Vlada Republike Hrvatske

Ministry of Economy and Sustainable Development

in cooperation

HOPS d.o.o.

HEP ODS d.o.o.

HROTE d.o.o.

Risk preparedness Plan (draft)

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HROTE d.o.o., CEO: Boris Abramović

Zagreb, November 2021

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HEP OPERATOR DISTRIBUCIJSKOG SUSTAVA

HROTE d.o.o.

HROTE HRVATSKI OPERATOR TRŽIŠTA ENERGIJE d.o.o.

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Contents

1. Abbreviations

ACE	Area Control Error. The ACE represents the individual remaining imbalance the load-frequency-control (LFC) area is responsible for.
aFRR	Automatic frequency restoration reserve
CCR	Capacity calculation region
CE SA	Synchronous area of Continental Europe
CERT	Croatian computer emergency response team
DSO	Distribution system operator
EBGL	Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing
ENTSO-E	European Network of Transmission System Operators for Electricity
FRCE	Frequency restoration control error
FRR	Frequency restoration reserve
HEP ODS	HEP – Operator distribucijskog sustava d.o.o.
HOPS	Hrvatski operator prijenosnog sustava d.o.o.
HROTE	Hrvatski operator tržišta energije d.o.o
ICT	Information and communication technology
ID-RT	Intra Day-Real time
IEM	Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity
ITA	Inter TSO agreement
LFC area	Load-frequency control area
LFC block	Load-frequency control block
mFRR	Manual frequency restoration reserve
MINGOR	Ministry of Economy and Sustainable Development
NCER	Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration
Odluka	Odluka o određivanju nadležnog tijela za sigurnost opskrbe električnom energijom, adopted by the Government of the Republic of Croatia on April 1, 2021. (Official Gazette of the Republic of Croatia, No. 34/2021)
RA	Remedial action
RPR	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
RSC	Regional security coordinator
SAFA	Synchronous Area Framework Agreement for Regional Group Continental Europe
SGU	Significant grid user
SOGL	Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation - System Operation Guideline
TSO	Transmission system operator

2. Introduction

The aim of this document is to meet the requirements of articles 10, 11 and 12 of the 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 (abbr. RPR). On the basis of the regional and national electricity crisis scenarios identified pursuant to articles 6 and 7 of RPR, the competent authority of each Member State shall establish a risk-preparedness plan [1.].

Through the process described in the RPR, ENTSO-E in cooperation with Member States and ECG identified and analysed 31 electricity crisis scenarios [2]. Among the scenarios, it is considered 29 relevant for Croatia in the aspect of possible national and regional energy crisis. For this purpose, the Ministry of Economy and Sustainable Development as a designated national authority, in cooperation with HOPS (Croatian TSO), HEP ODS (Croatian DSO) and HROTE (Croatian energy market operator) and after consulting, inter alia, Energy agency, Croatian Chamber of Commerce, Croatian employers association, producers, consumer association, established the Risk preparedness plan, fully compliant with RPR, in order to prevent, prepare for and manage electricity crises.

Keywords: Critical infrastructure, electricity crisis scenarios, risk preparedness plan

3. General information

3.1 General information of Ministry of Economy and Sustainable Development

According to Odluka o određivanju nadležnog tijela za sigurnost opskrbe električnom energijom (Decision on designating the competent authority for security of electricity supply), adopted by the Government of the Republic of Croatia on April 1, 2021. (NN 34/2021) [3.] Ministry of Economy and Sustainable Development (abb. MINGOR) is the designated national governmental authority of Croatia, responsible for carrying out tasks of REGULATION (EU) 2019/941.
Full name:
Ministry of Economy and Sustainable Development

Headquarters:
Radnička cesta 80, 10000, Zagreb

Minister:
Tomislav Ćorić, Ph. D.

3.2 General information of HOPS d.o.o.

HOPS d.o.o. is a transmission system operator fully owned by the HEP d.d. HOPS is a full member of the European Network of Transmission System Operators for Electricity ENTSO-E.

Company full name:
Hrvatski operator prijenosnog sustava d.o.o.

Company headquarters:
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Registration number:
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3.3 General information of HEP ODS d.o.o.

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3.4 General information of HROTE, d.o.o.

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Hrvatski operator tržišta energije d.o.o.

