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Switzerland's risk preparedness with regard to electricity

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This report was drawn up by the Swiss Federal Office of Energy (SFOE) with the involvement of the Federal Office for National Economic Supply (FONES), the Federal Office for Civil Protection (FOCP), the Federal Electricity Commission (ElCom) and the national grid company (Swissgrid).

The report provides information and answers questions about risk preparedness relating to electricity supply.

The report gives an overview of the responsibilities and tasks of the entities concerned in both the Confederation and the electricity industry. It describes a range of measures that may be taken in the context of risk preparedness relating to electricity, and the current way in which federal crisis management for electricity is coordinated.

The report describes the situation as at 30 June 2022. It will be updated to reflect changes infederal crisis organisation.

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List of abbreviations

ACER	EU Agency for the Cooperation of Energy Regulators
BBl	Federal Gazette
BCM	Business Continuity Management
CACM	Capacity Allocation and Capacity Management
CCR	Capacity Calculation Regions
CyRO	Cyber Risk Ordinance
CCMB	Federal Civil Protection Crisis Management Board
CCMBO	Federal Civil Protection Crisis Management Ordinance
CPDA	Civil Protection and Civil Defence Act
CIP	Critical Infrastructure Protection
CSG	Conference of Secretaries General
DDPS	Federal Department of Defence, Civil Protection and Sport
DETEC	Department of the Environment, Transport, Energy and Communication
EAER	Department of Economic Affairs, Education and Research EAER
ElecA	Electricity Act
ElCom	Federal Electricity Commission
EnA	Energy Act
ENTSO-E	European Network of Transmission System Operators for Electricity
EPEX	European Power Exchange
ESA	Electricity Supply Act
ESO	Electricity Supply Ordinance
ESOO	Ordinance on the Organisation to ensure National Economic Supply in the Electricity Sector
EU	European Union
FBMC	Flow Based Market Coupling
FCR	Frequency Containment Reserves
FCh	Federal Chancellery
FOCP	Federal Office for Civil Protection
FONES	Federal Office for National Economic Supply
GAOA	Government and Administration Organisation Act
GAOO	Government and Administration Organisation Ordinance
HydRO	Hydropower Reserve Ordinance
ICT	Information and Communication Technology
MoU	Memorandum of Understanding
MEAS	Mutual Emergency Assistance Service
NAOC	National Alarm Operations Centre
NEA	Nuclear Energy Act
NES	National Economic Supply
NCSC	National Cyber Security Centre
NIST	National Institute of Standards and Technology
NTC	Net Transfer Capacity
NRA	National Regulatory Authority
NESA	National Economic Supply Act
NESEIO	National Economic Supply in the Electricity Industry Ordinance
NESO	National Economic Supply Ordinance
OSTRAL	Organisation for Power Supply in Extraordinary Situations
SECO	State Secretariat for Economic Affairs
SFOE	Swiss Federal Office of Energy
TSO	Transmission system operator
TERRE	Trans European Replacement Reserves Exchange
VSE	Association of Swiss Electricity Companies
WRA	Water Rights Act

1 Introduction

Switzerland has a comprehensive crisis preparedness plan in the electricity supply sector. This report provides information and answers questions about risk preparedness relating to electricity supply particularly with regard to cooperation in the Pentalateral Energy Forum (Pentaforum)[1] on the implementation of European risk preparedness in the electricity sector.

1.1 EU regulation on risk preparedness

Since 2019, risk preparedness in the electricity sector in the EU has been regulated by Regulation (EU) 2019/941.[2] This focuses on how to ensure that member states are made sufficiently aware of and are prepared for the full range of risks to security of supply. It also addresses the establishment of tasks and responsibilities in the event of an emergency and the possible cross-border effects in the event of protective measures being adopted.

Implementation of the regulation began in the EU in early 2020. The purpose of the regulation is to raise crisis prevention, preparedness and management to a European level. This means that the member states must appoint a competent authority to communicate with the European Commission and carry out risk assessment in cooperation with the European Network of Transmission System Operators (ENTSO-E) and Regional Coordination Centres (RCCs[3]). To this end, regional crisis scenarios are drawn up based on the individual national scenarios of the member states, whereby 'regional' covers several countries. The EU regulation stipulates that the regional scenarios include at least the following risks:

- rare and extreme natural hazards;
- accidental hazards going beyond the N-1 criterion and exceptional contingencies;
- consequential risks including the consequences of malicious attacks and fuel shortages.

On this basis, the member states must then draw up risk preparedness plans containing prevention and response measures that are clearly defined, transparent, proportionate, non-discriminatory and compatible with the principles of the single market.

The Swiss legal framework differs from the terms of Regulation (EU) 2019/941. Should Switzerland conclude an electricity agreement with the European Union at some time in the future, the legal implications will have to be reviewed and adjustments made to the legal provisions if necessary.

1.2 Risk preparedness in the Pentaforum

Risk preparedness in the electricity sector is also a topic addressed by the Pentaforum, in which Switzerland is involved. In 2017, the Pentaforum countries signed a Memorandum of Understanding (MoU) on cooperation over risk preparedness and management in the electricity sector, which was replaced by an updated MoU in 2021.[4] Regional cooperation has already proven its worth on several occasions, for example in managing the difficult situation in Belgium in the winter of 2018/19 or when trilateral redispatching between Switzerland, Germany and France was agreed.[5] For Switzerland as a non-EU

1 The Pentalateral Energy Forum (Pentaforum) is a regional cooperation mechanism between the energy ministries of Germany, France, Belgium, the Netherlands, Luxembourg, Austria and Switzerland (as an observer since 2011)). It comprises representatives of the TSOs, ENTSO-E, regulators, ACER and the EU Commission.

2 Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC EUR-Lex - 32019R0941 - EN - EUR-Lex (europa.eu)

3 Regulation (EU) 2019/943 on the internal market for electricity provides the statutory basis for the RCCs. Their relationship with third parties is to be regulated by formal agreement.

4 Memorandum of Understanding of the Pentalateral Energy Forum on Risk Preparedness in the Electricity Sector, December 2021 MoU on risk preparedness in the electricity sector

5 Redispatching is a measure in transmission constraint management. It involves altering power generation in order to divert electricity flows and so alleviate grid constraints.

member, regional cooperation in the electricity sector is of particular value and helps to ensure security of supply.

Switzerland's neighbouring countries are France, Germany, Austria and Italy. Liechtenstein, its fifth neighbour, is annexed to the Swiss customs area under an international treaty between the two countries, under which it also adopts Swiss law on national economic supply. Liechtenstein is also part of the CH control area; however, as yet only selective contractual regulations exist, e.g. for transmission constraint management on the Eschen-Feldkirch network element.

1.3 Terminology and delimitations

A selection of terms relating to risk preparedness are defined below:[6]

A **power outage** (power failure, blackout) is an unpredictable interruption of the power supply lasting a few minutes, hours or days. This may be caused by a storm or ice formation that causes failure of a power line; malfunctions or incorrect interventions in system operation; cyber attacks, terror attacks, etc. The national grid company (Swissgrid), together with the electricity industry, is responsible for remedying a power outage under the Electricity Supply Act (ESA; SR 734.7). Trade and market mechanisms essentially continue to function during a power outage.

An **electricity shortage** is a shortfall in supply that the private sector is unable to manage. Article 2 letter b of the National Economic Supply Act (NESA; SR 531) defines a severe shortage as ‘a supply situation in which there is an extreme risk of immediate, major damage to the economy or considerable disruption to national economic supply’. Causes may include, individually or in combination: drought, extended cold spell, earthquake, problems with the power stations fleet, limited electricity import capacities, large-scale cyber attacks on critical infrastructure, geopolitical uncertainties, etc.

Electricity crisis is the general term for a large-scale and prolonged power outage and for an electricity shortage situation. A crisis is an unfavourable development in a given situation with an uncertain outcome that requires fundamental decisions and special efforts by decision-makers to bring about a turnaround.

Prevention involves reducing the probability of occurrence, i.e. applying measures to ensure that hazards do not occur in the first place or to limit their impact. Understanding the reasons why an event occurs enables system operators to prevent further incidents. Incidents may occur as a result of grid security issues, operational issues or a lack of grid decongestion measures. Ensuring sufficient redispatching capacity or creating a redundant control centre are examples of preventive measures.

Preparedness involves the totality of measures taken (relating to material, staff, organisation, training) to ensure the efficient and timely management of an imminent or occurring event in order to reduce the extent of the damage caused. This applies to all events, regardless of their origin; the primary concern is how the effects can be mitigated. Preparedness involves drawing up a set of measures to be implemented after an event occurs. These include grid restoration, black-start capacity and national economic supply management measures.

