size

The distribution network operators declared total network costs (including fees and charges as well as surcharges on the transmission network) of over CHF 5.1 billion for 2019. These are based on the operating and capital costs of a "secure, high-performance and efficient network", plus tax expenditure and fees and payments to the state (including surcharges on the transmission network). The largest component of distribution network costs is operating and capital costs, which account for 67 per cent of the total, or CHF 3.4 billion (Figure 4). If this amount is added to the direct taxes and compared with the network use remuneration mentioned above, the shortfall amounted to around CHF 38 million for 2019. The share of fees and charges has risen by 1 percentage point to just under 32 per cent over the last five years. This group includes fees and charges demanded by cantons and communes, as well as national legally required charges for renewable energies. The increase can be primarily explained by the gradual increase in the national legally required charges for renewable energies from 2014. However, the communes and cantons have also increased their fees and charges.

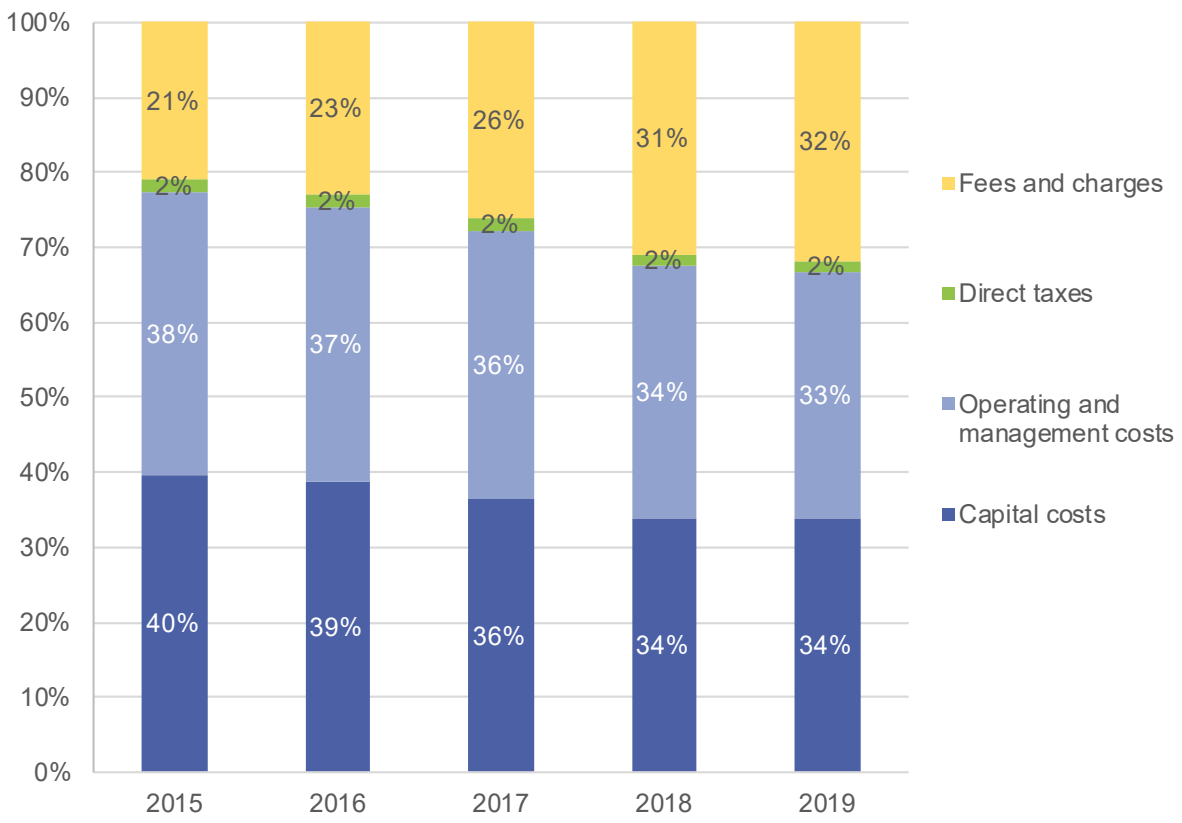


Figure 4: Breakdown of distribution network costs

In its 2019 Annual Report, Swissgrid reported network use costs of CHF 458 million and system services costs of CHF 180 million. If these accumulated costs of over CHF 0.6 billion for the transmission network are added to the distribution network costs amounting to just over CHF 5.1 billion, this results in total costs of just under CHF 5.7 billion for the Swiss electricity network. Figure 5a shows how these are distributed among the individual network levels (NL). The local distribution network (NL 7) is by far the most costly, accounting for more than half of the total. Another fifth of the costs are incurred on NL 5. By comparison, the shares of costs at the transformation levels (NL 2, NL 4 and NL 6), which form the links between the various transmission levels, were low. The share of costs of the high-voltage network operated by Swissgrid (NL 1, including system services) was 16 per cent. Figure 5b shows the distribution of network costs excluding fees and charges. It is clearly evident that the costs in Swiss francs and their share of total costs declined significantly on NL 7 compared to Figure 5a. This is because fees and charges are primarily incurred on NL 7 and to a lesser extent on NL 5 and NL 3.

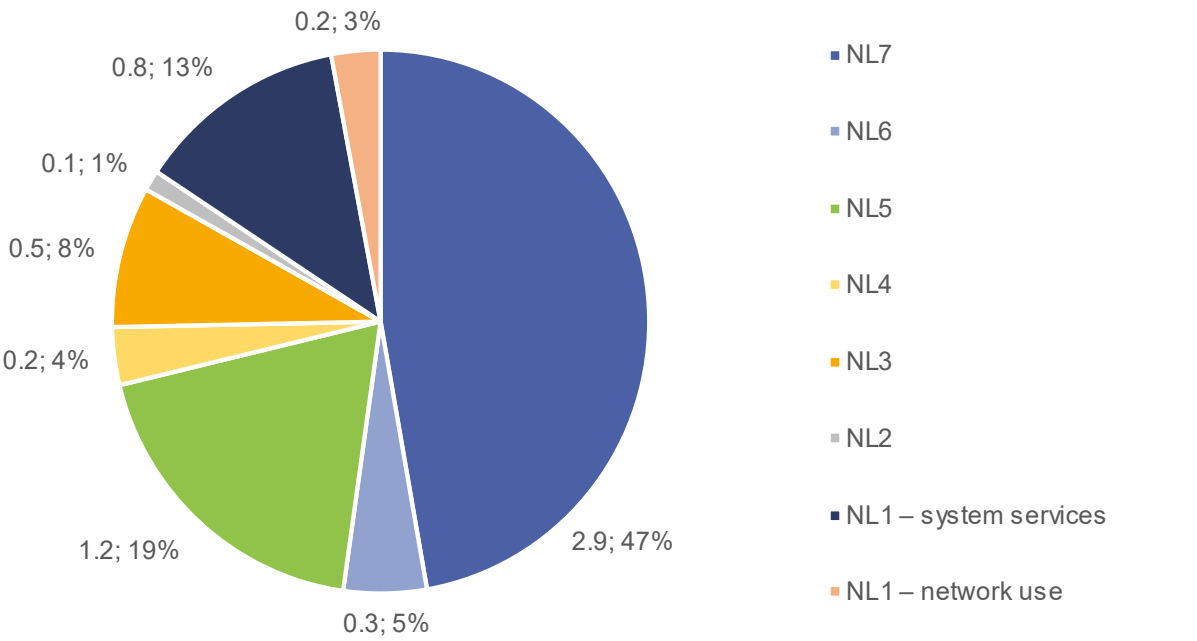


Figure 5a: Costs in CHF billion and breakdown of the shares of costs of the Swiss electricity network (including fees and charges as well as surcharges on the transmission network) by transmission network (NL 1) and distribution network (NL 2 to NL 7) in 2018.

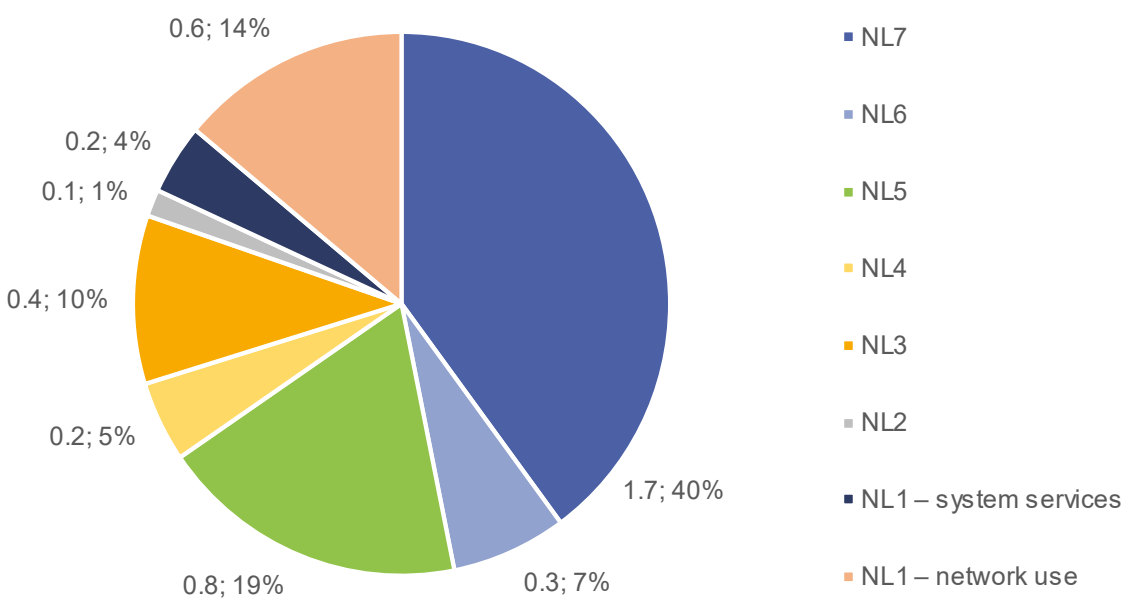


Figure 5b: Costs in CHF billion and breakdown of the shares of costs of the Swiss electricity network (excluding fees and charges as well as surcharges on the transmission network) broken down by transmission network (NL 1) and distribution network (NL 2 to NL 7) in 2018.

4.2 Network expansion and planning

4.2.1 Long-term planning of the transmission network

In accordance with Article 9a of the Electricity Supply Act, which entered into force on 1 June 2019, the Federal Office of Energy (SFOE) develops scenarios that lay the basis for transmission and distribution network planning. These must take the federal government's energy policy objectives, general macroeconomic data and the international environment into account. When developing these scenarios, the SFOE consults with the cantons, the national grid operator, the other network operators and other involved parties as needed. Article 5a of the Electricity Supply Ordinance states that scenarios must be reviewed every four years and updated where necessary. According to the SFOE, the first scenarios are expected to be ready in 2021.

Article 9d, which enters into force on 1 June 2021, stipulates that the national grid operator must submit its long-term plan to ElCom for inspection within nine months of the Federal Council's approval of the most recent scenarios. The content of long-term planning is described in Article 6a of the Electricity Supply Ordinance, which will also enter into force on 1 June 2021.

Since no scenarios are available at the present time, Swissgrid's long-term planning is based on the Strategic Grid 2025 report, which was completed in early 2015. With this report, the long-term planning of the transmission network has now been coordinated across Switzerland, and this essentially meets the requirements specified in Article 8 para. 2 and Article 20 para. 2a of the Electricity Supply Act. From ElCom's perspective, the Strategic Grid 2025 report not only represents a significant milestone in the planning of the entire Swiss transmission network, but it can also contribute towards improving cross-border coordination in the areas of financing and use of the grid. The magnitude of the investments for the expansion and maintenance of the grid appears to be plausible. The preservation of the value of the transmission network can be assured on the basis of the defined planning.

The Strategic Grid 2025 report takes due account of the requirement for balanced investments as specified in Article 22 para. 3 of the Electricity Supply Act. However, the uncertainty with respect to efficiency is probably considerably greater than the comprehensive, exact calculations regarding the indicated net benefit might suggest. For further discussion within the scope of long-term planning and the evaluation options in the sectoral plan and planning approval procedures, the uncertainties need to be quantified with the aid of sensitivity analyses. This will increase the meaningfulness of the cost/benefit analysis. With respect to cross-border financing, discussions concerning the methodology need to be intensified between Swissgrid and ElCom, as well as within all relevant bodies. Based on the report released by Swissgrid, it is now possible to assess the previously difficult-to-evaluate criterion of efficiency using a method that is as objective as possible and based on transparent assumptions. While this should be wElComed, the uncertainties with respect to evaluation of the benefits are also reflected in the criterion of efficiency. In view of this, the same sensitivity deliberations have to be applied here as those regarding the uncertainties relating to the benefits.

4.2.2 Long-term planning of the distribution networks

Since 1 June 2019, Article 9b of the Electricity Supply Act has stipulated that each network operator must specify which principles are to be applied for network planning. When specifying these principles, they must specifically take account of the fact that, as a general rule, the network may only be expanded if measures to optimise the network or increase its capacity are insufficient for guaranteeing a secure, high-performance and efficient network for the entire planning horizon. Paragraph 3 of Article 9b states that ElCom may define minimum requirements in this regard. According to paragraph 4, the Federal Council may require network operators to publish these principles.

Furthermore, Article 9c of the Electricity Supply Act establishes network operators' obligation to collaborate for the purpose of expansion planning. This also includes the obligation to provide one another with any information required for this purpose at no charge. To this end, they must include the cantons affected and any other parties concerned in the planning process where appropriate.

Article 9d will enter into force on 1 June 2021; this article stipulates that the network operators must prepare a ten-year development plan (long-term plan) based on the scenarios and in accordance with further requirements for their network area for any of their networks with a nominal voltage higher than 36kV. The long-term plan must describe the projects envisaged and explain the extent to which they would be effective and appropriate from both an economic and technical standpoint. Additionally, they must indicate which network development measures are envisaged beyond that ten-year timeframe. Article 6d para. 2 of the Electricity Supply Ordinance, which also enters into force on 1 June 2021, states that the long-term plans for distribution networks with a nominal voltage higher than 36kV must be drawn up within nine months of the Federal Council's approval of the most recent scenarios.

In accordance with Article 8 para. 2 of the Electricity Supply Act, network operators are obliged to carry out long-term planning in order to maintain secure, high-performance and efficient network operation. This obligation applies to networks with a voltage of 36kV or higher. In the view of ElCom, there is no need for action with regard to the fundamental method of preparing long-term planning. Nevertheless, ElCom will address this topic again as soon as the legal framework relating to "intelligent electricity supply networks" has been more clearly defined. For the time being, ElCom recommends that network operators should use the document entitled "Long-term planning for NL 2 and NL 3" published by the Association of Swiss Electricity Companies (VSE) as a reference tool and contact the Technical Secretariat of ElCom if they have any questions regarding the recoverability of the costs associated with the various expansion options.

4.2.3 Participation in the sectoral plan and planning approval procedures

In the procedures for the electricity transmission lines sectoral plan (SÜL) and the planning approval procedure, ElCom checks compliance with the criteria set out in the Electricity Supply Act ("a secure, high-performance and efficient network"). DETEC re-

aches decisions on any differences that arise between ElCom, the SFOE and ESTI based on the agreement of 2018. The regulation on the additional costs factor on the distribution grid entered into force in the year under review. Swissgrid created the modules on the transmission grid at the suggestion of ElCom. This tool will enable the systematic cost calculation of SÜL variants.

In 2020, ElCom participated in the support group for the following sectoral plan procedures (SÜL) as part of its statutory duties: All'Acqua – Magadino, Vallemaggia (SÜL 109) 1st and 2nd stage, Innertkrichen – Ulrichen (SÜL 203), lead-in cable Innertkirchen (SÜL 202.1). As part of the bundling of infrastructure, a service duct for Swissgrid cables in the second Gotthard motorway tunnel, which is to be constructed, was deemed recoverable. The premature expiry of some easements of a Swissgrid line in the communal district of Balzers in Lichtenstein presents an unusual challenge. At distribution network level, ElCom issued opinions on projects involving voltage increases as part of planning approval.

4.3 Investments in the grid infrastructure

As part of its monitoring tasks, ElCom monitors whether sufficient investments are being made to ensure that the electricity network remains in good condition.

4.3.1 Investments in the transmission network

Taking into account the past annual results, the bottom-up budget of CHF 222 million was reduced by CHF 38.4 million to CHF 183.6 million in the form of a realisation discount. Changes to planned investments in the 2019 realisation period were in line with expectations. The lower level of investment was attributable, in particular, to delays with the transformers for UW Chippis and Mettlen due to production errors and to procedural delays and pending authorisations. This concerned projects in Valais (Bâtiaz – Le Verney, Bickigen – Chippis, Mörel – Ulrichen) as well as in other regions of Switzerland (e.g. Pradella – La Punt). The actual investment volume for network projects in 2019 stood at CHF 116.2 million.