Company headquarters:
Ulica grada Vukovara 284, 10000 Zagreb

Registration number:
080517130

Company CEO:
Boris Abramović

3.5 Member states in the region

Region means a group of Member States whose transmission system operators share the same regional coordination centre as referred to in Article 36 of IEM. According to ACER Decision on SOR, HOPS belongs to Central Europe system operation region (Central SOR). Regional measures and procedures are coordinated with all the members of the region, especially with:

- ELES (Slovenia),
- MAVIR (Hungary),
- TERNA (Italy),
- APG (Austria).

HOPS participates in capacity calculation region (CCR) Core. Regional measures and procedures are coordinated with all the members of the region, especially with:

- ELES (Slovenia),
- MAVIR (Hungary),

as neighbouring countries and Core CCR participants as well.

3.6 Non member states in the region

HOPS cooperates and coordinates with TSOs of neighbouring nonEU countries:

- EMS (Serbia),
- NOSBiH (Bosnia and Herzegovina),

considering the following:

- Serbia and Bosnia and Herzegovina are nonEU countries and relations between countries may but do not have to be in line with EU legislation,
- Although there is a state border between Croatia and Montenegro, there are no direct electricity connections between Croatia and Montenegro, and therefore no bilateral measures are implemented between the two countries.

4. Summary of the electricity crisis scenarios

By definition, electricity crisis means a present or imminent situation in which there is a significant electricity shortage or in which it is impossible to supply electricity to customers.

Electricity crisis should be declared, when according to Appendix I of Methodology for Identifying Regional Electricity Crisis Scenarios [4.], there is a high probability that the crisis will occur, and the expected EENS and LOLE indicate that the crisis scenario rating should be determined as “disastrous” or “critical”, but may be declared when crisis scenario rating is determined as “major” or “minor” as well. Expected EENS and LOLE estimates HOPS in coordination with HEP ODS.

The electricity crisis scenarios are briefly described hereunder, which were identified at the regional and national level in accordance with the procedure laid down in articles 6 and 7 of RPR. Summarised scenario descriptions are based on detailed information from “Risk-Preparedness Regulation – Identification of Regional Electricity Crises Scenarios” [2] from 7 September 2021, which was prepared by ENTSO-E WG Risk preparedness. No entirely national crisis scenario has been considered because, taking into account the size and shape of the Croatian power system, all events of national importance significantly affect at least one of the neighbouring countries.

4.1 Cyberattack on entities connected to electrical grid

This crisis scenario considers the 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.

Assumptions applied are that attackers might gain access to one or more critical ICT systems used by TSO, DSO, power plant, or major load, and gather information of the systems from SCADA/EMS to the primary and secondary systems/equipment in the field. The attacker might be able to control the system meaning that they may switch off lines, transformers, manipulate schedules from TSOs towards market partners or other TSOs. The attack may cause unintended outages of lines, transformers, power plants etc. with possible overloading on remaining lines and transformers and/or direct loss of supply. Switching of lines close to a border or cross-border lines may cause problems in other grids. Market partners may possibly not be able to follow schedules or to identify manipulated schedules.

There would be a risk of a forced blackout for the whole country, with a possibility of the blackout spreading to adjacent grids or the entire synchronous area.

4.2 Cyberattack on entities not connected to electrical grid

Cyber attack on business critical ICT infrastructure of market participants is taken into the account (not physically linked to the power grid).

Assumptions applied are that attacker is able to enter one or more critical ICT systems of market participants. Attacker may manipulate market conditions, offers and bids on energy exchange platforms, power plant's control systems. Manipulated schedules may cause power plant outages and have an impact on system frequency and security of supply. The attacker may be creating and sending manipulated schedules to other partners. The attacker may stop energy market functions. Power plants might follow wrong schedules and frequency/system balance could be in danger. Market operators or power exchange might lose their control about whole process and have to follow back-up procedures. Security of supply could possibly be in danger if the TSOs are no longer able to balance the system with available reserve power.

4.3 Physical attack - critical assets

By this scenario, any form of physical attacks including sabotage, acts of terrorism, war or any other intentional destroying of technical equipment in TSO or DSO grid or power plants are considered.

The impacts are that N-1 criterion might be violated. Destroyed assets and possible longer time needed for repairing them can cause loss of supply in different areas. Unplanned usage of redispatch capabilities or reserve energy may be needed. Additionally, load shedding could be applied. The attack could directly cut load from the grid. Destroyed assets may no longer be available for energy transport and distribution. Loss of grid elements may cause overloads on other lines. Market partners are possibly not able to follow schedules or have to reschedule energy trades due to missing connections to other countries or regions. Normal market activities could be stopped due to missing grid elements.