Intervention or **response** involves limiting the extent of the damage caused by an electricity crisis and its duration. Appropriate and well-prepared measures are taken to ensure that power supply is restored as rapidly as possible.

The following chart illustrates the difference between prevention/preparedness and intervention/response.

[6] Definitions of terms based on the FOCP Glossary of Risk Terms

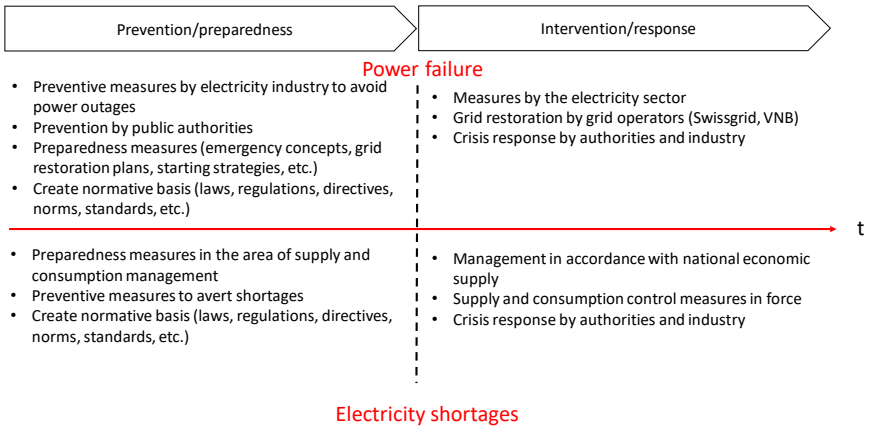

Figure 1: Difference between prevention/preparedness and intervention/response in the context of a power outage and electricity shortage (author's illustration)

2 Risk scenarios

2.1 National risk scenarios

In its national risk analysis, the Federal Office for Civil Protection[7] (FOCP) considers two hazard situations that lead to an electricity crisis. These are a power outage lasting several days in several cantons, and a prolonged nationwide electricity shortage. Further electricity crisis scenarios have been drawn up in the context of critical infrastructure protection (CIP) and national economic supply (NES). These are used for internal administrative purposes. As yet no overview of the systematic risks that lead to electricity crises has been compiled. Such risks will be examined in depth under the national CIP strategy up to the end of 2023. Measures to improve resilience will then be developed based on the findings.

2.2 Regional risk scenarios

Under Article 5 of Regulation (EU) 2019/941, the European Network of Transmission System Operators for Electricity (ENTSO-E) is responsible for proposing a methodology for identifying the most relevant regional electricity crisis scenarios. The article also lists the minimum risks that must be considered and the minimum elements the proposed methodology must entail.

In the methodology developed by ENTSO-E,[8] the transmission system operators in Europe in coordination with the respective competent national authorities must first identify scenarios that have a particular regional impact. ENTSO-E then compiles a list of the regional scenarios, which are in turn evaluated by the transmission system operators. Based on their assessments, ENTSO-E draws up an overall rating, which it publishes in a report.

2.2.1 National evaluation of regional risk scenarios

In spring 2020,[9] ENTSO-E asked the transmission system operators to submit possible scenarios with regional characteristics. In Switzerland, a working group set up by Swissgrid with representatives from the SFOE, FONES, FOCP and ElCom drew up the required regional scenarios. In a second step, it conducted the national evaluation of the scenarios, which were then sent back to ENTSO-E. It should be noted that there is room for improvement in the ENTSO-E scenario methodology and specifications, in particular with regard to the comparability of values, the definition of the scenarios and the evaluation criteria being too open to interpretation. ENTSO-E is currently reviewing and improving the methodology as a result.

The following table contains regional risk scenarios that were given a rating equal to or greater than 2 by Switzerland's working group. These are scenarios with a national rating and a cross-border dependency rating of at least 'minor', whereby one of the two must be rated as 'major'.

[7] FOCP national risk analysis report. Disasters and Emergencies in Switzerland 2020, 26 November 2020 https://www.babs.admin.ch/en/aufgabenbabs/gefaehrdrisiken/natgefaehrdanalyse.html

[8] Methodology to Identify Regional Electricity Crisis Scenarios in accordance with Article 5 of the REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on risk preparedness in the electricity sector and repealing Directive 2005/89/EC.

[9] This report thus does not address Switzerland's current energy supply situation with regard to the war in Ukraine.

ID	Name of the scenario	National rating [10]	Cross-border-dependency rating	Score
21	**Unwanted power flows due to the fact that physical flows don't follow market related scheduled flows** *Unwanted and unplanned power flows can lead to local overloads of the transmission grid (n-1 criterion). In the worst case, this can trigger a failure cascade of grid elements and cause blackouts. Switzerland, with its extensive interconnection through 41 cross-border lines, is very affected by such unwanted flows.*	Major	Major	4
25	**Unexpected / unforeseen interaction of energy market rules** *Unexpected or unforeseen behaviour due to energy market rules can, for example, lead to increased unplanned flows. Because of its numerous cross-border lines, Switzerland may be impacted in particular. Effects similar to scenario 21.*	Major	Major	4
10	**Cold Spell** *The assumption is a 10-20°C lower average temperature, little wind and low hydropower production. Consumption would increase significantly. The cold spell is likely to occur in a larger region (neighbouring countries also affected), which means that imports are likely to be limited.*	Major	Minor	2.4
12	**Winter Incident** *This scenario foresees large amounts of snow or heavy snowfall and ice formation. There are many avalanches in the mountains. This leads to the failure of multiple grid elements and the congestion of the still functioning grid. Power outages would probably be limited to local areas.*	Major	Minor	2.4
14	**Nuclear fuel shortage** *The supply of nuclear fuel is essential for the operation of nuclear power plants. Every year, part of the fuel has to be changed. A shortage could have far-reaching consequences, especially in winter, as around 35% of Swiss production depends on it.*	Major	Minor	2.4
15	**Local technical failure with regional importance** *A failure of a critical network element (substation, transformer) can have regional effects. In the worst case, cascading effects can occur, even resulting in large-scale blackouts. The trigger could be a network element in Switzerland or Switzerland could be affected by an incident abroad.*	Major	Minor	2.4
27	**Pandemic** *The main threat of a pandemic to the power system is when there are insufficient skilled personnel available. For example, power plants would have to be shut down, market platforms could not be operated, plant maintenance would be delayed and grids could not be properly operated.*	Major	Minor	2.4
29	**Dry period** *A long dry period with little rain leads to low water levels and thus low hydropower production. Thermal power plants can also be affected if there is insufficient cooling water. Switzerland could be severely affected because more than 60% of electricity comes from hydropower.*	Major	Minor	2.4
1	**Cyber attack on business critical ICT infrastructure of entities which are physically connected to the power grid like TSOs, DSOs, power plants and major (industrial) loads** *Taking control of important ICT systems for the operation of the power system can have devastating effects. Or disturbances can be caused that affect the stability of the power system. The consequences can be far-reaching and lead to large-scale blackouts.*	Minor	Major	2

Table 1: Switzerland's national assessment of regional electricity crisis scenarios

[10] The following assessment methodology is used: Disastrous (EENS% ≥ 0.25% of annual demand, LOLE ≥ 168 hours), Critical (EENS% ≥ 0.05% and < 0,025%, LOLE ≥ 48 and < 168), Major (EENS% ≥ 0.01% and <0,005%, LOLE ≥ 12 and < 48), Minor (EENS% ≥ 0.002% and < 0,01%, LOLE ≥ 3 and < 12), Insignificant (EENS% < 0,002%, LOLE < 3). The following values are applied: Disastrous: 10, Critical: 5, Major: 2, Minor: 1 and Insignificant: 0. To calculate the score, the cross-border dependency rating is multiplied by the national rating as follows: None - factor 1, Minor - factor 1.2 and Major - factor 2

The two scenarios with ID 21 'unwanted power flows' and ID 25 'unexpected interaction energy market rules' received the highest rating.[11] Both arise because the Swiss transmission grid is closely integrated into the European transmission grid. Switzerland is particularly affected by unplanned power flows, in part because of unforeseen interaction of energy market rules and especially when Italy is integrated into Flow Based Market Coupling (FBMC) and Switzerland is not. New market platforms for cross-border balancing power exchange can also further increase such unplanned flows.

Other highly rated scenarios include extreme weather situations (ID 10, 12 and 29), pandemic (ID 27), nuclear fuel shortages (ID 14) and technical infrastructure failures (ID 15). The scenario involving cyber attacks (ID 1) also receives a high rating.