4.3.2 Investments in the distribution network

Between 2015 and 2019, the distribution network operators invested around CHF 1.4 billion annually (Figure 6). During this period, write-offs increased from CHF 914 million to over CHF 960 million. As a result, the investment surplus fell from around CHF 533 million to just under CHF 480 million. Since the reliability of Switzerland's electricity networks is very high, also by international comparison (cf. Section 3.5), ElCom still considers the investments in the distribution network to be sufficient.

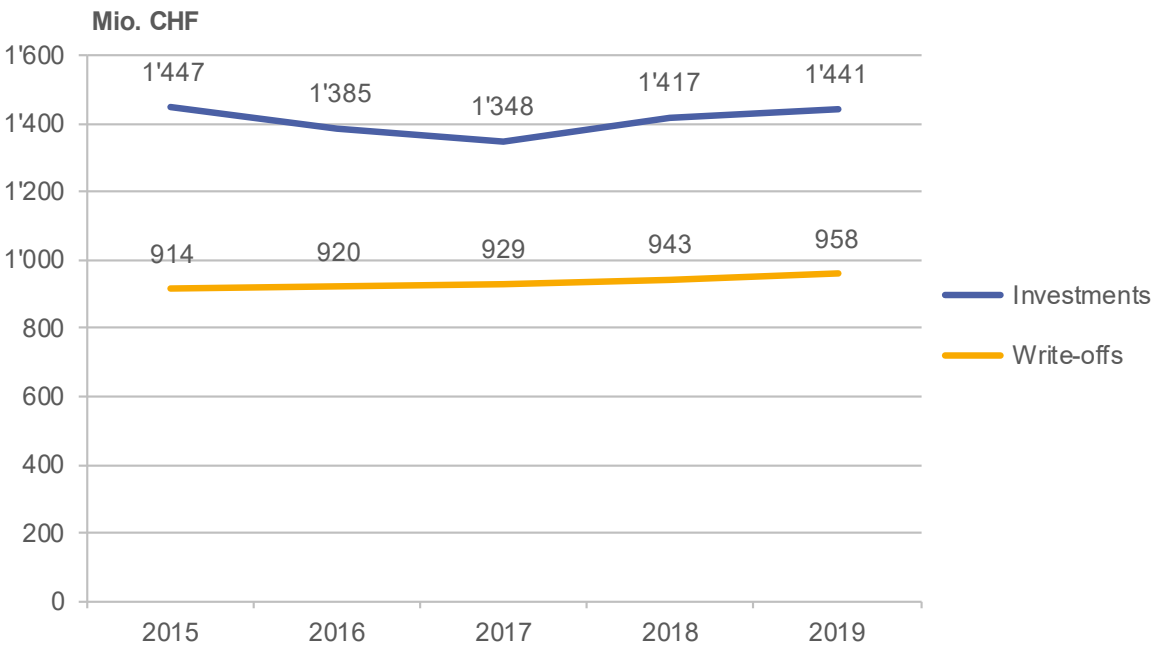


Figure 6: Trend in investments and write-offs in the distribution network

4.4 Increases in network capacity

Additional network capacity may become necessary in order to connect producers of electricity from new renewable energy to the distribution network. Swissgrid refunds the associated costs by incorporating them into its calculation of the system services tariff. This form of remuneration therefore requires the approval of ElCom which relies on a directive that serves as a guideline for network operators when submitting applications. This directive also specifies the criteria for the assessment of such applications. In the year under review, ElCom evaluated 39 applications for the remuneration of costs associated with increases in network capacity. ElCom dismissed two applications since the entitlement to a refund had expired. One network operator challenged the expiry ruling. Proceedings were pending at the Federal Administrative Court at the time of reporting. In the past 11 years, ElCom has issued a total of 971 rulings of this nature (cf. Figure 7, Table 5).

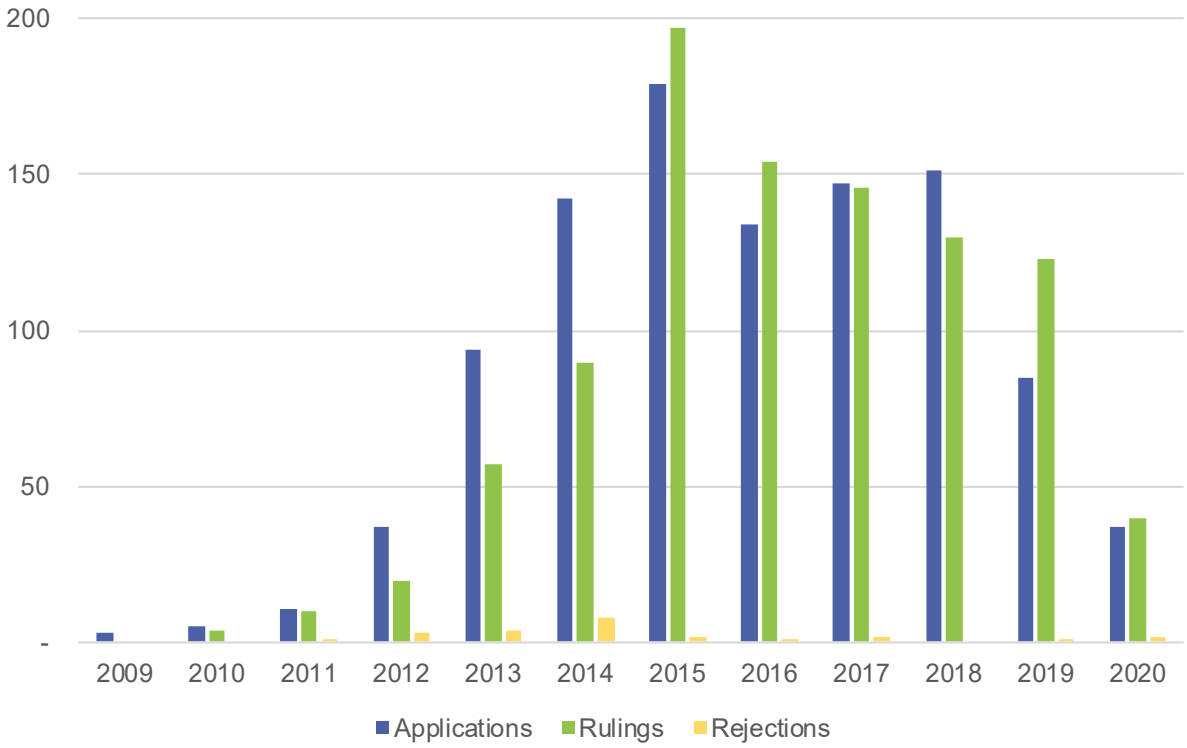


Figure 7: Trend in the number of rulings on network capacity increases

As of the end of 2020, the total costs for network capacity increases reached around CHF 113.1 million, with a total power plant output of 358.6MW. Table 5 presents an overview of the key data relating to network capacity increases in the period from 2009 to 2020.

	Total	PV	Wind	Other[1]
No. of rulings	971	918	4	49
Minimum generator output [kW][2]	4	4	1,500	22
Maximum generator output [kW][2]	74,000	8,303	16,000	74,000
Total generator output [kW]	358,630	155,397	30,000	173,233
Minimum costs [CHF][2]	3,500	3,500	1,151,165	16,697
Maximum costs [CHF][2]	9,262,389	746,912	9,262,389	2,990,952
Total costs [CHF]	113,120,049	69,822,326	19,853,343	23,444,380
Average costs [CHF][3]	116,379	76,142	3,308,891	478,457

	Total	PV	Wind	Other[1]
Minimum relative costs [CHF/kW][4]	3	3	451	3
Maximum relative costs [CHF/kW][4]	9,719	9,719	1,116	4,148
Average relative costs [CHF/kW][4]	315	449	662	135

1) For example, biomass, small hydropower plants, applications involving different types of installations
2) Per application / ruling
3) Corresponds to the average value of approved costs of network capacity increases per ruling
4) Relative costs = ratio of costs to installed capacity

Table 5: Figures on rulings on network capacity increases pronounced between 2009 and 2020

4.5 National grid operator

The former owner of the transmission network was required by law to transfer the entire nationwide network to the national grid operator, Swissgrid. In the year under review, ElCom also determined the regulatory residual value of installations belonging to the transmission network on 31 December 2012 and ruled on the recoverable network costs.

4.6 Rulings and decisions relating to networks

ElCom ruled on the obligation to pay a grid usage charge in relation to concessions in 2018. It decided that in the specific case energy import was not exempt from the payment of network use remuneration in accordance with Art. 14 para. 5 Electricity Supply Act. An appeal was lodged against this ruling. Both the Federal Administrative Court, in its judgment A-5904/2018 of 4 December 2019, and now also the Federal Supreme Court, in its judgment 2C_81/2020 of 13 July 2020, rejected the appeal.

In judgment 2E_1/2019 of 30 April 2020, the Federal Supreme Court upheld ElCom's complaint in accordance with Art. 120 para. 1 let. a of the Federal Supreme Court Act (FSCA) against the Canton of Lucerne and thus ruled on a negative conflict of competence between ElCom and the Canton of Lucerne. This primarily concerned the issue of whether the assessment of network cost contributions lies within the competence of ElCom or at cantonal level. The Federal Supreme Court decided that because the costs for the network connection are part of the development costs traditionally governed by cantonal law, they should continue to be governed by cantonal law and are therefore not part of the network usage costs in accordance with Art. 14 et seq. of the Energy Supply Act. ElCom's competence is restricted to ensuring that costs already individually invoiced for are not charged for again as part of network usage remuneration (Art. 14 para. 3bis Energy Supply Act). However, ElCom is not responsible for determining or monitoring gird connection charges and grid cost contributions which lies within the competence of the cantonal authorities.

5 The Swiss electricity market

The switching station, known as the 'star of Laufenburg' in Fricktal in the canton of Aargau, supports network stability and supply security for Switzerland and Central Europe as a whole.

5.1 Structure of network operators in Switzerland

The number of network operators in Switzerland fell by nearly four per cent to 632 between 2014 and 2019. There has been a clear trend towards fewer network operators for some time now, a trend attributable in part to network takeovers and mergers between communes. According to Switzerland's official communal register, the number of communes declined from 2,352 to 2,205 (six per cent) between 2014 and 2019. During this period, Switzerland's population grew by just over four per cent. This resulted in an increase in the number of end consumers per network operator. However, a typical distribution network operator still remains small (Figure 8) and supplies just over 1500 end consumers on average. Only 82 network operators supply more than 10,000 end consumers, while 12 of them supply more than 100,000 end consumers. Together, Swiss network operators supply more than 5.6 million customers with electricity.

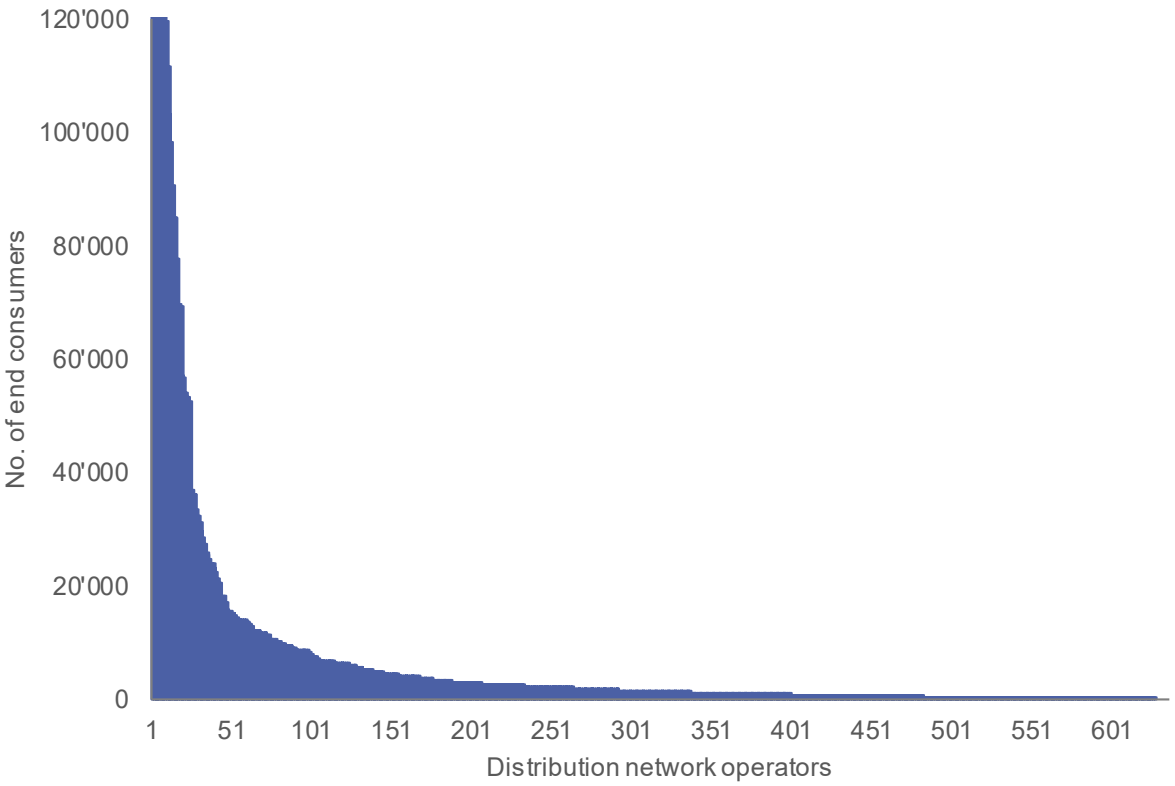


Figure 8: Number of end consumers per distribution network operator. For the sake of readability, the vertical scale has been cut off at 120,000 end consumers; the data cut-off relates to eight distribution network operators

5.2 Market access and switching rate

In this initial stage of liberalisation of the Swiss electricity market, only major consumers (those with an annual consumption of at least 100MWh) may exercise their right to free market access, i.e. they have the right to freely choose their electricity supplier. They have until the end of October of each year to decide whether they want to switch from the basic supply in the following year. Once in the free market, a major consumer can no longer return to the regulated basic supply.

ElCom regularly conducts a survey of the largest distribution network operators in order to determine the number of potential and effective end consumers on the free market. This currently relates to 81 network operators, which supply electricity to a total of 3.9 million or almost 75 per cent of end consumers in Switzerland. Of the 32,708 end consumers with the right to free market access (0.6 per cent of all end consumers), 22,605 (69 per cent) have exercised that right. End consumers in the supply regions of these network operators account for a total of 39.5TWh (around 75 per cent) of end consumption in Switzerland[1]. Just over half the supplied energy (21.8TWh of a total of 39.5TWh) is consumed by end consumers with a right to free market access. Those consumers who have chosen to access the market consume 17.6TWh (or 81 per cent) of the available energy.

The right to freely choose an electricity supplier was exercised on a relatively small scale during the first few years after the market was liberalised (Figure 9). Due to falling market prices, the number of end consumers who exercised their rights increased sharply in the years that followed. In 2019, the proportion of end consumers on the free market fell slightly. This decrease is due to the fact that the number of consumers entitled to free market access has grown faster than the number of consumers who have actually opted for free market access. According to the latest figures, two-thirds of all consumers entitled to market access have exercised this right to date (orange curve). They consume four-fifths as much energy as that consumed by customers with the right to free market access (blue curve). This means that the number of consumers who have not yet exercised their right to market access is relatively low.