4.4 Physical attack - control centres

This scenario predicts the physical attack on control centre (TSOs, DSOs or major power plants) including acts of terrorism or war, possible hostage situations, insider attacks or any other intentional attack on control centres.

The attacker may attempt to destroy or damage the main and back-up control centre of a TSO or DSOs or major power plant operation centres. The impacts considered are that TSO/DSOs may no longer be able to monitor and operate the system. Power plants may be stopped by the attacker. Missing reaction on events or missing preparation for foreseen grid situation could lead to overloads, violations of N-1 criterion, possible multiple outages/local or total blackouts. The power plant operators may no longer able to monitor or steer the power plants, consequently balancing and ancillary services might be impacted. Operational staff may have to be sent to substations, area control centres or parts of the power plants to get information via telephone. Market partners may possibly not be able to follow schedules due to missing power plants. TSOs/power plants may not be able to interact with market partners. In worst case, market may be suspended and replaced by other decision making mechanisms.

4.5 Insider attack

The scenario would be initiated through sabotage by employee(s) or subcontractor(s) via physical intervention or misuse of ICT systems.

An employee(s) or subcontractor(s) takes control of the grid. In addition to controlling the grid, they can also physically destroy assets. The TSO, DSO or power plant operator are no longer in control. In particular, critical assets are no longer controllable. The security of supply could be in danger, as either a significant volume of load or generation could be disconnected. The insider can also destroy assets of the electrical energy supply for major customers or whole DSOs, power plant connection points or whole power plants.

4.6 Solar storm

This scenario would be initiated by the Sun sending out a strong Coronal Mass Ejection (CME) - e.g. a Carrington-like event. The effects are strongest in the most northern countries of Europe but are also significant in Central Europe. This event can be forecasted by space agencies a few days in advance.

It would be a necessity to prepare for a preventive shutdown of electricity installations on a European scale to secure assets (namely transformers). Preparation would need to be done to temporarily replace the markets by the TSOs to balance supply and demand (central dispatch). Also, preventive interventions on network assets would need to be done to protect them from the incoming solar storm because the induction on power lines and transformers can cause voltage disturbance and can lead to insulation failures. There could also be long-term damage to assets that have not been secured by a preventive shutdown.

It would be a necessity to analyse the grid to identify faulty equipment. Intervention would be needed on protected equipment to put them in service again. Fast restoration of the system can be further complicated by damaged telecommunication systems.

4.7 Volcanic eruption

The scenario would be initiated by the eruption of an active volcano in Iceland that is, should it erupt (i.e. under a glacier), likely to produce a significant volume of ash. It is likely that such an eruption would be preceded by seismic activity in the immediate vicinity but may occur with less than one hour of warning.

The damage to additional infrastructure in Iceland due to long-distance ash fall can cause further local issues and restrict the ability to restore/repair existing outages. Ash dispersal in mainland Europe (particularly in north-western Europe) may cause outages.
Prolonged ash dispersion can reduce solar power production significantly across Europe. In case adequacy is threatened due to lower solar power generation, providing electrical energy support to other countries may be difficult or impossible.

This scenario names specifically an eruption of a volcano on Iceland, but similar assessment could be done to assess other volcanic eruptions that may be more relevant for specific TSO's location. Indirect impact through electricity markets should be taken into account as well.

4.8 Storm

The scenario predicts that storm of usual strength has been forecasted and remedial actions have been taken. The forecasted storm increases in the last hour in force and extent. It crosses for example from Western to Eastern Europe with expected average wind speeds >150 km/h and wind gusts >200 km/h.
There are exceptionally strong wind gusts or local thunderstorms, causing vortexes, lightning strikes and potentially affecting electrical infrastructure components. The storm lasts 3 days and affects multiple network components. The repairs take time due to storm-damaged roads and the fact that many locations are difficult to reach. The large swaths of damage cause shortages of material, spare parts and personnel.