2.2.2 Regional risk scenario evaluation by the Pentaforum

The regional risk scenario evaluations by the seven Penta countries were summarised as part of the Pentaforum's cooperation activities. The scenarios were evaluated in the Pentaforum member states according to the ENTSO-E methodology. A summary of the scenarios was made by adding up the individual evaluations and recording them in descending order as in the table below.

ID	Electricity crisis scenario	Penta-Rating (0-140)
1	Cyberattack - entities connected to electrical grid	44.0
28	Heatwave	31.2
12	Winter Incident	28.6
3	Physical attack - critical assets	27.2
17	Loss of ICT tools for real-time operation	25.2
10	Cold Spell	22.8
29	Dry period	22.4
9	Storm	21.6
4	Physical attack - control centres	21.0
16	Multiple failures caused by extreme weather	20.8
6	Insider attack	20.2
18	Simultaneous multiple failures	19.4
24	Industrial / nuclear accident	19.4
5	Threat to key employees	19.0
11	Precipitation and flooding	18.4
27	Pandemic	18.0
19	Power system control mechanism complexity	17.2
20	Human error	16.6
13	Fossil fuel shortage	16.0
25	Unforeseen interaction of energy market rules	14.4
15	Local technical failure	12.6
7	Solar Storm	12.2
2	Cyberattack - entities not connected to electrical grid	11.2
26	Unusually big RES forecast errors	9.6
22	Serial equipment failure	9.0
31	Forest fire	8.6
21	Unwanted power flows	8.4
30	Earthquake	6.8
14	Nuclear fuel shortage	6.8
23	Strike, riots, industrial action	5.4
8	Volcanic eruption	3.2

Table 2: Evaluation of regional risk scenarios by Penta

[11] Switzerland's current energy supply with regard to the war in Ukraine was not a factor in the evaluation.

All 31 scenarios are included in the table above. The ranking does not correspond to Switzerland's scenarios evaluation, for a number of reasons. Firstly, there is some room for interpretation in the evaluation, especially with regard to the extent of impact; secondly, there are geographical differences: Switzerland, for example, is more affected by unwanted flows than other countries. Nevertheless, it can be seen that extreme weather events (cold spell, dry period and extreme winter) and cyber risks have a high priority both in Switzerland and in the Penta region as a whole.

Cyber risks were rated very highly by the Pentaforum overall because some countries rated this scenario as Critical and as Major in cross-border dependency. This is an example of the very different evaluations given by the various countries, depending on how a scenario is interpreted.

2.2.3 Impact of the war in Ukraine

When ENTSO-E drew up the risk scenarios in 2021, the issue of a European-wide energy crisis was not taken into account. In other words, the current situation triggered by the war in Ukraine is not reflected in the assessments above.

Because of the war in Ukraine and the disruption that this may cause to gas supply in Europe, as well as the reduced capacity of French nuclear power plants and the drought experienced in 2022, the electricity supply situation is critical and there is a real possibility of an energy crisis across the continent. Russia has reduced deliveries of gas and this is negatively impacting gas and electricity supply in Europe.

Switzerland is entirely dependent on imports from Europe for its gas supply. It produces a large amount of its own electricity but still needs to import power in the winter months. Switzerland’s security of supply is thus largely dependent on the supply situation in its neighbouring countries; an energy crisis in Europe has a direct impact on Switzerland.

The Federal Council has introduced several short-term measures to ensure that there is enough electricity and energy during the 2022/2023 winter. Long term, it wants to strengthen security of supply in Switzerland by introducing a measures under the Federal Act on a Secure Electricity Supply from Renewable Energy Sources.

3 Tasks and responsibilities in Switzerland

3.1 Electricity supply

In Switzerland, electricity supply is based on the principle of subsidiarity and cooperation. Under Article 6 of the Energy Act (EnA; SR 730.0) the primary responsibility lies with the energy or electricity industry; the state only intervenes at a subsidiary level. This means that the law regulates systemic aspects that require regulation (e.g. monopoly areas) and also those tasks that the electricity industry does not or cannot perform itself in the overall interest. For example, central functions in market design, such as the operation of the control area, international coordination, schedule and transmission constrain management, regulated grid access and basic supply are regulated by the ESA.. ElCom monitors the implementation of these basic requirements, as well as security of supply. The market ensures that enough energy is supplied.

In the event of an electricity supply crisis (power outage and/or shortage), when supply can no longer be maintained by the private sector, a number of official bodies become involved.[12] The Federal Council is responsible for crisis management at federal level.

3.2 Prevention, preparedness

In the area of prevention, under Article 8 paragraph 1 EnA the Confederation and cantons must create conditions in good time to ensure that production, grid and storage capacities can be made available should Switzerland's energy supply be insufficiently secure in the longer term. Furthermore, ElCom monitors the expansion of the network infrastructure and whether production and imports are sufficient to meet domestic consumption.

In addition to creating the appropriate framework, the state has a certain responsibility to intervene if the electricity industry does not (or cannot) fulfil its tasks as required by law.[13] Under Article 9 ESA, the Federal Council may take measures to ensure that the electricity industry is able supply power in the medium to long term. Furthermore, under Article 5 paragraph 6 of the Electricity Supply Ordinance (ESO, SR 734.71) the SFOE may set minimum technical and administrative requirements for secure and efficient grid operation and declare international technical and administrative provisions and standards and the recommendations of recognised specialist organisations binding.

Preparedness at state level includes national economic supply intervention measures based on the NESA. Thanks to these temporary intervention measures, electricity supply can be maintained in the event of imminent or existing electricity shortages. The NESA also states that preparatory measures shall be taken to ensure the country is prepared in the event of shortages. Furthermore, ElCom has the power to order companies to conclude contracts in order to avoid shortage situations, the Federal Civil Protection Crisis Management Board undertakes preparedness planning and crisis organisation and management is in place throughout the Federal Administration and power industry. Further explanations are given in the following sections.

[12] Responsibilities in the area of security of supply are set out in a report produced for the National Council Environment, Spatial Planning and Energy Committee dated 11 January 2017. This explains which entities in Switzerland have which role and which responsibilities in the operation of the electricity sector.

[13] See Dispatch on the Energy Supply Act, p. 1647f.

3.3 Power outage, electricity shortage

Article 6 paragraph 2 EnA states that the responsibility for avoiding (prevention) and mitigating (preparedness/response) power outages lies primarily with the companies in the electricity industry. In order to ensure secure and efficient grid operation, TSOs have the task of preventing and mitigating power outages in accordance with Article 8 ESA and Swissgrid in accordance with Article 20 ESA. Compliance with these provisions is monitored by ElCom.

In the event of a power outage, the law and the ordinance explicitly regulate the tasks relating to system operation. In the event of a large-scale grid failure, Swissgrid coordinates the restoration of grid operations and coordination with the surrounding synchronous power grid. In the current market design the market players (suppliers, power plant operators, traders, balance group managers) are responsible for ensuring energy supply. In organising balance management, Swissgrid ensures that all the players involved have the necessary incentives to operate a stable system in the interests of security of supply.

In the event of an electricity shortage, responsibility lies with the National Economic Supply organisation (NES) under the NESA. This organisation is primarily concerned with ensuring the country is prepared for a shortage.

3.4 Players in Switzerland

In Switzerland, there is no single law regulating the handling of electricity crises; this is covered by a range of acts (primarily the NESA, ESA and EnA) and their ordinances. As a result, in the event of an incident the lead is assumed either by the Federal Department of the Environment, Transport, Energy and Communications (DETEC) or the Federal Department of Economic Affairs, Education and Research (EAER).

3.4.1 Federal Council

The Federal Council issues ordinances giving detail to the legislation on security of supply decided by Parliament. It has two primary responsibilities in this area: it may order preparedness and response measures in accordance with Article 9 ESA and order electricity management measures under the NESA.

Furthermore, it has emergency powers (as does Parliament) and can issue ordinances and rulings directly on the basis of the Constitution (Art. 185 para. 3) in order to counter existing or imminent serious threats of disruption to public order or internal or external security.

The Federal Council also issues directives regulating fundamental aspects of crisis management in the Federal Administration (BBl 2019 4593).

3.4.2 Federal Chancellery

The Federal Chancellery plays a central role in crisis management at federal level. In the event of an incident or crisis affecting several departments, it draws up an overview of the crisis units in operation and supports the Federal Council's ad hoc crisis unit, if deployed. Once an incident has occurred, the Federal Chancellery can offer to evaluate it. The Federal Chancellery supports the federal departments in providing standardised training in crisis preparedness and advises their specialist units on setting up crisis management processes.