1 Average end consumption in Switzerland was 53.7TWh between 2009 and 2019 (Source: Swiss Federal Office of Energy).

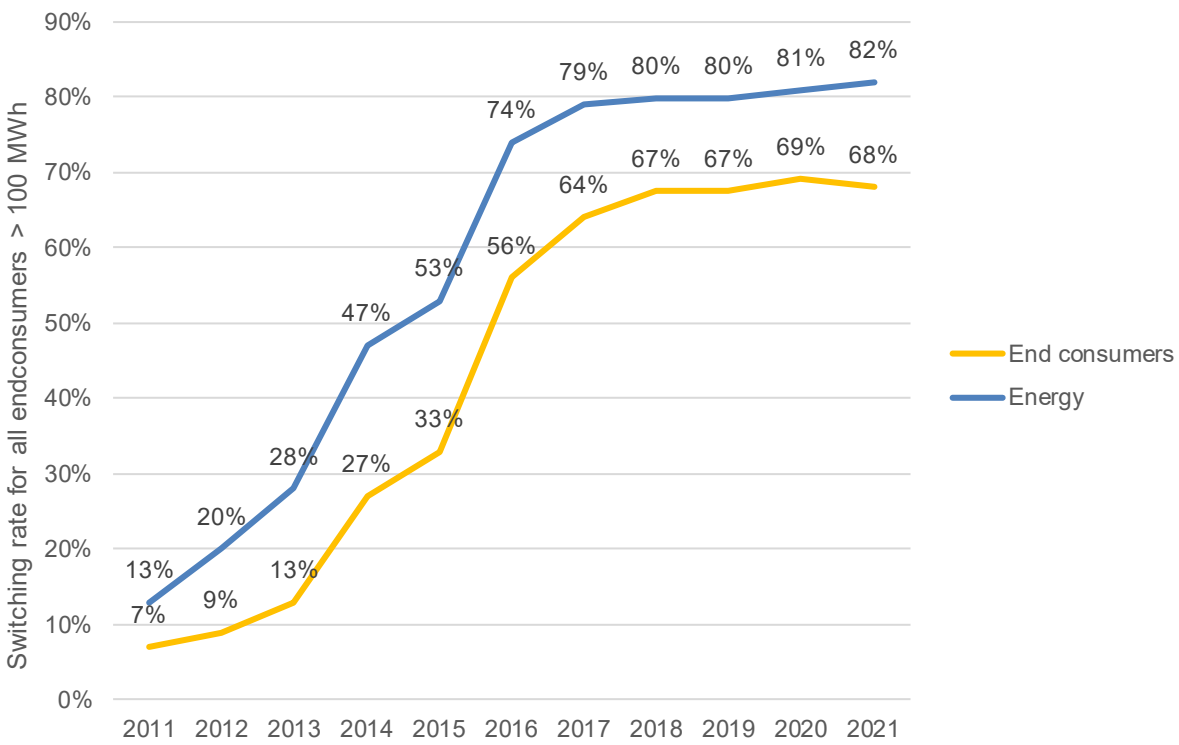


Figure 9: Switching to the free market

Figure 10 below shows the distribution of the quantity of energy sold as a function of the size of the network operator. The largest ten network operators (dark blue) supply just under 42 per cent of the energy sold to end consumers in the distribution network. If expanded to the 50 largest network operators, the share rises to over 70 per cent of energy supplied. The next 50 largest network operators together supply one tenth, while the remaining network operators supply one sixth of the energy consumed by end consumers.

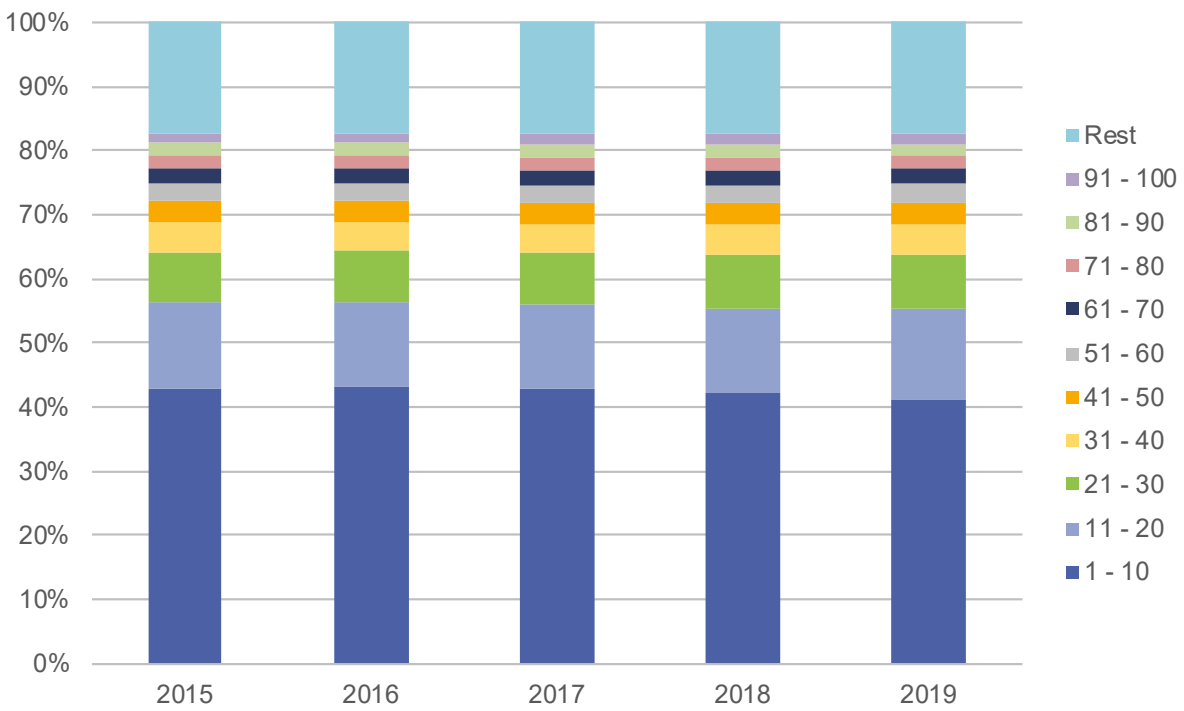


Figure 10: Proportion of energy supplied via the distribution network by company size

5.3 Transmission network tariffs

As the overview in Table 6 shows, the tariffs for the use of the transmission network remain subject to fluctuations. The general system services are identical in the 2021 and 2020 tariffs. The network usage tariffs, which are governed by Art. 15 para. 3 of the Electricity Supply Ordinance (30 per cent working tariff, 60 per cent power tariff, 10 per cent basic tariff) rose year-on-year. However, thanks to the full use of auction proceeds to reduce tariffs, this increase was mitigated. In contrast, the tariff for active power losses was reduced from 0.25 to 0.15 cent/kWh (see also Section 3.6 System services).

	2017	2018	2019	2020	2021
Network use					
Working tariff [cents per kWh]	0.25	0.23	0.19	0.18	0.20
Power tariff [Swiss francs per MW]	41,000	38,200	31,100	28,800	33,600
Fixed basic tariff per exit point	387,700	365,300	288,000	269,400	319,800
General system services tariff [cents per kWh]	0.40	0.32	0.24	0.16	0.16
Individual AS tariff					
Active power losses [cents per kWh]	0.08	0.08	0.14	0.25	0.15

Table 6: Trend in transmission network tariffs for network use and general system services for distribution network operators and end consumers (Source: Swissgrid AG)

In order to compare the tariffs of the various network operators, ElCom converts the tariff components (working, power and basic tariff) into cents per kWh. If the individual tariff components of the transmission network are summarised in cents per kilowatt hour, this results in a figure of 0.91 cents per kWh for 2020 and 0.92 cents per kWh for 2021. On average, a typical household with an annual consumption of 4,500kWh (category H4: 5-room apartment with electric cooker and tumble dryer, but without an electric boiler), pays network use remuneration of 9.6 cents per kWh for the transport and distribution of energy (see Figure 11 in the next section). With respect to the 2021 tariffs, the share represented by the transmission network in the tariffed network costs for these households again amount to around 10 per cent.

5.4 Distribution network tariffs

General tariff structure

Amendments to the Electricity Supply Act of 23 March 2007 and the Electricity Supply Ordinance of 14 March 2008 entered into force on 1 June 2019. ElCom again answered many questions in connection with these amendments, a few of which have been published in the amended notification entitled "Fragen und Antworten zur Energiestrategie 2050" (Questions and Answers on the Energy Strategy 2050). The increase of smart meters on the Swiss distribution network means new tariff models are also increasingly being introduced, which are provided, for example, as optional tariffs to the basic tariff in the network tariffs. Dynamic tariffs are possible which take account of the network load behaviour of end consumers more effectively and enable costs to be saved through differentiated load management and differentiated consumption. This kind of dynamic tariff can be provided subject to certain conditions under the current legal provisions. ElCom issued the notification 'Questions and Answers on New and Dynamic Network Usage and Energy Supply Tariffs' in 2019 which sets out the legal framework in Section 3.3.

In 2021, the median electricity price for a household with consumer profile H4 was 21.2 cents/kWh (Figure 11). Projected over one year, this corresponds to an electricity bill of CHF 954 for a consumption of 4,500kWh. The electricity price is made up of four elements: the network use remuneration, the energy price, the fees paid to the state and the federal charges for the promotion of domestic renewable energy. The network operators must publish the first three components by the end of August before the respective tariff year at the latest. The average price of electricity in 2021 is thus up slightly on the previous year. However, the extent of the changes differs depending on the individual tariff components: while network tariffs rose by 0.1 cent/kWh, energy tariffs remained constant. Charges for renewable energies did not change and the fees paid to the state rose by 0.1 cent/kWh on average. Network operators have declared both the cheapest and their standard products since 2018. The latter is charged to end consumers if they do not actively select another electricity product. This relates exclusively to energy. As a result, comparisons between the tariffs for the distribution network with previous years are only possible to a limited extent from 2018 onwards.

1 Available at www.ElCom.admin.ch > Documentation > Information.

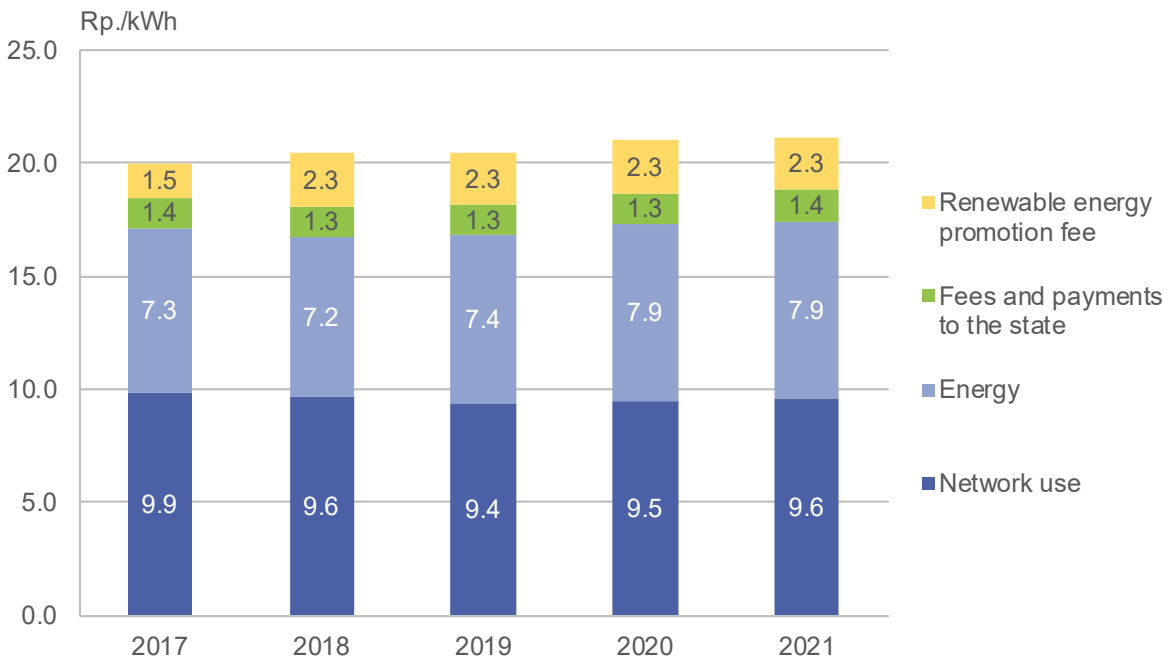
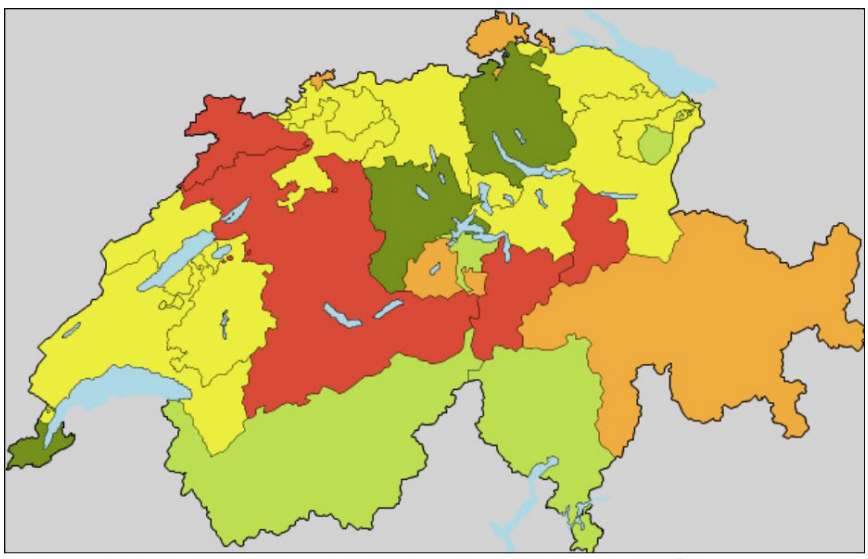


Figure 11: Cost components of the average overall electricity tariff for consumer profile H4 (excluding VAT).

The tariffs in Figure 11 refer to national medians. Considerable differences in tariffs often exist at the cantonal and communal levels. Detailed information about the tariffs of each communality can be found on the ElCom website (www.ElCom.admin.ch), together with an interactive map, by clicking on the link to the overview of electricity tariffs ("Electricity Price – Overview"). The median cantonal tariffs for 2021 are shown in Figures 12 to 15 below. The methodology used for presenting these tariffs has been adapted since the 2018 activity report and year-on-year comparisons are no longer provided. The further away the cantonal tariffs are from the Swiss median, the deeper red (higher tariff) or green (lower tariff) the colouring. The changes in colour therefore depict the development of the cantonal tariffs in relation to the comparable national level. The canton of Basel-Stadt, for example, had relatively high network tariffs in 2021 (orange), while the canton of Geneva, on the other hand, had relatively low network tariffs (light green).

The maps below show the situation in 2021. Network and Energy are the only tariff components that can be directly influenced by network operators and are controlled by ElCom. The median network use remuneration for 2021 is 9.6 cents/kWh and the median energy tariff is 7.9 cents/kWh.

Network use

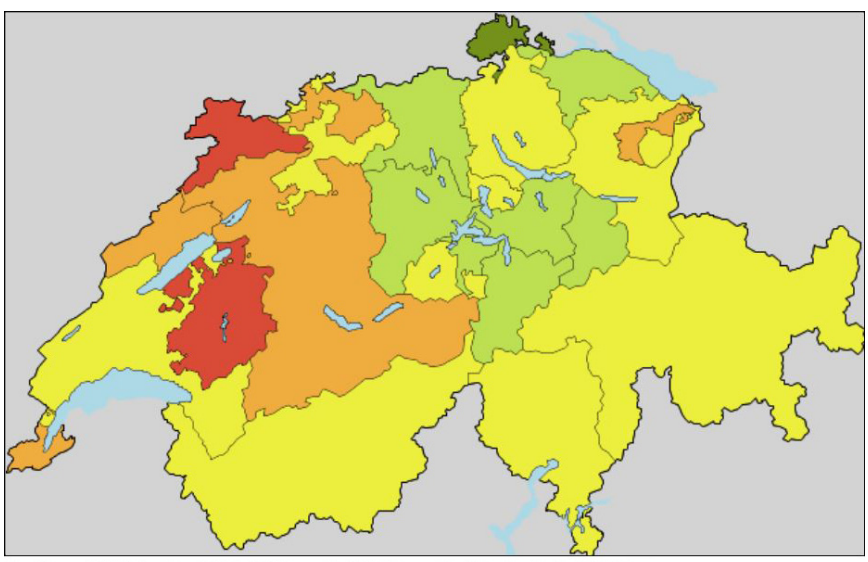


Comparison of tariffs in cents per kWh: category H4, network use for 2021

< 8,05 | 8,05 - 9,00 | 9,00 - 9,94 | 9,94 - 10,89 | > 10,89

Figure 12: Median cantonal tariffs for network use for the H4 consumer profile in 2021

Energy



Comparison of tariffs in cents per kWh: category H4, energy for 2021

< 6,57 | 6,57 - 7,35 | 7,35 - 8,12 | 8,12 - 8,89 | > 8,89

Figure 13: Median cantonal tariffs for energy for the H4 consumer profile in 2021

Fees and payments to the state

Figure 14 shows the median cantonal and communal fees and payments to the state. It does not take into account the uniform Switzerland-wide federal fee for the promotion of renewable energy[1]. Fees and payments to the state are not controlled by ElCom. They are determined in local political decision-making processes. The median value of fees and charges for 2021 is 1.4 cents/kWh. It is noticeable that there are often high and low, but rarely medium amounts (coloured yellow).

1 Since the network surcharge is uniform throughout Switzerland, it is not shown here. However, the total is depicted in Figure 15.