There is potential fragility of the grid integrity with an impact on end users. Such impacts include: damages on lines due to wind and trees, damage to substations due to flying debris, automatic protection schemes triggering due to lighting to protect assets, pylons collapsing, many interconnectors operating close to security limits due to flows, internal and international transmission limitations, emergence of some internal islands and sensitive losses of transmission or distribution infrastructure potentially leading into load shedding or local/regional brownouts.

4.9 Cold spell

With this scenario, we consider the following preconditions: Winter with cold temperatures around 10-20°C below seasonal average for a longer period of time.

Impact of cold weather may be that water is freezing in rivers and reservoirs of hydro power plants. Demand may be increased due to extra heating requirements. Generation outputs of power plants might be decreased due to limited capacity to cool thermal and nuclear power plants (frozen rivers). Hydro power plants output may also be reduced. Cold weather is causing breakdowns in power plants. Power generating units in reserve could be out of service due to ice preventing their start.

Due to the climate conditions some network elements may be exposed to increased stress (icing, sagging). N-1 criterion might be violated. All of the above might be causing adequacy issues, load shedding may be required and energy prices might increase significantly. This way, the market might also be impacted.

4.10 Precipitation and flooding

The scenario is initiated by heavy rain that lasts for several days and causes flooding of substations and power plants. There is a fast increase in water levels that were already very high.

The scenario can result in flooding (and possibly landslides) of substations and power plants, and weakening of tower foundations, as well as difficulties to travel for personnel, inducing a higher response time and their lower availability. There could also be a possible collapse of weakened anti-flood embankments in concerned countries, hydro power plants potentially out of operation and possible damage of dams, which store water on yearly basis. The damage and uncontrolled release of water from one dam will damage a whole river and cause great damage to the nearby community. Asset repairs cannot start until the water is gone and can then take up to a month.

4.11 Winter incident

This scenario may be initiated without any preconditions, in particular also in the normal state and operation of the electrical power system. There could be possible high system demands and electricity transfer as well as temperatures below winter average, accompanied by heavy snow in some areas. There could also be high demand caused by low temperatures.

Weather conditions consisting of humidity and wind of sufficient strength could cause overhead line conductor and tower icing. There is snow and ice accumulation on trees adjacent to overhead lines. There are potential avalanche risks, with unstable snow conditions in mountainous regions.

There could be multiple tower and power line faults due to ice loading and/or sticky snow. Extreme snow and ice conditions could cause multiple circuit tripping and could lead to overloads on remaining circuits. Faulted conductors and towers could cause fragmentation of the network and possible islanding. The fault repair duration could extend beyond the immediate storm timescale: some roads and areas are impracticable and existing maintenance stock can be insufficient to replace all of the damaged equipment. The reaction time of line crews is increased because of blocked roads and dangerous environments.

4.12 Fossil fuel shortage

In this scenario, we consider potential gas or coal supply disruption. The initiating event occurs in the period of the year with high domestic fuel/coal demand and low stock. The initiating event is one (or more) prolonged disruption of fossil fuel supply system disruption. Prolonged supply limitation leads to shutdown of power generation from at least some of the power plants affected possibly causing limited energy shortages, most likely in peak demand time.

The same supply problem may impact many countries at the same time. All the above could be leading in adequacy issues and load shedding. There is imminent risk of blackout in at least limited area. Energy market might also be impacted as affected power plants have limited or no ability to offer energy and services, electricity prices could increase significantly. Central heating could be limited as well and that could cause electricity demand due to switching to local electrical heating.

4.13 Nuclear fuel shortage

The initiating event occurs in the period of a year with high domestic electricity demand and low nuclear fuel stock. The initiating event leads to one or more events that follow, such as prolonged disruption of fossil fuel production; fuel supply system failure for technical reasons or due to malicious activity and supply limitation due to trade-related or political reasons, weather conditions, etc. Additionally, alternative non-intermittent power generation capacity and/or electricity import may be limited. This scenario may also be relevant for states that do not have nuclear power plants due to a general adequacy problem in Europe.

Initially, power generation is dispatched to power plants not dependent on the nuclear fuel, then power generation from affected power plants is limited to save fuel. A prolonged supply limitation leads to the shutdown of power generation from some of the power plants affected. The scenario could lead to forced electricity supply curtailments (selected areas/entities/hours) and an increased risk of load shedding. Curtailments may result both from fossil power plants shutdowns and from curtailing renewable generation, if there is not enough inertia available in the system.