The Federal Chancellery's responsibilities in the event of special and extraordinary situations are governed by the Federal Chancellery Organisation Ordinance (Org-FCh, SR 172.210.10). Its specific tasks are set out in the Federal Council Directive on Crisis Management in the Federal Administration BBl 2019 4593.

3.4.3 National economic supply (NES)

In the event of an electricity shortage, the NES organisation is responsible for drawing up and implementing management measures in the electricity sector. This organisation is made up of experts from the private sector and authorities, arranged into six divisions and working on a part-time basis. The Federal Office for National Economic Supply (FONES) also forms part of the NES, and provides organisational support to the divisions. The NES Energy Division works closely with the electricity industry (in particular VSE and Swissgrid) and various federal agencies (in particular the SFOE and ElCom) both in preparing for crises and in responding to an electricity shortage.

The NES organisation collects general data to assess the risks to the country's supply of essential goods and services and continuously analyses the supply situation. For its part, the Energy Division monitors and analyses the development of the country's energy supply on an ongoing basis. The VSE is responsible for ensuring the electricity industry’s readiness to implement the NES measures, and has set up the Organisation for Electricity Supply in Extraordinary Situations (OSTRAL) for this purpose. The nature and scope of OSTRAL's preparedness activities are specified by the Energy Division.

3.4.4 Swiss Federal Office of Energy (SFOE)

The SFOE is the federal government's specialist authority for energy supply and energy use. It plays an important role in creating the conditions for an adequate and diversified energy supply that is secure, efficient and meets environmental standards. The SFOE's main responsibilities regarding electricity supply relate to the creation of appropriate framework conditions at state level in accordance with Article 6 paragraph 2 EnA (prevention).

In order to evaluate state-level framework conditions for security of supply, energy scenarios (energy perspectives and systemic analyses) are required that cover a period of ten to twenty years or more. ElCom's monitoring and surveillance activities in the area of electricity supply security also have a medium to long-term time horizon, but they focus solely on electricity. The SFOE is responsible for evaluating energy scenarios in connection with energy policy legislation. This includes both 'regular' legislation and security of supply measures pursuant to Article 9 ESA.

3.4.5 Swiss Federal Electricity Commission (ElCom)

ElCom is Switzerland's independent regulatory authority in the electricity sector. It has two main responsibilities, namely to regulate and monitor the Swiss electricity market.

This involves monitoring compliance with the ESA, i.e. taking all necessary related decisions and pronouncing rulings where required (Art. 22 para. 1 ESA). By law, it is responsible in all those areas where decision-making and the authority to issue rulings is not expressly the responsibility of another authority. ElCom is thus responsible for enforcing all standards set by the ESA and the implementing legislation relating to security of supply, and for ensuring that the players in this field carry out their various tasks. This also covers the preventive measures contracted out to the network operators, such as regulatory issues relating to balance management (e.g. incentives for market players through the imbalance price, regulation of automatic and manual load shedding), transmission constraint management (e.g. determining who meets the costs of redispatching) and ensuring sufficient balancing power (e.g. allocation processes).

Under Article 22 paragraph 3 ESA, ElCom is responsible for oversight of the electricity market in order to ensure secure and affordable supply in all parts of Switzerland. It thus conducts monitoring of electricity supply security. If it becomes apparent that there will be a significant threat to domestic supply security in the medium to long term which the companies in the electricity industry are unable to counteract on their own, ElCom is required to submit proposals for measures to the Federal Council (ESA, Arts 9 and 22).

Besides measures under Article 9 ESA, ElCom may, in agreement with the NES organisation, propose to the Federal Council that measures be taken pursuant to Articles 31 and 32 NESA. Unlike those taken under Article 9 ESA, these are short-term measures to immediately mitigate temporary electricity shortages. Furthermore, under Article 5 paragraph 3 ESO, ElCom may order industry players to conclude contracts.

3.4.6 Federal Office for Civil Protection (FOCP)

At the request of the cantons and based on the Federal Act on Civil Protection and Civil Defence (CPDA; SR 520.1), the FOCP may support the competent agencies in preparing for and managing disasters and emergencies. To this end, the FOCP maintains the National Emergency Operations Centre (NEOC) and supports the Federal Civil Protection Crisis Management Board (CCMB). For selected hazards, the specialist authorities draw up so-called 'starting strategies' for the CCMB, setting out the first steps to be taken in the event of an incident.

3.4.7 Federal Civil Protection Crisis Management Board (CCMB)

The CCMB is the Confederation's organisation for preparedness and response to incidents of national significance concerning protection of the population. The Ordinance on the Federal Civil Protection Crisis Management Board (CCMBO; SR 520.17) regulates the essential aspects of this.

As part of preparedness planning to ensure the operational readiness of the CCMB, the SFOE has drawn up a starting strategy for power outages and the NES organisation has a starting strategy for electricity shortages. These set out the main aspects and principles of crisis response. Preparedness planning also involves elements relating to response; however, unlike the starting strategies, response strategies are not fully drawn up until an incident actually occurs.

3.4.8 Cantons

Under Article 6 paragraph 2 EnA, the cantons and the Confederation are required to create suitable state framework conditions for a reliable and secure power supply.

Furthermore, the cantons play an important civil protection role in the event of an electricity crisis in ensuring prevention, preparedness and crisis organisation at cantonal level. This report does not deal with this aspect in any further detail.

3.4.9 National grid operator (Swissgrid)

Swissgrid, the owner and operator of the Swiss transmission system, is responsible for the non-discriminatory, reliable and efficient operation of its network as an essential basis for the secure supply of electricity in Switzerland (Art. 20 para. 1 ESA). If the stability of grid operation is at risk, Swissgrid can order any measures necessary in agreement with power plant operators, system operators and other stakeholders (Art. 20 para. 2 let. c ESA). Under Article 5 paragraph 2 ESO, Swissgrid is also required to agree standardised measures to maintain the security of supply with the system operators, energy producers and other stakeholders.

Swissgrid is responsible for maintaining grid stability. It does this by providing balancing power (Art. 20 para. 2 letter b ESA), which, although involving the supply of energy, primarily concerns system security and stability, and is therefore the task of the grid operator.

3.4.10 Distribution network operators

The ESA states that all grid operators (i.e. Swissgrid and distribution network operators) are required to coordinate their activities. In particular, they are responsible for ensuring secure, productive and efficient grid operation (Art. 8 para. 1 let. a ESA).

Swissgrid concludes operating agreements covering a range of aspects with distribution network operators directly connected to the transmission system. These include: coordination with Swissgrid during normal grid operation and grid failure; implementation of specifications for automatic frequency-dependent load shedding; voltage maintenance on the transmission network; and reporting abnormal network conditions that may affect the operation of the transmission network to Swissgrid in a timely manner.

The distribution network operators are required to supply established end-consumers in their network area (households and end-consumers with an annual consumption of less than 100 MWh per consumption site) and those who have waived access to the grid (waiver of free choice of supplier) with the desired quantity of electricity of the required quality at any time and at reasonable tariffs (universal service in the partially open market, cf. Art. 6 paras 1 and 2 ESA).

4 Energy crisis organisation at federal level

Responsibility for managing the response to a crisis is assigned by the Federal Council. It may set up an ad hoc crisis committee with powers to give instructions to other federal crisis groups, in accordance with the Federal Council directives on crisis management in the Federal Administration (BBI 2019 4593). Interdepartmental crisis groups such as the CCMB support the ad hoc crisis committee as instructed by the Federal Council. The organisation, tasks and deployment of the interdepartmental crisis groups take place in accordance with the directives and ordinances of the various groups. Various activities to improve strategic and operative federal crisis management were launched following the COVID-19 pandemic, for example moves to transform the current organisation for the coordination of federal energy activities into a federal energy crisis organisation.

4.1 Current organisation for the coordination of federal energy activities

Since the end of 2021, coordination of federal activities to ensure the security of energy supply have been coordinated in an interdepartmental organisation. This ensures the coordination and harmonisation of federal measures on electricity and gas supply. At policy level, the guidelines are set by the DETEC/EAER steering committee, which comprises the heads of DETEC and the EAER, the director of the SFOE, the NES delegate and the president of the Federal Electricity Commission (ElCom) as well as representatives of the following bodies: the Swiss Gas Industry Association (VSG), the Association of Swiss Electricity Companies (VSE), the Conference of Cantonal Energy Directors (EnDK), the CEOs of Axpo, Alpiq, BKW, Repower and Swissgrid, and members of the oil industry.[14] The steering committee is responsible for policy coordination between the Confederation and the cantons, assessment of the situation at the policy/strategic level, evaluation of the need for action and preliminary consultation on Federal Council decisions. An interdepartmental steering group has been set up to deal with strategic matters. The operative level comprises the working groups and task forces of the other public authorities responsible. No changes take place to the constitutional and statutory powers or to hierarchical relationships.