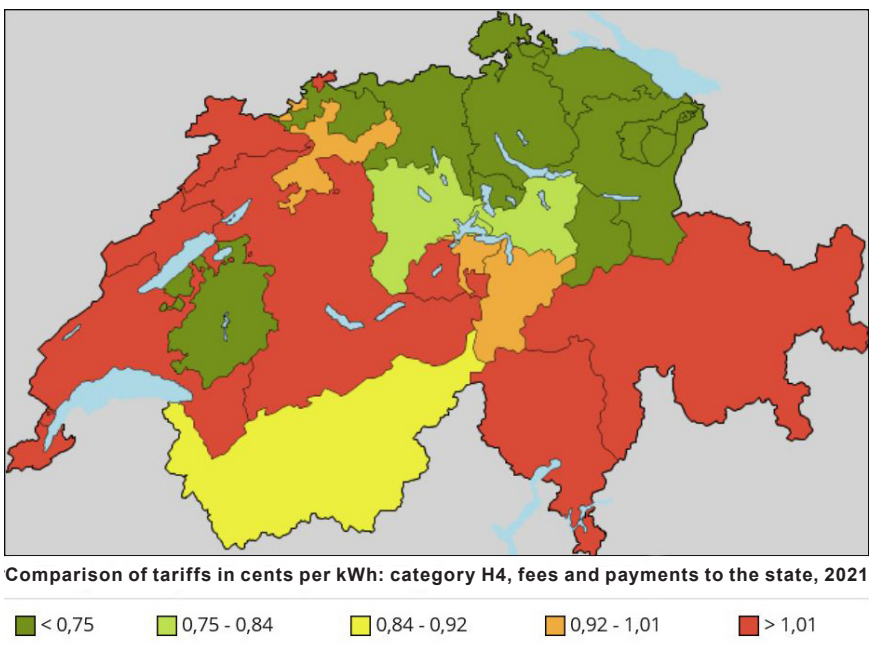


Figure 14: Median cantonal tariffs for cantonal and communal fees and payments to the state for consumer profile H4 in 2021

Overall electricity tariff

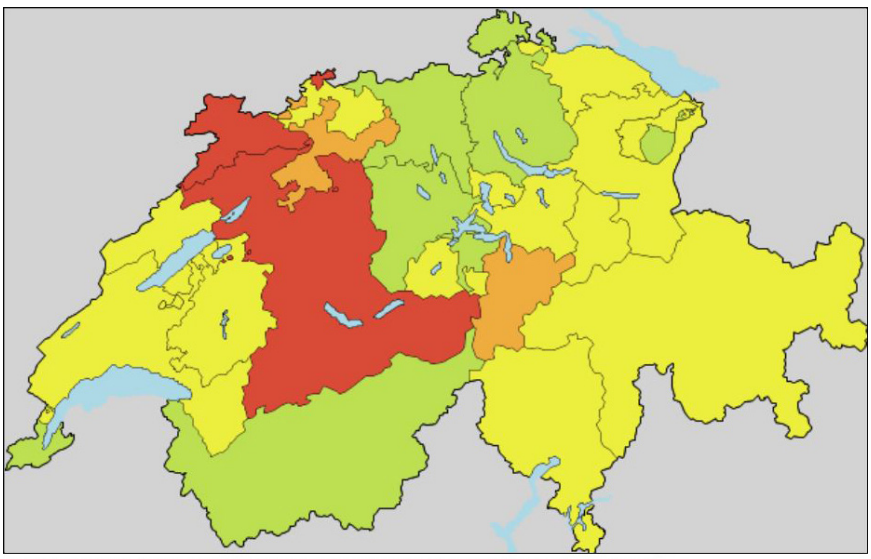


Figure 15: Median cantonal tariffs for the overall electricity tariff for the H4 consumer profile in 2021

The total tariff also includes the network surcharge for the promotion of renewable energy. This was successively increased from 1.5 cents/kWh to 2.3 cents/kWh between 2017 and 2021. The share of the electricity tariff accounted for by network surcharges and fees paid to the state amounts to 17.5 per cent in 2021.

5.5 Examination of tariffs

The network operators submit their cost accounting for tariffs – together with other documents – to ElCom in electronic format by 31 August. In the year under review, ElCom specified the status of the cost accounting in its new directive 1/2020 concerning submission and subsequent amendment. This states that amendments to submitted cost accounting can only be made on application and subject to approval or upon request by ElCom. The network operators also confirm that the cost accounting submitted on 31 August is correct and complete through their legally valid signature. Subsequently only the items indicated in the reports may be amended. If the network operators wish to amend further data, they must submit a justified application to ElCom. Corrections may be made to the last five financial years at the most after approval by ElCom.

As various queries concerning coronavirus (COVID-19) were received from network operators, ElCom published the frequently asked questions and answers in a notification (FAQ on Coronavirus of 7 April 2020).

In 2019, the Swiss Federal Audit Office (SFAO) reviewed ElCom's work with respect to prices and tariffs. SFAO came to the conclusion that ElCom's duty to supervise the tariffs charged by the power companies is being executed correctly and in accordance with the law. SFAO published its report on its website in May 2020 (www.efk.admin.ch/publikationen).

In the year under review and in line with its past practice, ElCom examined the compliance of tariffs in various ways:

- Each network operator is required to submit its cost accounting by the end of August, which forms the basis for the network and energy tariffs for the following year. ElCom uses around 180 tests in order to check the cost accounts for errors, inconsistencies and implausible figures, and returns its evaluations to the network operators for adjustment or explanations where necessary. A total of more than 4,000 comments were sent to the network operators. The 629 network operators, who submitted their cost accounts on time or after the first reminder, received ElCom's evaluation in the year under review together with a request to check any required changes and either implement them or substantiate the original figures.

- ElCom conducts targeted audits on network operators who have unlawful or implausible figures in their cost accounting even after adjustment. In the year under review and the year before, ElCom particularly reprimanded the inadmissible calculation of coverage differentials from the previous years and excessively high profits from the implementation of the CHF 95 and CHF 75 rule.

  With respect to coverage differentials, this involves the calculation of coverage differentials in one year and the amount carried forward to the following year. The fact that a number of network operators have accumulated shortfalls over recent years is an issue in ElCom's view. Overall (Network and Energy) shortfalls – not yet tariffed costs – of around CHF 1.5 billion were declared to ElCom in the year under review. This high cost block presents a risk to stable tariff development.

  In contrast, the CHF 95 and CHF 75 rule concerns costs and profit in energy sales to end consumers in universal service. In view of the improved cost structure, ElCom lowered the threshold on 1 January 2020 by CHF 20 to CHF 75 per invoice recipient which enables the network operators to continue generating sufficient profit.

After around ten years of regulatory activity, ElCom decided to reorganise its regulatory concept. This project involves the reorganisation of the way tests and other preliminary studies and analysis based on the data submitted by network operators are carried out. Progress was made in this respect during the year under review. In conjunction with a new database solution, an audit strategy based even more heavily on data will be pursued from 2021.

Network evaluation:
Here the focus was on the same problems as in previous years. In the year under review, ElCom again identified installations for which the synthetic values were not derived correctly, were inadequately documented or were calculated on the basis of a very low number of historically valued installations. Synthetic values must be derived in a transparent and comprehensible manner in the distribution network based on the acquisition and production costs of a sufficient number of similar installations. Otherwise, there is a risk that they could exceed the value of a similar installation and thus infringe Article 13 paragraph 4 of the Electricity Supply Ordinance. This does not apply with respect to the cost of properties, the value of which must be established historically. Land registry documents can be obtained from the land registry office due to their unlimited statutory retention obligation. Synthetic valuations for installations became impermissible as of 1999 and, since that point, the value of installations must be established historically on the basis of annual financial statements and investment documents. Even when reviewing the historical valuations, ElCom found costs that could not be documented. In addition, since the Electricity Supply Act entered into force on 1 April 2008, additions to installations may no longer be charged both as operating costs and additionally included in fixed assets (see the final letter from IWB dated 9 September 2013, which can be accessed at: www.ElCom.admin.ch > Documentation > Directives > Tariffs).

Several different companies only perform write-offs for the first time in the year after their installation was put into operation instead of in its first year of operation, or only after the definitive booking has been made in the system. This is contrary to Article 13 paragraph 2 of the Electricity Supply Ordinance which stipulates that installations must be written off on a straight-line basis to a residual value of zero over their entire useful life. Delayed write-offs increase the residual value of the installation, and thus the imputed interest costs, in an unlawful manner.

Questions surrounding the correct valuation of the network infrastructure were a key audit issue in ElCom proceedings in 2020 as well. A decision had to be reached in one case which arose through a merger between communes: ElCom's audit prompted an adjustment in the value of the merged regulatory assets which resulted in a complete review of asset accounting. By focusing specifically on construction projects and types of construction performed in the accounting periods, ElCom has made major adjustments to the standard values used in some cases.

In addition, recoverable internal services also had to be reduced to the calculation permitted in compliance with Article 15 paragraph 1 of the Electricity Supply Act. During the audits, this prompted reductions of up to half compared to the hourly rates originally applied, because internal settlements have to be carried out without a profit mark-up and may not be carried out in accordance with VSEI (Association of Swiss Electrical Installation Companies; Zurich, Switzerland), KBOB (Coordination Conference for Public Sector Construction and Property Services) or other management approaches.

ElCom also issued a warning about excessive interest on net current assets. In addition to acquisition and production costs, net current assets required for operations can also be included in the calculation of imputed interest. However, as invoicing is carried out several times a year, the capital tied up in the net current assets does not have to be available over the entire year. This must be taken into account in the calculation of net current assets interest based on the respective frequency of invoicing.

Operating costs:
As in previous years, the majority of adjustments imposed by ElCom concerned recoverability and the distribution of costs by segment.

In accordance with Article 15 paragraph 1 of the Electricity Supply Act, the costs of a secure, high-performance and efficient network are defined as recoverable costs. This means that other costs that do not fall under this definition are non-recoverable. These include costs incurred for marketing and sponsorships, for example, as well as various non-network-related activities, such as public lighting or administrative activities for other business areas.

With respect to the distribution of costs by segment, remuneration for network use was often charged on the basis of inflated overhead costs while cost allocation was incorrect in business areas outside of the monopoly sector. Furthermore, in some cases network operators apply factors that are not proportionate, appropriate or comprehensible, which contravenes Article 7 paragraph 5 of the Electricity Supply Ordinance.

Other network issues:
In the network area ElCom had to assess a pancaking situation: if networks on the same network level but belonging to different network operators are directly interconnected, this presents the risk of end consumers being charged several times and incorrect cost allocation. In the case examined, ElCom found no grounds to indicate that the allocation and passing-on of costs failed to comply with the provisions of electricity supply legislation and industry documentation.

In relation to coverage differentials, it was determined that one network operator's practice did not comply with the provisions of the ElCom Directive 2/2019 concerning surpluses and shortfalls. Coverage differentials are identified every year and should generally be taken into account from the next tariff calculation. The amounts to be settled must be distributed correctly to the individual network levels. This means the coverage differentials must be taken into account at the network level where they arose.

Energy costs:
With respect to energy provided to basic supply end consumers, the main focal points in the year under review were the average price method and the CHF 95 and CHF 75 rule. In one case, the procurement costs applied for power losses were reduced. In another case the 'energy management and optimisation' costs applied by a network operator for energy procurement had to be reduced. The proper procedure is for a network operator without a full supply agreement to indicate such costs. However, only costs actually incurred in accordance with electricity supply legislation are recoverable for universal service.

Average price method:
With its final vote on 15 December 2017, Parliament maintained adherence to Article 6 paragraph 5 of the Electricity Supply Act and ElCom's average price method supported by the Federal Supreme Court. The latter concerns the question of how the costs of electricity procurement are to be shared between end consumers covered by the monopoly (universal service) and free market customers.

ElCom identified several network operators who had charged their fixed end consumers disproportionately high energy costs over recent years and had therefore possibly not applied the practice mandated by the courts and ElCom.

A further case was concluded in the year under review. The definition of the relevant procurement portfolio concerned adequate inclusion of trading activities in Switzerland and abroad. The latter are incorporated into the procurement portfolio to the extent of the physical import capacities to Switzerland from the country of origin. The relevant costs for the tariff calculation are determined from the average purchase price in the respective price zone, the physical import volume and the costs of the cross-border transmission rights required. In another ruling, ElCom decided that long-term supply contracts with Switzerland as the destination of supply should be included in the average price method. The ruling was contested.

In terms of content, all or some of the following issues have been contested in the remaining ongoing proceedings: definition of the quantity and cost of energy to be used when calculating the average price method, implementation of ElCom Directive 2/2020 on weighted-average-cost-of-capital (WACC) production, interest on energy coverage differentials and differentiation of network operators within a group company.

CHF 95 or CHF 75 rule:
ElCom has once again focused on the CHF 95 or CHF 75 rule and requested that various network operators make adjustments. This rule was developed by ElCom in order to facilitate an assessment of the reasonable administrative and distribution costs and profits of network operators relating to the distribution of energy to end consumers for universal service.

In 2018, ElCom also conducted an in-depth analysis of the cost and profit situation with regard to energy sales. Based on this analysis, ElCom set new thresholds of CHF 75 and CHF 120 from 1 January 2020 for reviewing the energy tariffs of universal service end customers. These lower values were used to calculate the tariffs set for 2020. ElCom set out the detailed application of the CHF 75 rule in Directive 5/2018.

5.6 Judicial practice

In its ruling 2C_297/2019 of 28 May 2020, the Federal Administrative Court rejected all the main points of a complaint by a communal utility company and referred two subsidiary points back to ElCom for re-evaluation. The Federal Administrative Court had previously affirmed ElCom's ruling in full. The proceedings resumed by ElCom concerned the breakdown of overheads for operating costs on the grid, the determination of pump energy costs with regard to energy and fees and payments to the state. These proceedings were still pending in the year under review. The Federal Administrative Court's judgment confirmed various competencies of ElCom in the last instance, namely those of reviewing fees and payments to the state and energy products with environmental added value in universal service. The average price method used by ElCom for energy costs in standard practice was also recognised.

In its judgment 2C_828/2019 of 16 July 2020, the Federal Supreme Court addressed the energy costs of another communal utility company. In particular, it confirmed in the last instance the application of the average price method, the CHF 95 rule and the coverage differential mechanism. Finally, in a further judgment 2C_109/2C_115 of 7 October 2020, the Federal Supreme Court gave ElCom its approval to continue pending tariff evaluation proceedings. It thereby confirmed that ElCom had neither communicated approval of the tariffs nor relinquishment of future tariff evaluation proceedings in its feedback on the cost calculation.

5.7 Sunshine Regulation

The 'Sunshine Regulation' uses a transparent and standardised process to compare the quality, costs and efficiency of different network operators. It makes deviations more visible. This type of regulation supplements the tariff auditing procedures, which can be extremely resource-intense in some cases. Here, selected indicators relating to quality of supply and services, as well as to costs and tariffs, measure the quality, costs and efficiency of the provision of services by the individual suppliers. In addition, compliance indicators demonstrate adherence with the legally stipulated deadlines and regulatory requirements. This direct comparison of network operators is intended to create incentives to eliminate any identified weaknesses without the need for intervention on the part of the regulator. For comparison purposes, network operators with similar structures are grouped together.

To calculate the indicators, ElCom essentially uses data that are submitted each year by the network operators within the framework of cost accounting and supply quality surveys. ElCom also uses data from the Federal Statistical Office (FSO) that are publicly accessible. This means that there are practically no additional administrative costs for network operators associated with the Sunshine Regulation.

ElCom was involved in activities relating to the Sunshine Regulation throughout the entire year under review. As in the previous year, the creation of a legal basis within the frame-

work of the revision of the Electricity Supply Act was again a key issue. The aim is to publish the results of the individual network operators. The Federal Office of Energy (SFOE) is responsible for preparing any legislation related to energy. ElCom will contribute to the proceedings within the scope of agency consultations and consultation procedures.

In the second half of the year under review, the focus was on the formation of groups for comparison purposes and on the calculation of the various indicators. ElCom divided the approximately 630 network operators into a total of eight groups based on topographic criteria (population density) and the quantity of energy supplied to end consumers (energy density). It also calculated the necessary indicators for the sixth round. The individual results of the comparisons were successively submitted to the operators in December 2020. As in the previous years, the results of the comparisons were only sent to the network operators to whom they applied. The indicators calculated remained unchanged for the year under review. During the current year, the situation is to be reviewed to determine whether any new indicators should be incorporated into the calculations or existing ones amended.

As in past years, ElCom published many explanatory documents and results on the Sunshine Regulation on its website. These publications are aimed primarily at the network operators concerned, but also at interested members of the public.