4.14 Local technical failure

The initiating event for this scenario may be a local technical failure with regional importance (more than N-1) and could lead to failure of critical elements (e.g. transformer), fires inside a substation or an explosion inside a substation.

Possible impacts of failure are additional damages to other critical grid elements, cascading effects, the system might become unstable, N-1 criterion might be violated, risk of a blackout in at least a limited area and the inability to provide energy support to other countries.

4.15 Multiple failures caused by extreme weather

The initiating event may involve multiple failures caused by the extreme weather situation. In particular, multiple network components of the same type start failing unexpectedly due to a heat wave in a short period of time.

Several additional network components or third-party installations that support the grid (such as generators or compensators) continue to fail, so the possible impacts on the infrastructure include loss of critical grid elements, possible cascading effects and system instability.

4.16 Loss of ICT systems for real-time operation

The initiating event occurs either from the unavailability of a substantial part of telecommunication infrastructure used for power system or electricity market operation or from the unavailability of one or more ICT systems used in real-time planning and operation of the power system or energy market operation, due to technical failures.

Control of the electricity system is lost or limited and may go unnoticed for some time (in particular, erroneous forecasts or measurements may be noticed after many hours). Operators and market participants affected have to switch to backup solutions that may not provide all the normal functionality (or may be affected by the same failures). During the time needed to regain control, the system is susceptible to any additional disruption and switching to backup solutions is prone to error and may lead to a human error in the process.

Market participants may initially suffer financial losses due to incorrect information or lack of access to some market data. Incorrect decisions of the market participants resulting from access to incorrect data may aggravate the situation in the power system. Disconnections will result in physical removal of some of the demand and/or supply from the market, and there could be a possible switch from market-controlled dispatch to a TSO-controlled dispatch.

4.17 Simultaneous multiple failures

With this scenario, we consider out-of-range contingencies - the possible multiple failures at substations or transmission lines which might cause large-scale interruptions in the supply of electricity to consumers and possible technical failures on IT system, communication system or protection component.

N-1 criterion is expected to be in violation. The possible impacts of multiple failures is a cascade of disconnections due to the activation of protection components. In case of a severe scenario, we might be facing a loss of critical grid elements, power system might become unstable and there is an imminent risk of blackout in at least a limited area.

There is a possible need for system services and, on the other hand, it might be unability to provide energy support cross border. There is also a risk of local blackouts caused by cascade disconnections.

4.18 Power system control mechanism complexity

The scenario may be initiated by technical failures on IT systems, communication systems or grid protection components due to a signal to other grid/production/control components, resulting in a cascade failure. This would be a result of high interdependencies in very complex systems.

This scenario may have possible additional cross-border impacts (e.g. congestion on the interconnection), the risk of a regional black out and the risk of cascade impacts that can cause uncontrolled disconnections.

4.19 Human error

The initiating event may be a mistake of the operator or service staff, leading to a cascading event due to human error.

These N-1 violations or real-time constraints can occur on the grid as well as lead to cascading effects of other critical grid elements. The operational parameters (e.g. voltage, active power) could go beyond operational security limits. In extreme cases, it could lead to a system split.

4.20 Unwanted power flows

The scenario could be initiated by higher power flows than forecasted due to high production from renewables (wind, solar), atypical generation pattern in some countries and other external conditions, such as e.g. national or regional redispatching. Unexpected large-scale electricity flows beyond flows resulting from coordinated allocation mechanisms are recorded (e.g. on the interconnection). N-1 criterion is no longer fulfilled and remedial actions must be used.

There could be a significant increase of unexpected power flows in the transmission grid, which results in massive congestions of network elements, voltage problems and the overload of grid elements. The system is not N-1 secure and there would be insufficient time available to implement additional remedial actions. Emergency/automatic (cascade) failures of the network elements may appear and it could lead to load shedding, island operation of asynchronous areas and/or local and regional blackouts. There could also be a voltage impact (high or low voltage), unexpected reactive power flow, power commuting and cascading failures of grid elements.

4.21 Serial equipment failure

This scenario is initiated by some elements of the transmission or distribution network exhibiting abnormal behaviour that increase their risk of failure or lead directly to failure. An analysis finds that the root cause is a systematic failure in manufacturing, installation or maintenance. All elements of the same type or series are assumed to be susceptible to the same failure. All suspected elements are assumed unsafe but can't all be immediately replaced or repaired.