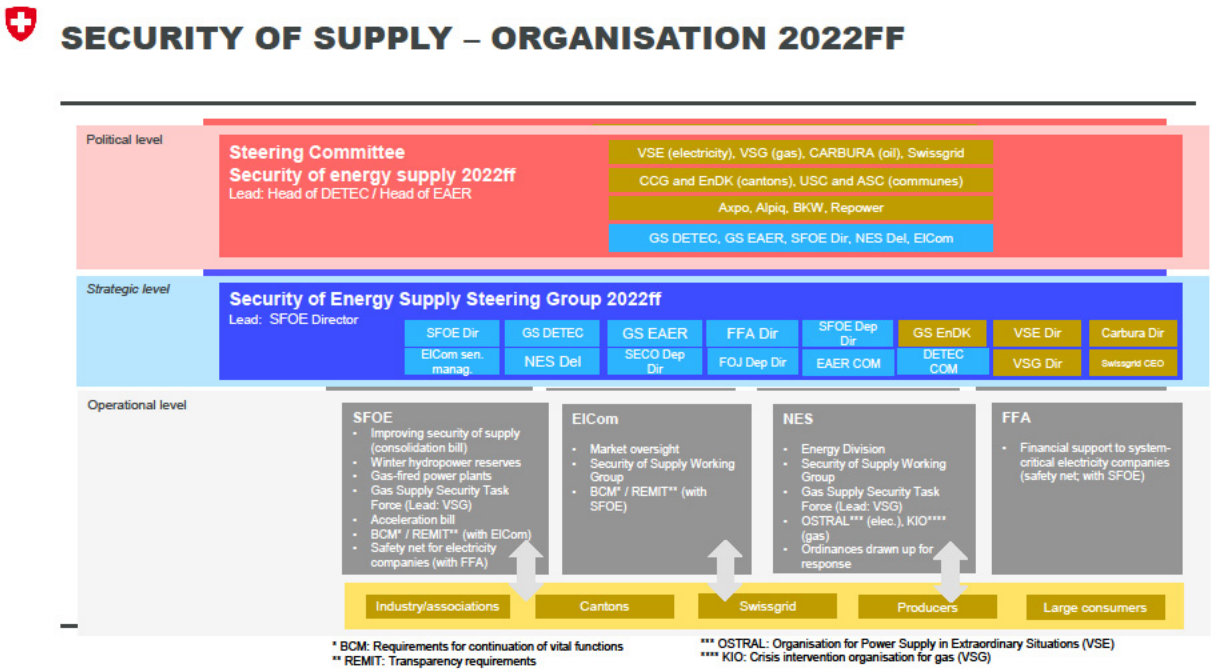

Figure 2: Organisation for the coordination of federal energy activities (as at 29 June 2022)

[14] See press release of 29 June 2022 on crisis organsiation Energie: Bundesrat und Branche stärken Gas-Beschaffung und bereiten sich auf mögliche Mangellagen vor (admin.ch) (not in English)

4.2 Activities to improve federal crisis management

In June 2022 the Federal Council asked the Federal Chancellery and the DDPS to draw up a discussion document with suggestions on improving strategic and operative crisis management by the end of March 2023. Particular focus is to be put on reviewing and reorganising the tasks, scope of authority and responsibilities of the various crisis groups – e.g. the CCMB, the Federal Council ad hoc crisis committee and the crisis committees in various specialist areas – and on their coordination and cooperation activities. The Federal Chancellery was also charged with reviewing, along with the departments, the tasks, scope of authority, responsibilities and composition of the crisis groups, to streamline them and if necessary to rework the relevant ordinances and directives.

Furthermore, on 17 May 2022 the National Council Control Committee submitted Motion 22.3506 'Statutory basis for a specialist crisis committee'.[15]

[15] See 22.3506 | Rechtsgrundlagen für einen "Fach-Krisenstab" | Geschäft | Das Schweizer Parlament (in German or French)

5 Procedures and measures

5.1 National procedures and measures

5.1.1 Prevention, preparedness and response by the electricity industry

Article 6 paragraph 2 EnA states that energy supply is the responsibility of the energy industry, which is therefore also responsible for the prevention and rectification of power outages.

The entity primarily responsible for restoring stable grid operations is therefore Swissgrid. Under Article 5 paragraph 2 ESO, Swissgrid is also required to agree standardised measures with the system operators, energy producers and other stakeholders to maintain security of supply; this also encompasses restoring the grid. If a network operator, a producer or some other party involved refuses to conclude an agreement, ElCom may order them to do so. Furthermore, in the event of stable grid operation being under threat, Swissgrid is required by law to take or order all measures necessary to ensure grid security (Art. 20 para. 2 let. c ESA). If such an order is not complied with, Swissgrid may take measures at the cost of the entity that received the original order. Obligations arising from contracts concluded under Article 5 paragraphs 2 and 3 ESO and the charging of costs in accordance with paragraph 4 are enforced under civil law.

Furthermore, the main electricity companies have pledged in an agreement (*Universaltragwerke für die Stromverteilung)* to provide mutual support in the event of a crisis in order to avoid any disruption to power distribution. They each undertake to keep an emergency electricity pylon in stock and to rent it out to each other in times of crisis.

The electricity industry may take further measures jointly and in a coordinated manner to avert an electricity crisis, provided these measures are compatible with the ESA and are approved by ElCom.

5.1.2 Prevention, preparedness and response by the authorities

The authorities are active in various areas of prevention, from coordination in international bodies to legislative projects and the 2050 Energy Strategy.

If the electricity industry is no longer able to deal with a crisis with its own resources, the state intervenes. It has various management measures at its disposal to control electricity consumption and supply. These can be implemented at different rates and with varying impacts on the economy and the public, either individually or in combination, depending on the situation. They are intended to preserve orderly coexistence in society in Switzerland. Certain other statutory provisions that conflict with the management ordinances may be declared temporarily inapplicable by the Federal Council on the basis of Article 34 NESA. For provisions of the ESA to be declared inapplicable, the Federal Council has to issue a management ordinance adding provisions to Annex 1 of the NESA (Article 34 paragraphs 1 and 4 NESA).

5.2 International cooperation

In addition to the cooperation in the Pentaforum, there is also cooperation between the regulators. ElCom represents Switzerland in various bodies (see 5.3.37) in the overview of measures.

The Pentaforum has a Memorandum of Understanding on cooperation in the event of an electricity crisis. This cooperation has already proven its worth. In the winter of 2018–2019, the Standing Group on Electricity Scarcity was set up to perform coordinative tasks in response to an impending supply shortfall in Belgium. The Forum subsequently concluded that it would be useful to have such a group going forward. The Pentaforum wants to further develop such opportunities and continue the good cooperation on the basis of Regulation (EU) 2019/941. Furthermore, it provides a context for regular exchange at ministerial level, the forum's highest level, and promotes constructive cooperation among the Penta countries in the field of security of supply.

Regional cooperation among transmission system operators has so far proven successful and many coordinative processes to prevent electricity crises have already been put in place.

5.3 Overview of measures

The following tables provide an overview of the measures taken in relation to electricity crises by the electricity industry, the public authorities and official bodies. A more detailed description of the measures can be found in Section 6. In each case it is indicated whether the measure relates to prevention or preparedness/response. These allocations were made on the basis of assessments by experts from the SFOE, FONES, FOCP and ElCom.

5.3.1 Electricity industry measures

Measure:	**Prevention**	**Prepared-ness/Re-sponse**
1. Industry measures	x	x
2. Grid planning	x	
3. Coordination processes	x	x
4. Operational intervention	x	x
5. Balancing capacity allocation procedure		x
6. Grid restoration planning		x

5.3.2 Public authority measures

Measure:	**Prevention**	**Prepared-ness/Re-sponse**
1. Security of supply monitoring	x	x
2. Ensuring appropriate statutory framework	x	x
3. Secure communication infrastructure		x
4. Cybersecurity	x	x
5. Other standards (CIP, international standards, etc.)	x	x
6. Hydropower reserves	x	x
7. Electricity monitoring: national economic supply		x
8. National economic supply response measures		x

5.3.3 Official bodies

Body	**Prevention**	**Prepared-ness/Re-sponse**
1. Federal crisis management		x
2. Federal Civil Protection Crisis Management Board		x
3. Security of Supply Working Group	x	x
4. National Economic Supply Energy Division	x	x
5. OSTRAL	x	x
6. Pentaforum (incl. crisis task force)	x	x
7. Cooperation between regulatory authorities		

6 Detailed description of measures

6.1 Electricity industry measures

6.1.1 Sector measures

Risk management

Responsible: Grid operators,[16] electricity producers
Scope: Energy and grid
Other: Prevention, national
Statutory basis: Articles 6 and 8 ESA, Article 5 ESO

Description: Risk management allows grid operators to meet the requirements of the Electricity Supply Act. It helps them to identify relevant risks in good time and to keep them under control. Appropriate risk reduction and prevention is also part of risk management.