5.8 Issues relating to measurement services

In the year under review, ElCom answered various questions from industry and determined that electricity supply law does not require network operators to submit a completion report to ElCom if 80 per cent of all measurement equipment meets articles 8a and 8b in accordance with Article 31e paragraph 1 of the Electricity Supply Ordinance. The number of measurement points should be inserted in form 2.1 of the cost calculation. However, the declaration in the cost calculation does not constitute confirmation from ElCom that the smart meters installed meet the legal requirements. The measurement data and load values of the end consumers, generators and storage operators concerned should be clearly presented to them (Art. 8a para. 2 let. c Electricity Supply Ordinance). From 1 January 2021, it must be possible to view and download the load values of 15 minutes, which have been recorded over the past five years, in a standard international data format. With regard to the quality of the measurement data made available on a customer portal, ElCom determined that they cannot be incomplete. Daily plausibility checks of the data are not provided for according to the industry documents. After the plausibility check, the measurement data on the customer portal must be complete. Several questions were asked about the recoverability of costs for fibre-optic networks used to transmit the measurement data from smart meters. If the network operator has a fibre-optic network on which smart meters are integrated, only the pro-rata costs of an efficient system are recoverable in relation to network costs. Appropriate cost codes should be used to determine the share (see the notification ‘Questions and Answers on the Energy Strategy 2050’).

5.9 Unbundling

The statutory provisions on the separation of network operation from the other areas (unbundling) are becoming increasingly important due to the fact that network operators are stepping up their participation in competitive areas of the market. ElCom therefore paid particular attention to the accounting unbundling of network operations, the prohibition of cross-subsidisation and the prevention of the use of information advantages from the network sector in the year under review (violations of the unbundling provisions under criminal law are prosecuted by the SFOE). It responded to numerous inquiries and both informed and raised awareness amongst network operators on a variety of topics at appropriate events.[1] In one case of possible cross-subsidisation where it was suspected that services were being provided for third parties on the market at lower prices at the expense of network costs, ElCom examined accounting receipts, cost allocations, invoicing and network cost reductions based on random inspections. There was no indication of illegal cross-subsidisation at the expense of network operations and therefore no proceedings were initiated.

1 cf. e.g. ElCom seminar – part 3, slides 20 et seq., available at www.elcom.admin.ch > Events > Seminars for network operators.

5.10 Merger for own consumption, practice model, feed-in remuneration at cost, non-recurring remuneration, deduction of VAT on network supplement

ElCom answered various questions concerning a merger for own consumption. The opportunity for use of the distribution network by the merger for own consumption was addressed several times. ElCom determined that the use of the existing distribution network is not permitted. Even if the merger for own consumption bears a share of the line costs (through purchase or rental), this does not change this decision if the border point is not moved. There was also doubt over whether the virtual creation of the measurement point of the merger for own consumption at the transfer point was possible. As the merger for own consumption is treated like an end consumer (Art. 18 para. 1 Energy Act), this is deemed permissible if the participants in the merger for own consumption agree to have smart meters installed in accordance with electricity supply law.

Installation operators can under certain circumstances sell their self-generated energy at the location of production to several end consumers without end consumers forming a merger for own consumption in accordance with Art. 17 Energy Act. To enable the 'practice model' to be implemented in compliance with the law, ElCom supplemented the information provided in newsletter 1/2019 in its notification 'Practice Model Own-Consumption'[1] of 13 July 2020 and published the relevant principles on the consent of end consumers required and measurement and billing by the network operators. These provisions must be implemented from the outset in the case of new practice model projects.

The consent of end consumers must be obtained by the end of July 2021 for existing projects. If smart meters are not yet being used for measuring participants, the network operators must implement suitable measurement systems within a year from the start of the rollout. If the rollout was started before the notification was issued, the network operators must convert the participants of a practice model by the end of July 2021. If the smart meter rollout is carried out at a later date and the measurement system is not modified by the end of July 2021, the end consumers must be notified about the nature of the billing until the change to the measurement/invoicing system has been made and about the approximate share of own-consumption before their consent is obtained.

In the year under review, ElCom pronounced a total of five rulings relating to non-recurring remuneration and feed-in remuneration at cost. In one case, the Federal Supreme Court decided that the photovoltaic system in question was only visually but not structurally integrated. ElCom has now awarded one-off compensation to ensure protection of trust. This covers the actual costs of the visual integration which arose due to the modification of the installation to meet the requirements of an earlier SFOE directive that is not compatible with the Energy Ordinance.

ElCom issued two rulings regarding refusal to authorise extension of time limits for project progress reports. In both cases the complainant provided no valid grounds to prove it was not culpable itself or – in one case at least from the point of submission of the application for an extension of time limit – the situation was not foreseeable despite professional planning. Instead, it appeared the complainant had not sufficiently taken account of the significant time requirements for planning and implementation of the installations and had registered the projects prematurely. One of the rulings was contested at the Federal Administrative Court.

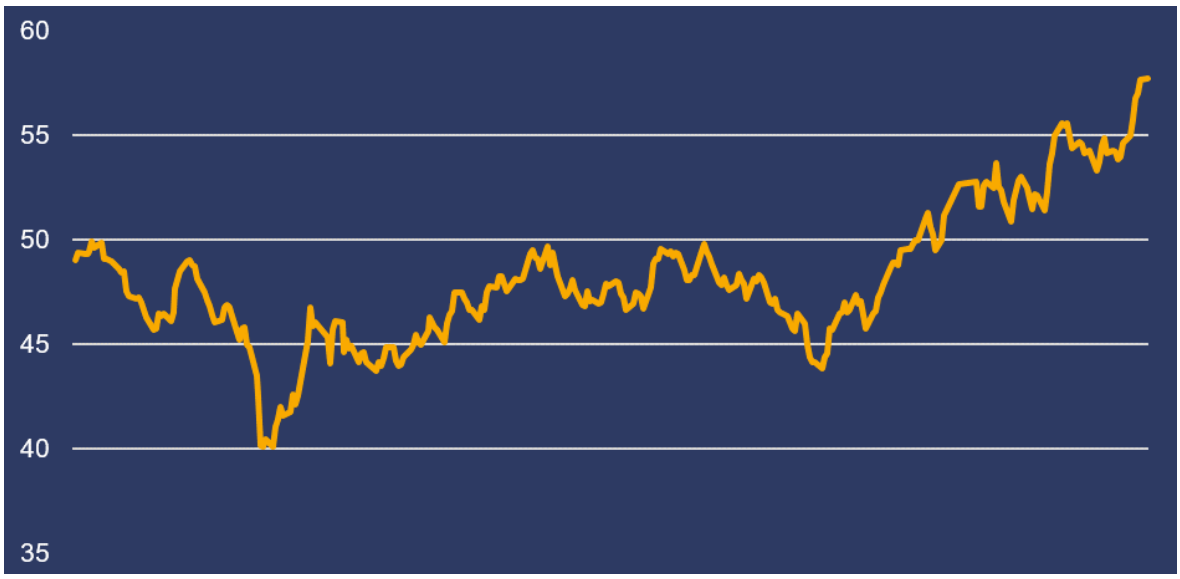
In another case, ElCom ruled that the transfer of a positive feed-in remuneration at cost decision to a different project not previously registered or entered on the waiting list was not permissible. However, based on the correspondence between the complainant and Swissgrid AG, the complainant could assume that the transfer had been approved. ElCom concluded that Swissgrid AG was bound to the basis of trust and that the complainant's photovoltaic system would receive feed-in remuneration at cost.

In relation to one-off compensation, ElCom issued a ruling and determined that a photovoltaic system does not qualify as a new installation under the Energy Act and will not receive one-off compensation if only the solar panels are exchanged during an upgrade without replacing the power inverter.

A further ruling issued by ElCom concerned the billing of VAT on the network surcharge. In its decision, ElCom indicated that the matters of VAT liability and the transfer of the network surcharge to end consumers could not be ruled on under the Energy Supply Act and its implementing provisions and that ElCom did not possess relevant competence in relation to the Energy Act and therefore could not consider the application.

1 Available at www.elcom.admin.ch > Documentation > Information.

6 Market Surveillance



The curve shows the base price for the Swiss calendar year 2022 in EUR/MWh from 01.01.2020 to 22.03.2021. The electricity price for calendar year 2022 has risen sharply since November 2020 due to higher CO2, gas and coal prices.

6.1 Market transparency in wholesale electricity trading

The activities of the Market Surveillance section were overshadowed by the coronavirus pandemic this year. The operational activities and monitoring of the Swiss wholesale electricity market and the activities of the Swiss market participants in the European Union were maintained in the secure room during the lockdown.

Two comprehensive studies were also carried out in this regard. An analysis of the negative prices for Switzerland, France and Germany in 2020 was carried out as part of the first study. The expansion of renewable energies, in particular wind and solar power – which are entered in the order books of the exchanges with marginal costs of almost zero – favours the emergence of negative prices. Inflexible conventional power stations are also causing the electricity price to move into negative territory. Negative prices are a necessary market mechanism to ensure demand for electricity is always in line with supply.

Owing to the lockdown and the resultant low load and the warmer-than-average spring weather this year, an increase in hours with negative prices was observed on the day-ahead markets in Germany, France and Switzerland. The study closely examines the number of hours with negative prices since 2015, the number of days with negative hour prices and the number of days during which the base price was negative for Germany,

France and Switzerland. The proportion of hours with negative prices according to the hour of the day is also analysed.

The second study carried out on the impact of the coronavirus pandemic on the European load is looked at more closely in Section 6.3.

The Market Surveillance section's workshop on 'Algorithmic trading – effects on energy trading' was cancelled due to the pandemic. The annual Market Transparency Report, which provides an overview of the key activities of ElCom's Market Surveillance section, was published in May. It reviews the annual performance of the spot and futures markets.

This overview is based on ElCom's spot and futures market reports which have been published weekly since 2018. The downloading of the data required and the drawing-up of the two reports was completely automated in the course of 2020 which means they can be produced at the touch of a button except for the market commentaries.

As the markets are increasingly converging due to current development, exchange between the energy regulators on market surveillance and market integrity is also becoming increasingly important.

The coordination meetings held with several market surveillance authorities in neighbouring countries also took place virtually this year. The usual exchange of experience on surveillance method issues with FINMA did not take place this year.

The work at European level continued without restriction. ElCom also took part in a very comprehensive survey of the CEER Market Integrity and Transparency Working Group (CMIT) this year to evaluate the implementation of market integrity and transparency at national level and to compare it with other regulatory authorities. Participation provides ElCom with an insight into the implementation of the EU's REMIT Regulation as part of the European regulatory process.

ElCom once again took part in ACER's EMIT forum which took place online this year. This forum, which was held for the fourth time, focused on how the markets can be protected during a period of change. Future developments, such as digitalisation, B2B trading platforms at network level 7 and the creation of new flexibility markets and their impact on REMIT reporting, were discussed.

Following a decision taken by the European Commission on 17 December 2020, ACER will levy annual ex-ante fees from 1 January 2021. This will enable the agency to meet its costs for the collection, processing and analysis of information reported by market participants as part of the REMIT Regulation (EU) no. 1227/2011. ElCom will not levy such fees.

6.2 Market Surveillance: facts and figures for 2020

At the end of 2020, 78 market participants were registered with ElCom. They used nine Registered Reporting Mechanisms (RRM) to transmit information about energy trading transactions they conducted on EU markets. ElCom received the fundamental data and pu-

blications on insider information through its own interfaces with ENTSO-E and the EEX transparency platform, which were created specifically for this purpose.

44.8 million transactions were reported to EICom in 2020. This once again confirms the upward trend of previous years. The increase of just under 15 per cent is moderate and is largely explained by greater use of automated trading systems.

The majority of the reports, just under 90 per cent, again related to standard contracts in 2020. The dominance established in previous years of spot over futures transactions was maintained, with a small change in favour of reports from the spot market (increase from 90 to 94 per cent). In 2020, the registered market participants reported the conclusion of 2,861 non-standard contracts which represents a change of around 10 per cent compared to the previous year.

By contrast, there was a greater increase in the fundamental data. Around a million more reports were logged than in 2019, which represents an increase of just under 22 per cent compared to the previous year. There were also more significant changes in the publication of insider information. The cases reported fell by around a third compared to the previous year.

To efficiently monitor the performance of the markets and the pricing mechanisms, ElCom uses other data, such as the EEX settlement prices which are used as a reference in the analyses. Information from public sources is also used, such as MeteoSwiss or Reuters.

The processing and analysis of the data collected enables evaluation of what is actually happening on the (European) wholesale trading markets. As market prices in Switzerland are heavily influenced by developments and events in neighbouring countries, this information is of great importance for market surveillance and the evaluation of Switzerland's supply security.

In anonymised and/or aggregated form, this data was also used in various publications, such as spot and futures market reports, the market transparency report and in various studies, such as the study on negative prices. This helps to increase transparency for production and consumer-side market participants and improve the quality of ElCom's analyses, studies and publications.

6.3 Study: The impact of the coronavirus pandemic on the European load

The various measures to combat the coronavirus pandemic resulted in a reduction in load in all European countries. This applies in particular to countries where industry was largely shut down. The restricted industrial production and the closure of restaurants and shops are the main reasons for the decline in load.

The evaluation of the ENTSO-E load data showed that the energy economy in Switzerland

was not as severely affected by the declining load attributable to the coronavirus-related lockdown as France, Italy or Spain. The fall in consumption on working days in Switzerland stood at around 10 per cent, whereas it was around 20 per cent in Spain, 25 per cent in Italy and 17 per cent in France.

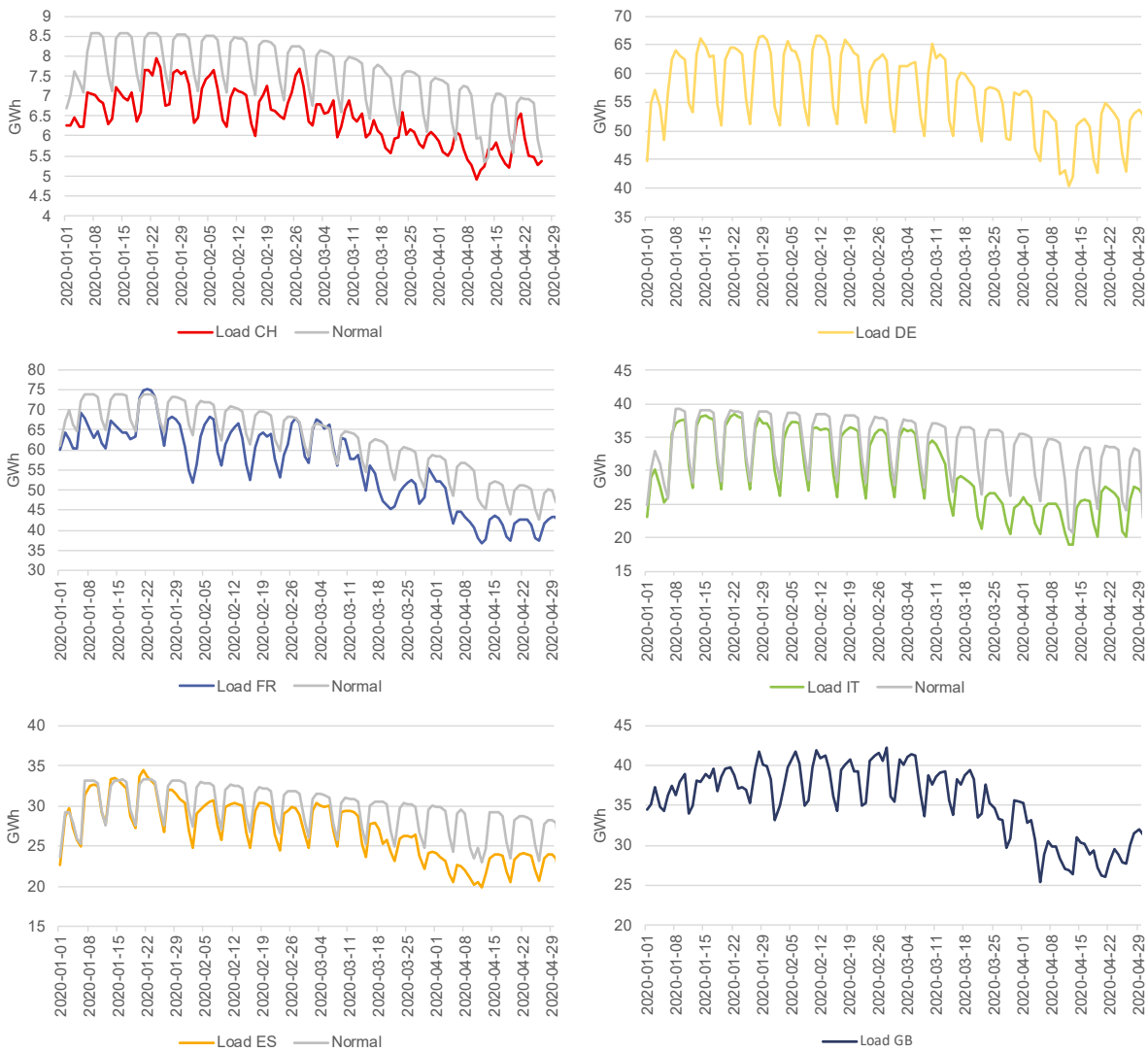


Figure 16: Daily electricity consumption in GWh since 01.01.2020 for Switzerland (CH), Germany (DE), France (FR), Italy (IT), Spain (ES) and the United Kingdom (GB) (data source: load values ENTSO-E, normal load values Refinitiv Power Research)

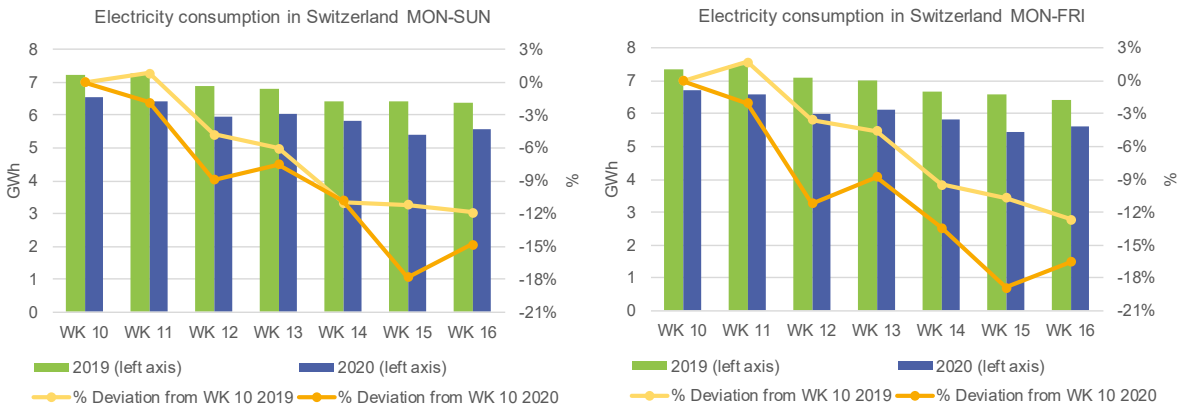


Figure 17: Weekly electricity consumption in Switzerland (graph on the left from Monday to Sunday, graph on the right from Monday to Friday) shown as bars for the years 2019 and 2020. The line with data points (secondary axis on the right) shows the percentage deviation of the consumption compared to week 10. (Data source: ENTSO-E)

6.4 MEAS case

ElCom closely examined the background to the MEAS auction carried out by Swissgrid in relation to an EPEX SPOT STOR. Swissgrid confirmed that this auction was carried out on behalf of TERNA. It only acted as an intermediary which is why the prices and volumes of this auction were not transferred to ElCom nor published on Swissgrid's homepage.