The affected operators analyse all instances of the same or similar elements for such faults, but depending on the actual scope of application of the affected element (electrical grid, power generation, electricity distribution, end-user installation, one or many Member States), the full risk assessment may require weeks or even months. Consequently, it is not known if the faulty equipment may operate safely and it is not known what (if any) operating conditions are safe. Depending on the role of the faulty equipment in controlling the electricity system, some control may be lost, or risk of loss of control is increased. There may be a possible need for maintenance services.

Multiple faults, especially occurring in a short period, may lead directly to power supply interruption, as well as cascading events and in extreme cases, to blackouts. If power plants (especially nuclear power plants) employ the same types of potentially faulty elements, there is a risk that they will need to be shut down as a preventive measure. If the faulty equipment is directly involved in supplying electricity to end-users, the supply may be affected immediately – either due to failures, or due to limitations imposed on operating conditions.

4.22 Strike, riots, industrial action

The initiating event may involve disputes of some kind that lead to industrial action at scale. It also may include riots, blockades or other massive social unrest (regardless of motivation or inspiration). As a direct consequence, staff in the energy sector (energy fuel mining, power plants, transmission and distribution) refuse to work, work to rule or are prevented from work. There could be a staff shortage in the operation rooms of power plants, electricity transmission or distribution and there could be less experienced staff in the control rooms, with an increased risk of human error.

Human errors are more likely in this scenario, as employees are working long hours and doing their best to cover multiple roles, with a high level of pressure. Social disturbance on a large scale will lead to unusual energy demand patterns, thus making power system behaviour less predictable. Planned and emergency repairs in the energy sector may be prolonged for a considerable time, possibly towards the period of a year, when energy demand is increased.

A combination of difficult conditions may lead to human errors as well. Faults on the power system may also cause local (or larger) blackouts, and technical problems as well as potential blackouts will take longer than normal to rectify due to staff shortages. There may also be a possible shortage of fuel needed in some power plants.

4.23 Industrial/nuclear accident

This scenario is initiated when a serious industrial accident occurs (e.g. radiation spread from a nuclear power plant, an explosion, toxic substance emission from a chemical plant, etc.) due to any reason (technical failure, earthquake, sabotage, terrorist attack, human error, etc.). Radiation or toxic contamination spreads over a large area, causing panic among the population. Large areas of the country are evacuated and cordoned off - this may include fossil fuel mines or processing, gas pipelines, sections of the electrical grid, some power plants or areas where control rooms of the TSO/DSO are located. Contamination may be transmitted across borders as well. The energy supply chain workers leave their working places or are not allowed to return to them.

All control is not available, especially in the areas with contamination. Some control room staff (from any part of the electricity supply chain) may be affected directly and could be unable to work for a prolonged time. Staff shortage and difficulty of access to control rooms will make managing the system riskier and more difficult.

If power plants are shut down, electricity supply may be reduced for a prolonged time. In a worst-case scenario, a partial or total blackout is possible, and may be difficult to recover from, as parts of the control area are inaccessible. Because of unpredictable (unusual) electricity production and consumption patterns, it is difficult to balance the power system. Both planned repair work and emergency repairs in the energy sector may be delayed or made impossible. Some of the power system infrastructure may be rendered inaccessible and impossible to use for years or decades (in the case of radiological contamination) or for weeks to months (in the case of chemical contamination). Increased human error risk may lead to further technical failures and blackouts.

4.24 Unforeseen interaction of energy market rules

The scenario would be initiated by highly unusual and extreme behaviour of some or many market participants (market panic), which itself may result from one of the following circumstances: change in some energy market rules or mechanisms in at least one country, which allows an undesired market effect (such as leading to gaming or arbitrage detrimental to system security); highly unusual weather, demand or power system conditions, which are unfamiliar to many energy market participants; highly unusual weather may in particular mean very low or very high temperatures for 10 or more consecutive days; highly unusual demand may in particular mean a disturbance of demand lasting more than 10 consecutive days, and may itself result from economic, social or political conditions.

'Energy markets' can refer to all types of bulk energy markets and capacity mechanisms, emission trading mechanisms, cross-border capacity trading mechanisms, DSR services traded on the markets, scarcity pricing, etc. Automated trading algorithms, if they are in use in affected energy markets, may increase risk or speed up the development of a crisis.