Business Continuity Management (BCM)

Responsible: Grid operators, electricity producers
Scope: Energy and grid
Other: Preparedness, national
Statutory basis: Articles 6 and 8 ESA, Article 5 ESO

Description: Business continuity management plays an important role in risk management, especially when incidents (internal or external) occur that require measures to ensure the smooth running of an organisation. Business continuity management is thus about strengthening the resilience of an organisation and being able to safeguard operations in the event of an incident.

6.1.2 Electricity grid planning

Electricity grid planning

Responsible: Grid operators
Scope: Grid
Other: Prevention, national
Statutory basis: Articles 6, 8 and 9ff ESA, Article 5 ESO

Description: Electricity grid planning is one of the core tasks of the grid operators. It is necessary in order to meet requirements set in the ESA and ESO, such as providing guaranteed grid access for end-consumers and ensuring secure and efficient operation of the grid.

[16] Grid operators include Swissgrid and the distribution network operators.

6.1.3 Grid coordination

Grid coordination

Responsible: Grid operators
Scope: Grid
Other: Prevention, preparedness, national, international
Statutory basis: Article 8 ESA, Article 5 ESO, EU Regulation 2017/1485 guideline on electricity transmission system operation (SOGL System Operation Guideline)

Description: Under Article 8 ESA all grid operators are required to coordinate their activities. TSOs in Europe are obliged to coordinate with each other, to comply with minimum requirements for Europe-wide grid operation and to cooperate across borders in order to maintain the operational security, stability and quality of the wide area synchronous power grid.
In signing up to the Synchronous Area Framework Agreement, Swissgrid has also agreed to comply with EU Regulation 2017/1485 establishing a guideline on electricity transmission system operation. Swissgrid is a member of the European Network of Transmission System Operators for Electricity ENTSO-E

6.1.4 Grid operation – operative intervention

Grid topology measures

Responsible: Grid operators
Scope: Grid
Other: Prevention, national
Statutory basis: Article 20 ESA, Article 5 ESO

Description: During regular operation of the grid, grid topology measures are taken in the event of a failure in grid security to maintain or restore regular functioning. Such measures include busbar switching or staging transformers.

Redispatching

Responsible: Swissgrid, power plant operators
Scope: Grid
Other: Prevention, national, international
Statutory basis: Article 20 ESA, Article 5 ESO

Description: National nodal redispatching is used to mitigate Switzerland internal grid congestion. International zonal or nodal redispatching takes place when there is grid congestion in border areas with neighbouring TSOs.

Foreign reserves

Responsible: Swissgrid
Scope: Grid, energy
Other: Prevention, preparedness, international
Statutory basis: Article 20 ESA, Article 5 ESO

Description: In the event of there being insufficient balancing power in Switzerland, Swissgrid can call on its neighbours to supply it, and vice versa. The Mutual Emergency Assistance Service (MEAS) is based on agreements with the TSOs in France and Italy and the emergency reserve with TSOs in Germany.

Reduction of cross-border capacities

Responsible: Swissgrid
Scope: Grid, energy
Other: Prevention, national, international
Statutory basis: Article 20 ESA, Article 5 ESO

Description: In order to maintain and restore normal grid conditions, Swissgrid can recalculate net transfer capacity (NTC), restrict available transfer capacity (ATC) or stop capacity allocation altogether.
These measures are taken in coordination with the foreign TSOs. Details are regulated in the VSE industry document 'Transmission Code 2019'.

Direct intervention in power plant operation

Responsible: Swissgrid
Scope: Grid, energy
Other: Prevention, preparedness, national
Statutory basis: Article 20 ESA, Article 5 ESO

Description: If the grid is not functioning properly, Swissgrid can declare a critical situation if additional measures are required to restore normal operation. When this happens, Swissgrid is given additional powers to intervene directly in the deployment of power plants and so restore grid stability.
Details are regulated in the VSE industry document 'Transmission Code 2019'.

Manual load shedding

Responsible: Swissgrid, distribution network operators
Scope: Grid
Other: Prevention, national
Statutory basis: Article 20 paragraph 2c ESA, Article 5 paragraph 2 ESO

Description: If the grid is in danger of failing, as a last resort Swissgrid and the distribution network operators can engage in manual load shedding. This involves reducing the total amount of electrical power in the grid in order to avoid further grid failure or collapse. The VSE industry recommendation on manual load shedding MLS – CH 2019 contains details of this, including the required advance action.

Automatic load shedding

Responsible: Grid operator
Scope: Grid
Other: Prevention, national
Statutory basis: Article 20 ESA, Article 5 ESO

Description: In automatic load shedding, depending on grid frequency, parts of the grid are switched off in order to stabilise it and secure supply to the end-consumers still connected. If this occurs, Swissgrid declares a critical grid situation. Reconnection following automatic load shedding and a return to planned operating mode for power plants, storage facilities and pumps as well as end-consumers must be coordinated. Details are regulated, among other things, in the VSE industry recommendation on technical requirements for automatic load shedding in consideration of changed specifications – CH 2016.

6.1.5 Balancing capacity allocation procedure

Balancing capacity allocation procedure

Responsible: Swissgrid, ElCom
Scope: Energy and grid
Other: Prevention, preparedness, national (poss. international)
Statutory basis: Article 20 paragraph 2 let. b ESA, Article 22 paragraph 1 ESO, Article 20 paragraph 2 let. C ESA, Article 5 paragraph 4 ESO

Description: If, in the balancing power auction, an insufficient amount of balancing power is procured because not enough bids are made, the power lacking can be compulsorily procured via the allocation procedure. This procedure is also applied if, during a supply period, the awarded quantity of primary, secondary or tertiary balancing power is no longer fully available. All TSOs participate in the allocation procedure. Details are regulated in the Swissgrid document *Zuteilungsverfahren und betriebliche Notbeschaffung*.

6.1.6 Grid restoration planning

Grid restoration planning

Responsible: Swissgrid, distribution network operators, power plant operators
Scope: Grid and energy
Other: Preparedness, national
Statutory basis: Article 20 ESA, Article 5 ESO

Description: Swissgrid is responsible for coordinating the restoration of the grid or resumption of supply following islanding, automatic load shedding, manual load shedding or a major disruption. Swissgrid creates, maintains and publishes a grid restoration concept for the transmission network. This concept is coordinated with the power plant operators on the transmission grid and with TSOs in the neighbouring countries. Persons involved in grid restoration are specifically trained and the training is documented. Details are regulated in the VSE industry document ‘Transmission Code 2019’.

6.2 Public authority measures

6.2.1 Security of supply monitoring

Monitoring of security of electricity supply

Responsible: ElCom
Scope: Energy and grid
Other: Prevention, national, international
Statutory basis: Article 22 paragraph 3 ESA

Description: The supply of electricity is monitored on an ongoing basis in order to identify and address any short-term need for action in order to maintain security of supply. If there are any signs of potential disruption, ElCom draws up measures (e.g. in transmission constraint management) and/or the security of supply working group is convened. The results of the monitoring process may lead to direct intervention in grid operation (e.g. pre-existing measures are implemented), ad-hoc measures may be introduced (cf. Art. 9 ESA) and proposals made regarding relevant legislation in Switzerland and the EU.

Adequacy analyses

Responsible: ElCom, SFOE
Scope: Grid and energy
Other: Prevention, national, international
Statutory basis: Article 22 paragraphs 3 and 4 ESA, Article 9 paragraph 3 OrgO-DETEC

Description: Modelling is conducted of Switzerland's system adequacy to observe systemic security of supply; this involves simulating supply and demand for electricity in order to identify possible future electricity shortages. A number of institutions regularly conduct such adequacy analyses, including ENTSO-E, the Pentaforum, the SFOE and ElCom. Depending on the time horizon, the findings may lead to direct intervention in grid operation (e.g. measures taken by Swissgrid), ad-hoc measures may be introduced (cf. Article 9 ESA) and proposals made regarding relevant legislation in Switzerland and the EU.