The process for the MEAS auction is set out below:

- D-2 TERNA notified Swissgrid of its requirements
- This request resulted in Swissgrid holding a tendering process in D-1
- Market participants registered with Swissgrid could submit hourly bids via Swissgrid's SDL page until 2.30pm D-1. Market participants indicated the prices at which they were willing to purchase energy for supply to Switzerland.
- These bids were then sent to TERNA in anonymised format.
- TERNA indicated its requirements and the market participants were notified by 4.00pm at the latest whether or not they had been awarded a tender.

ElCom notified Swissgrid that the results of the MEAS auction could have a major impact on the Swiss intraday market and on the Swiss intraday 1 auction. This applies, in particular, if the prices at which TERNA is willing to sell differ significantly from the current day ahead or intraday prices. Insider information could also influence the tender prices and tender volumes for certain partners.

An evaluation of the MEAS auction data by Swissgrid up to July 2020 showed that since the introduction of the Swiss intraday CH IDA 1 auction in March 2019, the prices in the CH

IDA 1 auction have been lower than the day-ahead prices for 47 per cent of the hours. However, when a MEAS auction took place based on volume tender, this figure stood at 56 per cent in 2019 and 63 per cent in 2020. Due to the MEAS auction there are lower prices in the Swiss Intraday 1 auction than in the Swiss day ahead price more frequently. This was to be expected as the tenders for the MEAS auction, which are usually concluded on the day ahead market in Switzerland, can immediately be resold on the intraday auction.

To ensure market transparency, Swissgrid was requested to publish the results of the MEAS auction in good time on its homepage, i.e. before the Swiss Intraday 1 auction.

ElCom became aware of the processes of the MEAS auction and its impact on the Swiss market through the EPEX Spot STOR. In cooperation with Swissgrid, a rapid and efficient solution was found to ensure a more transparent Swiss market.

6.5 RTE regulation on the balancing market in France

On 1 August 2018, the French network operator RTE amended the 'Règles relatives à la Programmation, au Mécanisme d'Ajustement et au dispositif de Responsable d'Équilibre' and added an article 4.2.1.2.1 (RTE regulation). This supplementary article only concerns those market participants which are deemed an 'EDA Point d'Échange'. These are market participants active on the French balancing market, but which are headquartered abroad. This therefore also includes energy companies from Switzerland.

Under this new regulation, these market participants do not procure the required energy volume on the intraday market in France in the event of activation on the balancing market in France, but only supply it through export from Switzerland to France (for a sales bid) or through import from France to Switzerland (for a purchase bid). Balancing market requests should generally be met through flexible power plant output to relieve the strain on the French network and market. Energy purchased on the French balancing market can then only be exported abroad. The aim is to avoid creating further strain through activities on the intraday market when the situation on the French electricity system is tight.

The French regulatory authority (Commission de Régulation d'Électricité, CRE) monitors compliance with this regulation. If irregularities in the trading activities of foreign market participants on the intraday market in France in the case of balancing market activation are determined through RTE, CRE warns market participants of potential violations of the RTE regulation or will request explanations of specific trading activities and will investigate events in relation to any potential violation of the aforementioned regulation.

Even though monitoring of compliance with this regulation lies within the competence of CRE, the behaviour of the Swiss energy companies active on the French balancing market was also monitored by ElCom in 2020. There were no violations of the RTE regulation in the cases examined.

7 International activities

At the Eglisau-Glattfelden run-of-the-river power plant, the Rhine forms the border between Germany and Switzerland. Some of the border power plant's installations lie on the German side.

As in 2019, international developments were heavily influenced by the implementation of EU directives from the fourth energy package (Clean Energy Package (CEP), summer 2019). Together with the new EU regulations, they are having a first actual impact on the European electricity sector.

Specific network codes and their methodologies still have to be implemented, partially developed and revised in the fields of network operations, grid connection, shortage management and balancing power (e.g. capacity calculations for intraday, D-1, balancing or futures markets).

These new laws harmonise the legal framework in the aim of liberalising and integrating the national electricity markets. It also aims to achieve positive effects for European consumers, renewable energies, supply security, competition and innovation. Revisions of the 'TEN-E Infrastructure Directive' and the legal framework for the EU gas market are also scheduled for 2021.

The coronavirus pandemic caused new uncertainties in 2020. The main effects of these new factors on the electricity sector will be felt from 2021 and until 2025–30 and will increasingly influence the extensive reorganisation of the energy markets. In particular, this applies to almost all aspects of the cross-border exchange of electricity, especially as the EU has approved an ambitious European Green Deal to achieve carbon neutrality (zero emissions) in the EU by 2050 to mitigate greenhouse gas effects.

This EU Green Deal is part of the fixed-term, large-scale 'Next Generation EU' development plan (over EUR 750 billion) to cushion the ef-

fects of the coronavirus pandemic on the EU economy and society and to make the EU more sustainable, crisis-resilient and better prepared for the challenges and opportunities of environmental and digital change. The Green Deal supports the global Paris Agreement (2015) to combat climate change and restrict global warming to well below 2°C.

The EU and United Kingdom reached agreement on their future relationship on 24 December 2020, thus avoiding a hard Brexit. The new partnership agreement entered into force on 1 January 2021. This means the UK is definitively leaving the European Single Market and Customs Union and is therefore also leaving the EU internal electricity market. The UK will no longer participate in implicit market coupling and must return to explicit cross-border capacity distribution. The UK regulator (Ofgem) and UK transmission network operator (National Grid) have been excluded from ACER and ENTSO-E until future cooperation with these bodies has been governed in detail.

In addition to further key energy aspects, the UK Trade and Cooperation Agreement nevertheless aims to ensure efficient trading via direct current interconnectors and provides for the opportunity to develop multi-region loose volume coupling within 15 months. However, it will not be as efficient as the EU standard model of flow-based market coupling. The EU and UK will also continue to cooperate on the exchange of information, network development plans and risk prevention planning.

In view of Switzerland's high level of integration with European neighbouring countries, all of these developments and changes within and outside of the EU are of major significance, both for the electricity sector – in relation to supply security – but also at a political, legal and economic level.

7.1 Congestion management

The Swiss transmission network is connected to the networks of neighbouring countries via 41 cross-border transmission lines. These connecting lines are vital to supply and network security as well as for Swiss exporters.

Since the available import and export capacities are limited, they are allocated in line with market-based procedures in accordance with Article 17 paragraph 1 of the Electricity Supply Act. However, there are two exceptions: the first relates to supplies under long-term contracts concluded before 31 October 2002 (in particular some contracts still in force with France). The second exception is that priority is given to supplies from hydroelectric power plants on the border. Thirdly, capacities in intraday trading are not currently priced.

That means the lion's share of the capacities of cross-border lines is allocated within the framework of explicit auctions. In contrast to implicit auctions, in which the transport right is automatically granted to the highest bidder when electricity is sold on the market, explicit auctions award the transport right separately from the energy transaction.

In recent years, the EU has gradually harmonised the rules for the management of connec-

ting lines and congestion management. This led to significant changes compared to the practices previously used by transmission network operators, such as the second expansion in November 2019 of Single Intraday Coupling (SIDC) with the addition of seven further EU member states (Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania and Slovenia) in addition to the 14 existing countries including Norway (EU member states: Germany, France, Austria, Belgium, Denmark, Estonia, Finland, Latvia, Lithuania, the Netherlands, Portugal, Spain and Sweden). A third expansion was scheduled for the end of 2020 but has been postponed.

Switzerland has thus far been excluded from projects such as this, even despite the fact that ElCom and Swissgrid are involved in some of the discussions concerning the management and congestion management of Italy's northern border.

Implicit auctions, also known as market coupling, have become more efficient and are now commonplace throughout most of the EU. The position of implicit auctions will be further strengthened by the gradual introduction of flow-based market coupling. This process identifies bottlenecks within networks so that they can be remedied by appropriate investment. Limiting cross-border capacity between countries and price zones is also the best way of preventing these bottlenecks from shifting to the border.

The EU and ACER will seek to enhance export and import opportunities, thereby boosting competition and supply security. This presupposes avoidance of any distortion of trade flows between price zones and countries in favour of purely internal or domestic flows, whereby international trade flows are generally diverted from the cheapest to the most expensive price zone due to price differences on the market.

To that end, the new EU Regulation 2019/943 on the internal market for electricity of 5 June 2019 stipulates that at least 70 per cent of the capacity of all lines must be released for cross-zonal trading so that market integration and supply security can be improved at a pan-European level and the negative consequences of unscheduled load flows avoided. For this 70 per cent of cross-border capacity, the EU only provides for exceptions up to 2025 and under strict conditions. A first judgment on the attainment of the '70% criterion' was published by ACER in December 2020 which underlined the need to avoid unscheduled load flows. A reassignment of the EU bidding and price zones based on structural bottlenecks is not proposed before 2022. An initial bidding zone review failed in 2018. As the physical flows do not necessarily meet the planned traded flows, they restrict the scope for exchange on the borders and often require expensive interventions to prevent risks to network stability (redispatch etc.). ACER recommends sharing the costs of such preventative and remedial measures based on the costs-by-cause principle to guarantee, optimise and maximise exchange capacity.

ACER's monitoring report on the electricity market in 2019 (ACER MMR – Market Monitoring Report, October 2020) underlines that the EU can further improve the calculation of cross-border capacities and that deeper integration of balancing energy markets would provide major economic benefits (e.g. the TERRE project). The report regrets that the

expansion of flow-based market coupling (FBMC) to the EU member states in Central and Eastern Europe is being delayed and the fact that little progress has been made on the integration of the EU futures markets.

ACER also underlined the doubling of negative electricity prices between 2018 and 2019, a trend that continued in 2020 due to the coronavirus pandemic. The electricity and gas markets proved resilient in the face of this unanticipated crisis which ACER attributed to the reforms of the third and fourth energy packages in 2009 and 2019.

ACER was critical of the fact that several capacity mechanisms have been introduced at national level to provide financial support for electricity production without a genuine supply problem existing. ACER estimated the costs of this for the EU as a whole at EUR 3.9 billion for 2019. According to ACER's report, unjustified mechanisms distort competition and disadvantage consumers.

This report also looks at certain developments in Switzerland, including the significantly smaller social loss that Switzerland incurred in connection with the use of its cross-border capacities with the EU compared with 2018 and previous years (around EUR 36 million in 2019). This estimated financial loss is mainly due to the fact that Switzerland is excluded from the market coupling mechanisms established in the EU as long as no bilateral electricity agreement is concluded. This means the management of all cross-border capacity remains suboptimal and only partly follows the price signals of the electricity exchanges. The social loss is also significant for some EU interconnectors.

Despite some positive aspects, the development of EU regulations and methods, from which Switzerland is either completely excluded or only apply to Switzerland in part, is likely to lead to increased bottlenecks in the Swiss network. They influence both trade and physical flows inside and outside the EU, which is in turn causing increasingly frequent overloading on Swissgrid's network. Wherever possible, ElCom and Swissgrid work together with ACER, the European Commission and the transmission network operators and authorities of other countries to optimise cross-border capacities. However, the possibility of Swissgrid having to temporarily restrict export and import capacities in order to ensure the stability of the Swiss network cannot be ruled out.

7.2 Border power plants

There are 30 hydropower plants along Switzerland's borders that produce electricity from watercourses adjacent to neighbouring countries. The distribution of electricity is often regulated by long-standing treaties between Switzerland and the respective neighbouring country in the case of these border power plants. For some of these border power plants, the contractually agreed quantity of electricity is distributed to the neighbouring country via the cross-border transmission network. Capacities in the cross-border transmission network are allocated through auctions. Swiss law grants priority to some of the border power plants in the allocation of cross-border transmission capacities, mea-

ning that capacities are allocated outside the auction procedure at no cost.

Until the end of 2014, a cooperation agreement existed between Swissgrid and the owners of the German transmission networks, which included the priorities in the cross-border transmission network provided for in the applicable Swiss legislation. This agreement was terminated by Germany's transmission network operators with effect from the end of 2014. The new cooperation agreement that entered into force on 1 January 2015 does not include any clauses governing priorities. In the view of the German transmission network operators and authorities, the granting of priorities runs contrary to both European and German law. This means Swissgrid has since no longer be able to grant priorities for supplies from border power plants on the German-Swiss border. In the year under review, ElCom – based on the jurisdiction of the Federal Supreme Court in five proceedings that are pending – legally determined the consequences of the fact that priority can no longer be granted. Swissgrid was obliged to transfer the auction proceeds, which were generated from the priorities not granted, to the holders of the priority rights concerned for the period from January 2015 up to and including September 2018 (by way of substitution).

A new provision has been in force since 1 October 2017 which gives priority to border power plants. Three applications requesting that priority be granted under the new provision were pending during the year under review. As part of this process, ElCom will have to decide how to deal with the priorities provided for under Swiss law but which cannot be physically implemented at the German border as a result of the terminated cooperation agreement.

7.3 Merchant Lines

Merchant lines are cross-border transmission lines. In the event of an exemption, there is no requirement to grant network access to third parties on electricity transmission lines such as these. While the transmission capacity is managed by the network operators, its utilisation is reserved for the investors. These exemptions are limited to a specific time frame, upon expiry of which the line is transferred to the ownership of the national grid operator. Switzerland had one merchant line at the Italian border during the year under review. On 3 August 2020, judgment A-671/2015 of the Federal Administrative Court relating to this merchant line was handed down concerning the amount of capacity exempted from the non-discriminatory, third-party access. The complaint of the merchant line operator was partially upheld and the matter was referred back to ElCom for re-evaluation. The merchant line operator has appealed against this judgment to the Federal Supreme Court. The appeal proceedings were still pending in the year under review.

The discussions on the creation of an additional merchant line from Switzerland to Italy on an existing, disused line were stepped up again during the year under review. The possibility of ElCom being requested to grant an

exception to network access as a merchant line in the following year in accordance with DETEC's Ordinance on Exceptions to Network Access and to Allowable Network Costs in the Cross-Border Transmission Network (NetCEO) cannot be ruled out.

7.4 Auction proceeds

Swissgrid allocates limited cross-border transmission network capacities via auctions. The proceeds of these auctions are shared equally for each border between Swissgrid and the respective foreign transmission network operator. Auction proceeds may be used to cover the costs of cross-border electricity supplies, to cover the recoverable costs of the transmission network or for the maintenance and expansion of the transmission network (Article 17, paragraph 5, Electricity Supply Act). Swissgrid submits a request to ElCom detailing how it intends to use the proceeds from the auction and ElCom ultimately decides how they are to be used (Article 22 paragraph 5c of the Electricity Supply Act). In the period from 2009 to 2012, around CHF 40 million were used for reducing the recoverable costs of the transmission network. The majority of the 2013 auction proceeds were to be used for the maintenance and expansion of the transmission network. Since, in the previous years, investments in the transmission network were not carried out to the extent originally planned, and given the costs associated with court rulings, Swissgrid applied to ElCom for the proceeds from 2013 to 2018 to be used exclusively for reducing the network tariffs. In accordance with the ratio agreed in 2018 for the use of auction proceeds, 35 per cent of the auction proceeds in 2019 were used for the maintenance and expansion of the transmission network and 65 per cent for reducing recoverable costs. In 2020, these figures stood at 45 and 55 per cent respectively.

Swissgrid submitted a proposal in the year under review regarding the use of auction proceeds from 2021 in which Swissgrid deviated from the agreed ratio of 55 per cent for the maintenance and expansion of the transmission network and 45 per cent for reducing the recoverable costs of the transmission network. This was justified by the expected compensation payments from the coverage differential proceedings in 2011 and 2012 and the evaluation adjustment 2. ElCom rejected the application in February and decided to maintain the agreed ratio. Due to the coronavirus pandemic, Swissgrid made an application for reconsideration in March and requested using the auction proceeds in 2021 solely for the reduction of the recoverable costs. This application was approved by ElCom in view of the extraordinary situation.

Figure 18 shows how the auction proceeds generated at Switzerland's borders were used between 2016 and 2020. The figures for 2020 are still provisional because the definitive calculations were not available at the time of publication.

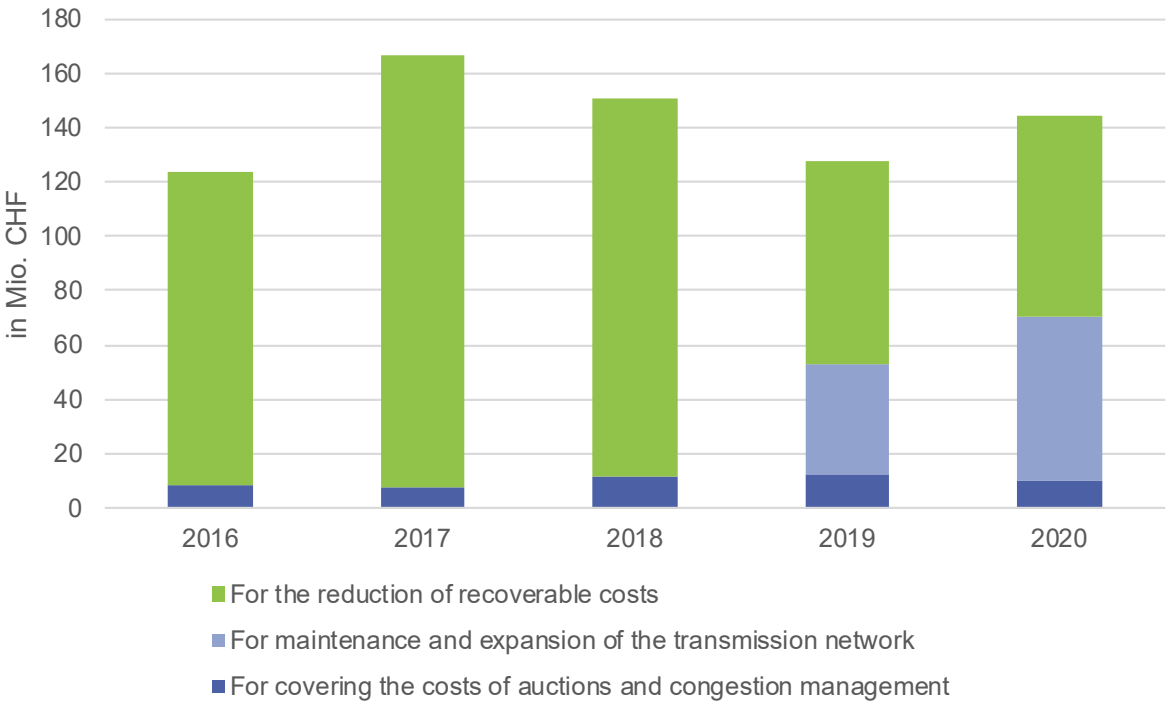


Figure 18: Use of the auction proceeds, 2016 to 2020

7.5 International platforms for the reserve power supply

The reserve power supply must balance out sudden fluctuations in electricity consumption and generation, making it a central component of electricity supply security. The EU's third internal market package systematically extends the procurement and use of the reserve power supply beyond national borders. Considerable price advantages in procurement (and ultimately for the consumer) and better protection against possible shortages are expected in some cases.

To this end, IT trading platforms will be established between some or all of the countries concerned. Switzerland is involved in all the platforms either as a member or an observer. The platforms for the exchange of primary balancing power (frequency containment reserves [FCR]) and imbalance netting (IN) are already active and certain aspects of them will be adapted. The platform for tertiary balancing power (Replacement Reserve/TERRE project) has been operational since 6 January 2020 with the go-live of Swissgrid to take place in October 2021. The two remaining platforms for the exchange of secondary balancing power (aFRR, mFRR) are still under development.

On 27 June 2019, the frequency containment reserve (FDR) cooperation between transmis-

sion network operators in Switzerland, Belgium, Germany, France, Austria and the Netherlands took its first successful step toward restructuring the market by introducing daily D-2 auctions for FCR. FCR cooperation dates back to the period before the introduction of EU network codes and is now the first regional cooperative arrangement to harmonise the market using the method specified by the Electricity Balancing Guideline (EBGL). ElCom as well as other regulators and stakeholders were involved. This cooperative arrangement serves to procure primary balancing power with the aim of procuring almost half of the FCR capacities in Europe's synchronous 50 hertz area in order to cut procurement costs and create entry incentives for new balancing power providers and technologies.

Within this framework, a complex allocation algorithm was developed that takes into account various price zones and other constraints, calculates a marginal pricing system and shortens the product length from one week to one day. Four-hour product time slices are even expected to be introduced in July 2020. In the future, the closing time for the market will be even closer to the real time.

Switzerland's participation in the latter three platforms for RR/TERRE, aFRR and mFRR is subject to a proviso on the part of the EU, according to which the European Commission decides on participation in the event of platform operation risk on the basis of opinions from the ENTSO-E association and the European agency ACER. ENTSO-E issued a positive opinion in 2017, while ACER did so in 2018. The European Commission's decision is still pending and is undoubtedly being influenced by the discussions on the Brexit procedures and the EU-Switzerland framework agreement.

ElCom aims to participate in the platforms, as it sees considerable risks from non-participation. These specifically consist of the very short-term occurrence of unscheduled, unannounced large electricity flows via the Swiss network, which can lead to congestion and outages. The heavily interconnected network means that such local failures can also directly affect the entire region around Switzerland.

7.6 International bodies

2020 was the first year of the new European Commission under President Ursula von der Leyen. She took up her position as successor to the Juncker Commission on 1 December 2019.

The EU is still fleshing out the Paris Agreement (2015) in specific terms to cut greenhouse gas emissions by 2030 so that Europe becomes the first carbon-neutral continent by 2050. The European Green Deal of December 2019 – together with the Next Generation EU package presented by the Commission on 27 May 2020 – represents a new growth strategy and investment agenda for clean energy to stimulate Europe's economic recovery from the coronavirus pandemic. The European Commission applies the 'do no harm' principle to the evaluation of sustainability and carbon-neutrality. EU member states must submit coherent energy and climate plans and feasible reforms of their own national energy markets. The long-

term, digital transformation of the European economy, society and energy sector is another urgent measure for the EU and must be laid down in specific terms.

The integration and strengthening of the EU internal electricity market in the period 2020–30 will be continued under this framework and aims to benefit consumers, supply security and energy transformation thanks to renewable energies and a sustainable economy. The organisation of the EU electricity market previously focused on the wholesale markets.

Technological progress and new regulations, or regulations revised in 2019, mean greater influence is being exercised over the power distribution networks and markets. In particular, these include Ordinance (EU) no. 2019/943 and Directive 2019/944 on the Internal Market for Electricity, Ordinance (EU) no. 2019/942 on the Agency for the Cooperation of Energy Regulators (ACER), Ordinance (EU) no. 2019/941 on Risk-Preparedness in the Electricity Sector and Directive (EU) no. 2018/2001 on the Promotion of the Use of Energy from Renewable Sources.

Cross-border and regional cooperation in the gas sector and its integration and complementarity to the electricity sector are also to be intensified: equal treatment of all energy sources on the electricity and gas market – such as in terms of taxation – is to be geared towards decarbonisation. A revision of the EU's legal framework for the gas market is planned in 2021–22 to optimise sector coupling between gas and electricity and their synergies as part of the EU strategy for an integrated energy system (July 2020). The EU believes the future integrated, interconnected and flexible energy system will reduce costs for society and support more efficient energy flows between consumers and producers as well as local solutions with renewable electricity.

The EU Green Deal contains further key elements. These include energy efficiency measures, improvement of consumer protection, the reduction of energy poverty and improved information for consumers about their options for interacting with the energy market and the sustainability of the products they use.

Regional Coordination Centres (RCC) must be introduced by July 2022 and the current Regional Security Coordinators (RSC), such as Coreso or TSCNet Services, will be replaced to support a secure, reliable and efficient electricity system and to implement capacity calculations and security analyses. Swissgrid is currently a member of TSCNet Services. How the conversion from TSC as a RSC to a RCC will take place and under what conditions Swissgrid can remain a member will be decided in early 2021.

The various EU laws, initiatives, reforms and energy or climate plans may also affect any potential conclusion of a bilateral electricity agreement between Switzerland and the EU which remained on ice in 2020 and depends on the prior conclusion of an institutional framework agreement from the EU's perspective. The EU is encouraging its own member states and third countries to accelerate environmental change and the energy transition, such as through market reforms.

ACER's new Director Christian Zinglersen began a five-year term in office on 1 January

2020. ElCom has observer status in the ACER Electricity Working Group and its sub-groups. On these committees as well as in the regional groups, which implement the EU's network codes, ElCom coordinates and represents Switzerland's interests as far as possible despite not participating in projects, such as Single Intraday Coupling (SIDC). Cooperation with ACER takes priority from the perspective of the Swiss network's security and took place – as with other bodies – almost exclusively via electronic means instead of physical meetings in 2020 for coronavirus-related reasons.

ElCom has held observer status on the Council of European Energy Regulators (CEER), which was founded 20 years ago, since 2012. CEER, like ACER, is seeking to strengthen the role of the regulators. CEER also supports the implementation of EU laws on the gas and electricity sectors, the European Green Deal and sector coupling of complementary gas and electrical energies. This aims to contribute to the long-term decarbonisation of the European economy. These activities are key elements in CEER's strategy 2019–21.

To overcome the uncertainty of Brexit, CEER granted the UK regulator (Ofgem) a special status whereby Ofgem will continue to be treated as a full member with voting rights.

In 2020, ElCom – together with the SFOE and Swissgrid – was again involved in the activities of the Pentalateral Energy Forum (PLEF) to ensure network security in winter and the distribution of redispatch costs. It participates in the discussions on the further development of capacity management on the northern Italian border. ElCom is an observer at the European Electricity Regulatory Forum whose only meeting in 2020 took place via video conference and focused on the challenge of integrating the EU's internal energy market. ElCom hardly participated in the activities of the OECD Network of Economic Regulators (NER), which is once again evaluating the independence of regulators and closely monitoring the consequences of the coronavirus pandemic.

8 Outlook

On 11 November 2020, the Federal Council decided to combine the revision of the Energy Act and the Electricity Supply Act into a consolidation bill entitled the 'Federal Act on Secure Electricity Supply with Renewable Energies'. It assigned the Federal Department of the Environment, Transport, Energy and Communications (DETEC) the task of presenting the dispatch by mid-2021. A key issue for ElCom is that these bills govern the framework conditions for maintaining a substantial share of current domestic electricity production in winter after the withdrawal from nuclear energy.

There are various challenges in the international context: the flow-based market coupling in the Central-West region is being rolled out to Central Europe, Italy is joining the European platform for intraday trading (XBID) and the international platforms for the exchange of balancing energy are increasing volumes close to real-time. This will increase volatility on the transport network and coordination requirements for interconnected operations over the next few years. In view of its geographical location and high level of electrical integration into the major markets in continental Europe, Switzerland will be significantly affected by these developments. ElCom is supporting Swissgrid with negotiations on the inclusion of the Swiss network as part of international optimisation. As import availability is increasingly dependent on political decision-making abroad, ElCom believes further action is required to secure domestic winter production.

In 2021, ElCom's IT infrastructure for the various annual surveys on network operators will be replaced and upgraded. The EDES project will replace the existing data delivery system with a more modern and efficient version. This includes new technology as a replacement for the current Excel forms and the use of web-based forms which enable data to be delivered via an interface. There will also be a new portal for master data management and data delivery. Finally, the electricity price website will also be redesigned.

The high shortfalls will remain a major issue in 2021. ElCom has underlined that no shortfalls may be created for the purpose of establishing reserves and that coverage differentials must not be misused as a financial instrument or for the purpose of skimming-off profits. Shortfalls remain much too high at CHF 1.5 billion. ElCom is therefore examining further measures for 2021.

The dispatch on the Gas Supply Act is expected in 2021. ElCom will also participate in the consultation procedure. The bill submitted for consultation in autumn 2019 includes plans for ElCom to be renamed as the 'Federal Energy Commission, EnCom' and to also monitor compliance with the Gas Supply Act. ElCom believes it is important that sector coupling between elec-

tricity and gas is driven forward through coherent regulatory and supervisory practice as is the case abroad.

Owing to the existing legal basis in Switzerland regarding market transparency and integrity, ElCom only has a limited insight into market developments. This means market developments can only be partially examined and the scope for identifying and preventing system failures through market manipulation is limited. A transparent, fair and verifiable market price is important in view of potential complete market liberalisation. This would require the introduction – as has long been established in the financial sector – of the prohibition of market manipulation and insider trading on the electricity wholesale market in Switzerland and the opportunity for cooperation on these matters with neighbouring regulatory authorities. The revision of the Energy Supply Act, due to take place in 2021, provides an opportunity to do so.

9 About ElCom

The Commission, from left to right: Dario Marty, Laurianne Altwegg (Vice President), Werner Luginbühl (President), Felix Vontobel, Katia Delbiaggio, Sita Mazumder, Andreas Stöckli

ElCom is responsible for monitoring the Swiss electricity market and ensuring compliance with the Electricity Supply Act. As an independent state supervisory authority, ElCom is playing an active role in the transition from a monopolistic electricity supply system to a competition-based electricity market. It is ElCom's responsibility to monitor the electricity prices charged for the basic supply. ElCom also monitors whether the network infrastructure is maintained and expanded so that supply security is guaranteed for the future.

Key electricity sector data
ElCom supervises wholesale electricity trading and the electricity sector, including Swissgrid. Its supervisory activities include network use tariffs, electricity tariffs for fixed end consumers, supply security, the condition of the electricity networks and the allocation of network capacities in the event of congestion at the country's borders.