6.2.2 Ensuring appropriate framework conditions (laws)

Energy Strategy 2050 and its further development

Responsible: SFOE
Scope: Energy and grid
Other: Prevention, national
Statutory basis: All legislation relating to energy (incl. EnA, ESA, ElecA, WRA, NEA)

Description: The Energy Strategy 2050 is a comprehensive plan that maps Switzerland's energy policy with the aim of preparing for changes in the energy markets against the backdrop of economic and technological developments and political decisions at home and abroad. The high standard of supply is to be maintained and Switzerland's energy-related environmental impact reduced, with the aim of achieving net zero by 2050. Realigned energy legislation has been in force since the beginning of 2018. In June 2021, the Federal Council approved development of Energy Strategy 2050 with the Dispatch on the Federal Act on a Secure Electricity Supply from Renewable Energy Sources. The bill is currently going through Parliament. The Federal Council also wants to speed up the licensing procedures for major wind and hydropower plants; a bill submitted for consultation is currently being evaluated.

Grid renewal and expansion

Responsible: SFOE
Scope: Grid
Other: Prevention, national
Statutory basis: ESA, ElecA and several ordinances

Description: The purpose of the Federal Act on the Conversion and Expansion of the Electricity Grid (Electricity Grid Strategy) is to ensure that the power grid in Switzerland is expanded sufficiently and in a timely manner in order to cope with demand. It is thus a major element in implementing Energy Strategy 2050. In order to be able to ensure the high quality of supply going forward, the power grid infrastructure must be renewed, converted and expanded. The Electricity Grid Strategy came into force in June 2019.

Scenario framework for grid planning

Responsible: SFOE
Scope: Grid
Other: Basis, planning, national
Statutory basis: Article 9a ESA, Article 5a ESO

Description: The Electricity Grid Strategy introduced a scenario framework for planning the electricity grid. It describes a range of possible developments in the energy industry up to 2030 and 2040 in three scenarios. These differ, among other things, in installed power plant capacity, storage capacity and annual electricity consumption. The first scenario framework is due to be approved by the Federal Council in autumn 2022.

The scenario framework is reviewed and updated periodically (every four years).

Energy perspectives

Responsible: SFOE
Scope: Energy
Other: Prevention, national
Statutory basis: ESA, Article 9 paragraph 3 OrgO-DETEC

Description: Energy perspectives provide a view of Switzerland's energy future and have been produced periodically since the 1970s as part of energy policy. They are closely linked to Energy Strategy 2050, with the current Energy Perspectives 2050+ addressing in particular the net-zero target by 2050. In simple terms, they involve scenarios for energy supply and demand up to the year 2050, on the assumption of a secure, clean, affordable and largely domestically produced energy supply.

Energy perspectives are drawn up on a recurring basis.

6.2.3 Secure communication infrastructure

Secure communication systems

Responsible: Polycom (FOCP, cantons), GCN (Swissgrid), EW-Telefonie (EVU)
Scope: Energy and grid
Other: Preparedness (Polycom), national
Statutory basis: e.g. ESA, NESA

Description: The network operators have dedicated communication systems. However, like the systems of the telecommunications service providers, these are dependent on a functioning power supply. The main RUs are equipped with the Polycom security radio system so that minimal emergency voice communication is ensured in the event of a power outage or disruption to the telecommunications network.

6.2.4 Cyber security

National Cyber Security Centre (NCSC)

Responsible: NCSC, GovCERT
Scope: Critical infrastructure CH (grid and energy)
Other: Preparedness, national
Statutory basis: Cyber Risks Ordinance (CyRO)

Description: The National Cyber Security Centre (NCSC) is the Confederation's competence centre for cyber security and thus the first point of contact for cyber issues. It is responsible for the coordinated implementation of the National Strategy for the Protection of Switzerland against Cyber Risks (NCS). The strategy sets out how incident and crisis management can be improved. It also contains a section on standardisation and regulation, in which the Confederation is called on to develop minimum standards for cyber security in cooperation with the private sector and to examine the introduction of reporting obligations for cyber incidents. These are important tools to protect against cyber risks. GovCERT, as part of the NCSC, supports critical infrastructure operators by providing technical analyses and information about cyber attacks on critical infrastructure.

ICT minimum standards

Responsible: FONES, SFOE, ElCom
Scope: Energy and grid
Other: Prevention, national
Statutory basis: ESA, ESA, CyRO

Description: Under the NCS, the FONES is required to define ICT minimum standards for critical infrastructure. In conjunction with electricity industry (VSE) representatives, the Handbook on Basic Protection for Operational Technology in the Electricity Industry has been drawn up, based on the international NIST cyber security framework. The minimum standards are thus based on the five NIST categories, Identify, Protect, Detect, Respond and Recover. There is also an assessment tool – an Excel spreadsheet containing 106 test criteria for the five categories. Moreover, the standard is compatible with other industry standards such as ISA, ISO27001/2, BSI, COBIT5, ISO27019 and NERC-CIP. The minimum standards also exist for the gas, wastewater, food, public transport and other sectors. New sectors are being added on ongoing basis. Acceptance of the standards is high, but ultimately the minimum standards are no more than recommendations at this stage. Work is currently underway to make the ICT minimum standards binding.

6.2.5 Critical infrastructure protection

Critical infrastructure protection

Responsible: FOCP, FONES, ElCom, Electrosuisse, electricity associations, ESTI
Scope: Operating companies, grid
Other: Prevention, preparedness, national
Statutory basis: Article 8 CPDA

The FOCP has published guidelines and an implementation aid to support critical infrastructure operators in reviewing and improving their resilience. The procedure involves analysing relevant risks and vulnerabilities that could lead to serious disruptions. The guidelines also describe how to draw up measures to reduce risks and how to set an appropriate level of safety on the basis of cost-benefit analyses. They have been implemented in a pilot project with Swissgrid and the responsible specialist offices.

The VSE has also published an industry standard on the physical safety of substations based on the FOCP's CIP guidelines. The measures apply to installations on grid level 1 and those at lower grid levels, insofar as these are not structurally separate from grid level 1 or cannot be operated independently of it.

Furthermore, the Federal Council's national strategy for the protection of critical infrastructures tasks the relevant specialist, oversight and regulatory authorities with reviewing and where necessary improving resilience in all sectors.

The VSE has also published other CIP-relevant documents and manuals.

6.2.6 Hydropower reserves

Hydropower reserves

Responsible: Swissgrid, ElCom, Federal Council
Scope: Energy
Other: Prevention, preparedness, national
Statutory basis: current: Article 9 ESA, Ordinance on the Establishment of a Hydropower Reserve HydRO

Description: The specific purpose of the hydropower reserve is to hold back energy from the market for extraordinary critical shortage situations that cannot be foreseen by market players. It is a kind of insurance policy against electricity shortages, which kicks in should the day-ahead electricity market not close. The Federal Council defines the bases of dimensioning, EICom then defines the key parameters of a tender, and the tender is issued by the national grid company Swissgrid. Swissgrid passes on the costs to all end-consumers via the grid usage charge.

The hydropower reserves will be introduced by ordinance for the winter of 2022/23.

6.2.7 Electricity monitoring national economic supply

Electricity monitoring national economic supply

Responsible: NES Energy Division:
Scope: Energy and grid
Other: Assessment of the national supply situation, taking into account the European context
Statutory basis: Article 7 NESO, Articles 1a and 1b ESOO

Description: NES monitoring provides an ongoing assessment of the electricity supply in Switzerland and thus allows any disruptions in supply to be identified at an early stage and suitable (management) measures to be taken. Monitoring looks at both the current supply situation in Switzerland and neighbouring countries (consumption, production and import and export capacities) as well as the situation over the coming months. Information is also provided on trends in energy prices in the European market, availability of production capacities, reservoir levels, meteorological data, consumption forecasts and analyses of self-sufficiency.

Representatives of ElCom and the SFOE are granted access to electricity monitoring.

6.2.8 National economic supply response measures

Call on the public to save electricity

Responsible: NES Energy Division:
Scope: Energy (consumption management)
Other: Preparedness, intervention, national, applied only in the case of an imminent or already existing electricity shortage
Statutory basis: Article 57 NESA

Description: Appeal to the public to voluntarily reduce their own electricity consumption. Tips on how to save electricity are communicated via media and communication channels.

Restrictions on use

Responsible: NES Energy Division:
Scope: Energy (and grid) (consumption management)
Other: Preparedness, intervention, national, applied only in the case of an imminent or already existing electricity shortage
Statutory basis: Articles 31 and 32 NESA

Description: Applications or activities and services that rely on electrical energy are restricted or prohibited in order to reduce electricity consumption and/or break peak loads. These restrictions and bans are put in place depending on the situation (savings requirements, time of year, etc.).