No. of network operators: approximately 630
No. of network levels: 7
Lengths of electricity networks: Network level 1 – approx. 6,720 km | network level 3 – approx. 8,840 km | network level 5 – approx. 46,999 km | network level 7 – approx. 149,000 km (overhead lines and cable, including building connections)
Transformers: network level 2 – 147 | network level 4 – 1,153 | network level 6 – approx. 60,000 (including mast transformers)

Total network use revenue: CHF 3.5 billion

Annual investments: approx. CHF 1.4 billion

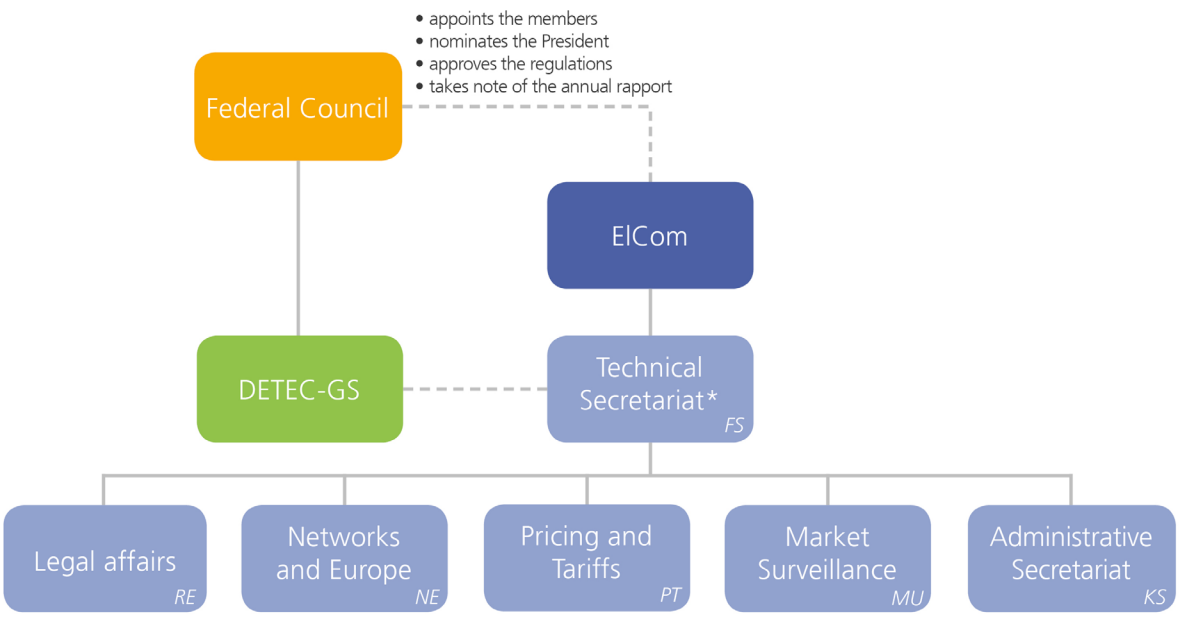
Annual electricity consumption: 54 TWh
Production: 60.5 TWh
Electricity imports: 23.6 TWh | **Electricity exports:** 30 TWh

ElCom possesses wide-ranging competencies for performing the following duties in particular:

- Examining all network use remuneration: In the liberalised energy market, the use of the networks for electricity transmission is compensated via network use remuneration. ElCom examines the lawfulness of this form of remuneration.
- Supervising electricity tariffs for fixed end consumers (basic supply, i.e. households and other end consumers with an annual consumption below 100MWh) and all those end consumers who do not opt for network access.
- Ruling on disputes associated with free access to the electricity network: Major consumers (with an annual consumption of at least 100MWh) have been able to freely choose their electricity supplier since 1 January 2009.
- Monitoring electricity supply security and the status of the electricity networks.
- Defining the procedures for the allocation of network capacities in the event of congestion in cross-border transmission lines and coordinating activities with European electricity market regulators.
- Carrying out comprehensive supervision of the national grid operator (Swissgrid AG) following transfer of the ownership of the transmission network to Swissgrid AG (unbundling).
- Supervising wholesale electricity trading.

9.1 Organisation and personnel

ElCom comprises five to seven independent Commission members appointed by the Federal Council, plus a Technical Secretariat. It is not subject to any directives of the Federal Council and is independent of the administrative authorities.



*Administratively linked to the general secretariat of DETEC

Figure 19: ElCom organisational chart

9.1.1 Commission

The seven Commission members of ElCom are independent of the electricity industry, and they all hold part-time mandates. On average, the Commission holds a plenary meeting once a month and its members also attend meetings of the five committees: Pricing and Tariffs, Networks and Europe, Legal Affairs, International Relations and Market Surveillance.

In the year under review, the Commission consisted of the following members:

President:

- Werner Luginbühl (since 2020): former member of the Council of States

Vice-President:

- Laurianne Altwegg (since 2015): Degree in Political Science, responsible for energy, environment and landscape at the Western Switzerland Consumers Association (FRC)

Members:

- Dario Marty (since 2018): Degree in Electrical Engineering (University of Applied Sciences), former Head of the ESTI
- Sita Mazumder (since 2018): PhD in Economics, Professor of Economics and Computer Science at the Lucerne School of Information Technology, Lucerne University of Applied Sciences and Arts
- Andreas Stöckli (since 2019): Attorney-at-law, Professor of Constitutional and Administrative Law at the University of Fribourg
- Katia Delbiaggio (since 2020): PhD in Political Science, Professor of Economics at the School of Business, Lucerne University of Applied Sciences and Arts
- Felix Vontobel (since 2020): Degree in Electrical Engineering (University of Applied Sciences)

Committees

In the year under review, the Commission operated the following committees:

Pricing and Tariffs

- Katia Delbiaggio (Chairperson)
- Laurianne Altwegg
- Sita Mazumder
- Andreas Stöckli

Legal Affairs

- Andreas Stöckli (Chairperson)
- Werner Luginbühl
- Lauriane Altwegg

Networks and Supply Security

- Dario Marty (Chairperson)
- Werner Luginbühl
- Lauriane Altwegg
- Katia Delbiaggio
- Felix Vontobel

International Relations

- Felix Vontobel (Chairperson)
- Werner Luginbühl
- Dario Marty

Market Surveillance

- Sita Mazumder (Chairperson)
- Katia Delbiaggio
- Andreas Stöckli
- Felix Vontobel

Resignations and new appointments

Werner Luginbühl, the longstanding Cantonal Councillor and Council of States member, has been chairperson of ElCom since 1 March 2020.

Christian Brunner stepped down as Commission member in 2020, the year under review. The graduate in electrical engineering (University of Applied Sciences) had been a member of ElCom since 2014. The Federal Council appointed Felix Vontobel as a replacement. Vontobel is also an electrical engineer who worked for Repower AG from 1987 to 2020. He took up his position at ElCom on 1st July 2020.

Representation of gender and language regions

There were three female and four male ElCom Commission members during the year under review, which corresponds to a ratio of women to men of 43 per cent. In terms of representation of language regions, the ElCom Commission members are as follows: German-speaking region: five persons; French-speaking and Italian-speaking regions: one person each.

9.1.2 Technical Secretariat

The Technical Secretariat provides the Commission with technical and specialised support, prepares ElCom's decisions and implements them. It conducts administrative proceedings and carries out the necessary clarifications. It is independent of any other authorities and is solely subject to the directives of the Commission. At the administrative level, the Technical Secretariat is affiliated with the General Secretariat of the Federal Department of the Environment, Transport, Energy and Communications (DETEC). The Administrative Secretariat is ElCom's central contact point for the general public, the electricity industry and the media. It coordinates the activities of the Commission and the Technical Secretariat and provides the Commission with administrative support. As of 31 December 2020, the Technical Secretariat employed 48 personnel on a full-time or part-time basis, including three apprentices. This corresponds to 39.5 full-time equivalents (FTE). The employees are made up of 18 women and 27 men, which represents a female proportion of 40 per cent. The average age of all employees is 43.1. Breakdown by national language (without trainees):

- Italian: 2 employees
- French: 7 employees
- German: 36 employees

Head of the technical Secretariat (48 employees)

Renato Tami
lic. iur., attorney-at-law and public notary

Networks and Europe (10 employees)

Michael Bhend
degree in engineering, Federal Institute of Technology

Pricing and Tariffs (15 employees)

Barbara Wyss
PhD in economics

Market Surveillance (5 employees)

Cornelia Kawann
degree in engineering, doctor of technology, MBA

Legal Affairs Section (10 employees)

Nicole Zeller
attorney-at-law

Administrative Secretariat (7 employees)

Simon Witschi
M.A.

9.2 Finances

In the year under review, ElCom had a budget of CHF 12.6 million at its disposal. Its effective expenditure amounted to around CHF 12 million. This amount covered ElCom's entire personnel and operating costs, including the additional expenditure associated with the replacement of existing IT systems.

On the income side, ElCom received a total of CHF 6.5 million, the main sources of which were payments of supervisory fees for ElCom's cooperation with foreign authorities and court costs paid by parties involved in legal proceedings.

9.3 Events

ElCom Forum 2020

The ElCom Forum had to be cancelled due to the coronavirus pandemic in the year under review. The next ElCom Forum takes place on 5 November 2021 at the Lucerne Culture and Congress Centre.

Information events

The information events for network operators normally held in spring could not be carried out in their usual format due to the coronavirus pandemic. As an alternative, the Technical Secretariat recorded the presentations in three languages and made them available to all interested parties on ElCom's website. Topics concerning cost audits, cost calculations and the revision of the Electricity Supply Act and the Energy Act were addressed.

Market surveillance workshop

The annual workshop held by the Market Surveillance section was also cancelled. The next Market Surveillance workshop is set to take place on 28 May 2021.

10 Annex

10.1 Facts and figures

A total of 138 new cases were received in 2020. 64 of these cases were successfully concluded in the year under review, meaning that 46 per cent of cases were concluded in the year in which they were received. In 2020, a total of 240 cases were brought to a conclusion. The surplus from previous years, in particular from 2017, was massively reduced again. General enquiries are those submitted via the contact form on the ElCom website or by e-mail and which deal with routine matters. Handling these enquiries normally takes anywhere from a few hours to one or two days. Occasionally, general enquiries may lead to proceedings. 440 such general enquiries were received in 2020. All but 18 of these were dealt with in full (96 per cent). A total of 61 rulings were pronounced in the year under review. A large portion of these concerned applications for increasing network capacity.

Complaints, etc.	Brought forward from previous years[1]	Received in 2020	Dealt with in 2020	Carried forward to 2021
Specific matters relating to tariffs	36	8	13	31
Increases in network capacity	29	55	55	29
Other cases	240	75	172	143
Total	**305**	**138**	**240**	**203**
General enquiries	14	440	436	18
Total including general enquiries	**319**	**578**	**676**	**221**

1 The number of cases carried forward is higher than in previous years due to a new data collection method.

Table 7: ElCom activities: statistics for 2020

10.2 Meetings

The members of ElCom attend monthly plenary meetings. In addition to these, the five committees hold their own meetings and ElCom also organises workshops and other extraordinary meetings. In the year under review, the members of ElCom (in various compositions) attended a total of 13 full-day and 22 half-day meetings within Switzerland. Once a year, ElCom organises a retreat during which its members seek contact with the local network operators.

10.3 Publications

Directives

24/3/2020	Cost calculation: submission and subsequent amendment
26/3/2020	WACC production

Notifications

18/3/2020	Behaviour of decentralised energy generation plants in the event of deviations from the standard frequency – upgrading of existing plants Retrofit 2
7/4/2020	FAQ on the coronavirus
28/4/2020	Algorithmic trading
5/5/2020	Agreement between ElCom, ESTI and SFOE on the planning approval ruling and electricity transmission lines sectoral plans (SÜL)
5/5/2020	Calculation of additional cost factor in accordance with LineO
5/5/2020	Calculation of the additional cost factor – MKFactory table
5/5/2020	Application of Art. 15c ElecA as part of the planning approval ruling
7/7/2020	Consultation procedure on the Energy Act by ElCom
4/9/2020	Own-consumption practice model
26/8/2020	Questions and answers on the Energy Strategy 2050

Reports and studies

27/2/2020	Winter Production Framework Paper
18/5/2020	Market Transparency 2019 – report by ElCom
26/5/2020	Inclusion of the Swiss Network in the EU's Capacity Calculations
27/5/2020	Study on the Impact of the Coronavirus Pandemic on the European Load
6/6/2020	Report on the Activities of ElCom 2019
17/6/2020	ElCom Final Report on System Adequacy 2030
24/6/2020	Analysis of the Negative Prices for Switzerland, France and Germany between 1 January 2015 and 31 May 2020
30/6/2020	Report on Balancing Power and the Reserve Power Supply 2019
16/7/2020	Switzerland's Electricity Supply Security 2020

10.4 Glossary

ACER	EU Agency for the Cooperation of Energy Regulators
aFRR, mFRR	Automatic / manual frequency restoration reserve Frequency restoration reserve
Balance management	Measures for constantly maintaining the electricity and capacity balance in the electricity system. It includes timetable management, data measurement and balance compensation management.
Blockchain	Expandable list of data sets linked together using cryptographic techniques
CBCA	Cross Border Cost Allocation
CEER	Council of European Energy Regulators
CEP	Clean Energy Package
CERT	Computer Emergency Response Team
CIP	Critical Infrastructure Protection Strategy
CMIT	CEER Market Integrity and Transparency Working Group
Congestion management	Ensures that the secure operation of the network can be maintained through preventive measures (e.g. NTC specification, capacity auctions) and operational measures (e.g. re-dispatch, reductions).
Control zone	Zone in which the national grid operator is responsible for network control. This zone is physically defined through measurement stations.
CORE	The CORE capacity calculation region consists of the former CWE (Central Western Europe) and CEE (Central Eastern Europe)
Cost-Plus Regulation	Method of cost regulation whereby each network operator determines the operating costs based on its own costs which includes a reasonable profit. This corresponds to the current cost regulation in Switzerland. In contrast, incentive-based

	regulation determines the costs that an efficient network operator would incur in the relevant network area.
DETEC	Federal Department of the Environment, Transport, Energy and Communications
Distribution network	High, medium or low voltage network for the purpose of supplying electricity to end consumers or electricity supply companies.
EEX	European Energy Exchange
EIV	Non-recurring remuneration
ElCom	Swiss Federal Electricity Commission
End consumers	Clients who buy electricity for their own consumption. This does not include power plants that buy electricity for their own consumption and for powering pumps in pump storage power plants.
ENTSO-E	European Network of Transmission System Operators for Electricity
EnV	Energy Ordinance
EPEX	European Power Exchange
ESTI	Swiss Federal Inspectorate for Heavy Current Installations
EU	European Union
European Green Deal	EU growth strategy for a sustainable economy
FCR	Frequency controlled normal operation reserve
FINMA	Swiss Financial Market Supervisory Authority
FITS	Flexible Intraday Trading System
FOCP	Federal Office for Civil Protection
FSO	Federal Statistical Office

H4	5-room apartment with electric cooker and tumble dryer, but without an electric boiler
HV	High voltage
ICT	Information and Communications Technology
IDM / IDM CH Index	Intraday Market / Intraday Market Index Switzerland
IN	Imbalance Netting
KEV	Feed-in remuneration at cost
kVA	Kilovolt ampere
kWh	Kilowatt hour
kWp	Kilowatt peak
LV	Low voltage
Median	Value in the middle of a data series arranged by size, i.e. half of all the observations are smaller and half are larger than the median figure. (Unlike the average figure, the median is resistant to statistical outliers.)
MV	Medium voltage
MVA	Megavoltampere
MW	Megawatt
MWh	Megawatt hour
Net transfer capacity (NTC)	Maximum exchange programme between two network zones that is reconcilable with the safety standards of both zones and which takes technical uncertainties regarding future network situations into account.
Network access	Right to use a network in order to obtain electricity from any supplier or to feed electricity into a network.
Network use	Physical use of a network system based on feed-in or withdrawal of electricity.

NO	Network operator
NextGenerationEU	temporary EU recovery plan to repair the damage caused by the Corona pandemic
NPP	Nuclear Power Plant
OT	Operational technology
PGV	Plangenehmigungsverfahren (planning approval procedure)
PLEF	Pentalateral Energy Forum
PV	Photovoltaic system
REMIT	Regulation on Wholesale Energy Market Integrity and Transparency Regulation (EU) No 1227/2011 of the European Parliament and of the Council of 25 October 2011 on Wholesale Energy Market Integrity and Transparency.
Reserve power supply	Power supply that can be drawn on automatically or manually by power plants to maintain the scheduled level of electricity exchange and ensure the continued safe operation of the network.
RRM	Registered reporting mechanism
SAIDI	The System Average Interruption Duration Index (SAIDI) indicates the average duration of interruptions in supply to an end consumer in an electricity supply system.
SAIFI	The System Average Interruption Frequency Index (SAIDI) indicates the average frequency of interruptions in supply to an end consumer in an electricity supply system.
SFOE	Swiss Federal Office of Energy
SIDC	Single Intraday Coupling
Strand km	A cable strand (strand km) consists of several conductors (e.g. 1 km with 3 phase or single phase conductors = 1 km). In the case of cable lines, one kilometre describes the absolute length of the cable. For overhead lines, for example, 3 phase conductors correspond to one strand (see VSE document NBVN-CH edition 2007).

StromVG	Federal Electricity Supply Act
StromVV	Federal Electricity Supply Ordinance
SÜL	Electricity Transmission Lines sectoral plan
System services, SDL	The ancillary services necessary for the safe operation of networks. The main components are system coordination, balance management, provision of reserve energy, self-contained start and independent operation capability of generators, voltage stability (including reactive energy), operational measurements and compensating active power losses.
Transmission network	Network used for the transmission of electricity over large distances within the country and for connection to networks outside the country, usually operated within the range of 220 to 380 kV. The following items are integral parts of the transmission network: a) transmission lines and support structures; b) coupling transformers, switching systems and measurement, control and communication equipment; c) systems that are used jointly with other network levels, mainly in association with the transmission network or without which it is not possible to operate the transmission network safely and efficiently; d) switching fields before the transformer at the transfer point to another network level or a power plant.
TSO	Transmission system operator
TWh	Terawatt hour
VSE	Association of Swiss Electricity Companies
XBID	Cross-Border Intraday Market Project
ZEV	Zusammenschluss zum Eigenverbrauch (merger for own consumption)

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