Electricity quotas

Responsible: NES Energy Division:
Scope: Energy (consumption management)
Other: Preparedness, intervention, national, applied only in the case of an imminent or already existing electricity shortage
Statutory basis: Articles 31 and 32 NESA

Description: In order to reduce electricity consumption, end-consumers with an annual consumption ≥ 100 MWh are only entitled to a certain percentage of their normal consumption for a certain period of time.

Grid disconnection

Responsible: NES Energy Division:
Scope: Energy (and grid) (consumption management)
Other: Preparedness, intervention, national, applied only in the case of an imminent or already existing electricity shortage
Statutory basis: Articles 31 and 32 NESA

Description: Distribution grid operators disconnect their end-consumers from the grid for a specific period of time in different areas on a rotating basis. Since this measure has a considerable impact on the public and businesses, it is only used as a last resort.

Export restrictions

Responsible: NES Energy Division:
Scope: Energy and grid
Other: Preparedness, intervention, national, applied only in the case of an imminent or already existing electricity shortage
Statutory basis: Articles 31 and 32 NESA

Description: By restricting the export of electrical energy, the aim is to ensure that the stored reserves in Switzerland and the electricity saved by means of consumption management measures are primarily available to supply Switzerland. Because the pumped storage power plants in Switzerland can produce electricity flexibly, neighbouring countries can nevertheless be helped to a certain degree while the grid continues to operate smoothly. In other words, some electricity can still be exported. Whatever the case, any exchange (import/export) of electricity must result in a positive contribution to security of supply in Switzerland.

Control of supply

Responsible: NES Energy Division:
Scope: Energy and grid
Other: Preparedness, intervention, national, applied only in the case of an imminent or already existing electricity shortage
Statutory basis: Articles 31 and 32 NESA

Description: The electrical energy reserves available in Switzerland are managed by a central agency. The purpose is to optimise the use of water reserves still available in reservoirs and to prevent possible production and grid constraints. For the Swiss electricity market, centralised control of supply means the abolition of market principles. A further aim of control of supply is to continue to ensure that Switzerland continues to be supplied with energy in the event of an electricity market failure.

6.3 Official bodies

6.3.1 Federal crisis management

Federal crisis management

Responsible: Federal Council, federal departments
Scope: Confederation
Other: Event response
Statutory basis: GAOA

Description: A large number of federal crisis units and bodies exist. Ultimate responsibility for crisis management lies with the Federal Council. Evaluation of the management of the COVID 19 pandemic also includes a review of crisis management at the federal level.

6.3.2 Federal Civil Protection Crisis Management Board

Federal Civil Protection Crisis Management Board

Responsible: CCMB
Scope: Energy and grid
Other: Preparedness, national
Statutory basis: CCMBO

Description: The CCMB is the Confederation's organisation for preparedness and response to incidents of national significance concerning protection of the population. The Ordinance on the Federal Civil Protection Crisis Management Board (CCMBO; SR 520.17) regulates the essential aspects of this.

6.3.3 Security of Supply Working Group

Security of Supply Working Group

Responsible: ElCom
Scope: Energy and grid
Other: Prevention, preparedness, national (poss. international)
Statutory basis: Article 22 paragraphs 3 and 4 ESA

Description: When an energy crisis looms in Europe or Switzerland, Swissgrid, the authorities and the major players in the electricity market set up the Security of Supply Working Group (formerly the Winter Working Group), headed by ElCom. The aim of this group is to obtain a shared understanding of the crisis situation and to introduce appropriate measures to avoid or mitigate transmission constraints in Switzerland.

6.3.4 National Economic Supply – Electricity Section

Electricity section

Responsible: NES
Scope: Energy and grid
Other: Preparedness, national
Statutory basis: Article 7 NESO

Description: The Electricity Section in the NES Energy Division consists of specialists from the electricity industry, electricity consumers and authorities working on a part-time basis. The section analyses the supply situation, prepares or updates the management concepts and, if necessary, asks for measures to be introduced. It is also involved in the implementation of these measures.

6.3.5 Organisation for Power Supply in Extraordinary Situations (OSTRAL)

OSTRAL

Responsible: National Economic Supply, VSE Energy
Other: Preparedness, national
Statutory basis: Article 1 ESOO

Description: The Confederation is reliant on private sector expertise to draw up and implement NES management measures in the electricity sector. It has therefore given the Association of Swiss Electricity Companies (VSE) the task of taking the necessary preparatory measures in the areas of production, procurement, transport, distribution and consumption in the event of an electricity shortage. The VSE has founded the Organisation for Electricity Supply in Extraordinary Situations (OSTRAL) to this end.

6.3.6 Pentalateral Energy Forum

Pentalateral Energy Forum (Pentaforum)

Responsible: SFOE, ElCom and Swissgrid Energy/grid
Other: Prevention, preparedness, international
Statutory basis:

Description: The Pentaforum provides a framework for regional cooperation in Central Western Europe with the aim of improving electricity market integration and security of supply. The energy ministries, regulators and transmission system operators of the Benelux countries, Germany, France, Austria and Switzerland work together on a voluntary basis. Its main focus in the area of supply security is the regional implementation of the EU Regulation on risk-preparedness in the electricity sector. In 2017, the Pentaforum countries signed a Memorandum of Understanding (MoU) on cooperation over risk preparedness and crisis management in the electricity sector, which was replaced by an updated MoU in 2021.

6.3.7 Cooperation between regulatory authorities

ACER

Responsible: ElCom
Scope: Energy and grid
Other: Prevention, preparedness, national, international
Statutory basis: Article 22 paragraph 5 ESA

Description: Regulatory and implementation issues are discussed and proposals drawn up in a number of different committees.

At present, Switzerland is only involved on occasion, on matters relating specifically to Switzerland.

Coordination on trilateral redispatching

Responsible: ElCom
Scope: Energy and grid
Other: Prevention, preparedness, national, international
Statutory basis: Article 22 paragraph 5 ESA

Description: When the situation so requires, issues on trilateral dispatching with France and German are discussed in these meetings. This work is highly relevant in view of potential crisis situations, especially in colder periods when France is heavily dependent on imports, and exports from Central Western Europe flow to France via Switzerland. At such times, unplanned flows can occur at very short notice, and this places very high demands on system operation. In this context, issues of governance, the availability of redispatching capacity and the financing of the associated measures also arise.

Implementation group: FCR, IGCC, MARI, PICASSO, TERRE

Responsible: ElCom
Scope: Energy and grid
Other: Prevention, preparedness, national, international
Statutory basis: Article 22 paragraph 5 ESA

Description: Issues regarding the organisation of the cross-border procurement of balancing power and energy are discussed in these regularly held meetings. Issues of governance (legality under EU and CH law), system security (fall-back levels in the event of a crisis) and the assessment of overall resilience are also addressed.

CCR Italy North

Responsible: ElCom
Scope: Energy and grid
Other: Prevention, preparedness, national, international
Statutory basis: Article 22 paragraph 5 ESA

Description: Here all regulatory matters relating to market design in Northern Italy are discussed. As Northern Italy's rivers flow primarily out of Switzerland, Switzerland plays a key role in this group. In particular, transmission constraint management (governance, definition of capacities, availability and financing of redispatching capacities) is discussed and formal agreements on this are drawn up and approved. There is also a higher-level group dealing with coordination of CCR Italy North and CCR CORE processes.[17]

[17] The CORE capacity calculation region comprises the former CWE (Central West Europe) and CEE (Central East Europe) regions.

CCR CORE

Responsible: ElCom
Scope: Energy and grid
Other: Prevention, preparedness, national, international
Statutory basis: Article 22 paragraph 5 ESA

Description: Here all regulatory matters concerning market design of the Core Flow Based Market Coupling (FBMC) are discussed. As many of the rivers in the Core region flow out of Switzerland, Switzerland plays a key role in this group. In particular, transmission constraint management (governance, definition of capacities, availability and financing of redispatching capacities) is discussed and formal agreements on this are drawn up and approved. These agreements also need to be assessed with regard to supply shortages. There is also a higher-level group dealing with coordination of CCR Italy North and CCR CORE processes.

EPEX NRA

Responsible: ElCom
Scope: Energy and grid
Other: Prevention, preparedness, national, international
Statutory basis: Article 22 paragraph 5 ESA

Description: All regulatory issues relating to EPEX are discussed in these regularly held meetings. Possible topics concerning crisis prevention or preparedness are the exchange's priorities in establishing short-term markets, governance and fall-back procedures in the event of a crisis, and the design of market rules (firmness, price limits).