The energy flows as the result of market transactions may lead to unusual volumes and direction of trade flows in day-ahead and intraday timeframe, including high variability of trade flows. Under unusual and variable system and market conditions, the methods used by TSOs for planning grid operations produce unsafe results, as the errors of trade flow forecasting would be unusually high. This leads to an increased risk of overload of power lines, including cross-border lines. Significant unexpected physical flows can affect transmission capacities for both internal and cross-border lines. Imbalances from various control blocks may lead to serious frequency issues in the system synchronous area. There may be possible increased costs of launching the power reserves, forced import or redispatching/countertrading.

Even though the power system in a market area has the technical capability to be balanced, the trade flows may cause at the same time a local imbalance and make it impossible to import or export sufficient energy. Coupled markets could lead to similar behaviour of market participants. There may be possible demand curtailment in some countries, if the net result of the trades leads to adequacy problems. There may also be the possible use of forced (but controlled) disconnection as a remedial measure or even possible emergency disconnection of some demand or supply.

4.25 Pandemic

The scenario would be initiated by the international spread of a disease. TSO operating staff could be infected. Infections could happen at the control centers, power stations, power plants and DSOs, which could lead to insufficient staff. Understaffing across sectors could be possible.

Furthermore, containment measures of governments might follow restrictions for operation directly (by directives) or indirectly (e.g. by other affected critical infrastructures). The scenario could create stressed or curtailed operational staff or personnel of service providers, which

causes an unscheduled downtime of power plants. Collateral governmental containment measurements could impede maintenance or revision services, followed by unscheduled downtime of power plants. Further, the stressed or curtailed operational staff of a TSO for field work results in failure to carry out repairs in the field.

Stressed or curtailed personnel resources of control centres and their processing facilities may jeopardize the performance of system control. Additionally, staff may still choose to be absent once precautions are established due to their circumstances, either personally or in their families.

Depending on the spread of the pandemic, the impacts on the power system may vary, but could include shutdowns of selected network elements, failures of power generation modules, loss of required reserves and balance problems in the power system leading to increased system operation costs. It could also lead to delimitations of asynchronous areas (transition to island mode), high system voltages due to low system demand during lockdown and an increased risk of human errors. There could be a possible decrease of the quality of the maintenance due to understaffing (rescheduling or prolongation of maintenance) as well as supply chain limitations for equipment and limited availability of contractor resources due to a pandemic. There may also be a delay on new projects (new grid elements could be ready later) and an increased risk of human error (planning, operations, maintenance, etc.).

4.26 Heatwave

The heatwave scenario could be strongly associated with the dry period scenario. The heat wave may impact the security of supply with reduced generation capacity at power plants and the sudden tripping off of several generating units due to lack of cooling. Furthermore, it may impact the security of the network with overloading of some network elements causing N-1 violations due to the outage of some sagged lines or increased load, as well as restrictions on capacities of cables. There could be an increase in demand due to air conditioning load.

There could be high temperatures in the river water, causing the loss of cooling capability for power plants), as well as low stream gauges, followed by constraints or cancelation of inland waterway transportation. There may also be a constant increase and long duration of temperatures during peak load period, peak demand could begin to exceed the maximum generation and import capacity and operational and intervention reserves are being activated and are rapidly diminishing. The load reduction or shedding are the final measures, and there may be a possible shortfall of generation by shutdown of power plants operation (up to adequacy problem) or the generation reserve is exhausted.

There may be a massive N-1 violation in the transmission grid observed, tripping off certain grid elements (including cross-border lines). There could be an automatic disconnection of the overloaded element and the risk of the cascading. Redispatching is being used to change active power flow, especially during situations with a high loaded grid in connection with lowered power plants infeed, followed by a certain risk of voltage instability (reactive power demand). Therefore, there may be significant voltage drops (in extreme cases, leading to voltage collapses) in the grids.

The scenario may pose a risk of postponement for maintenance or repair of defective power lines due to the working conditions for personnel (up to limitations in energy transfer capacity). There could also be stressed or limited service capacities (construction, maintenance, emergency services) due to reduced personnel resources, reduced transport capacities due to heating and the risk of asset degradation.

4.27 Dry period

The dry period scenario could be strongly associated with the heatwave scenario. This scenario's conditions include an extremely dry period characterized by low rainfall (no precipitation for several weeks) and reservoirs of all hydro power plants are almost empty.

The low water levels imply low hydro production (critical number of hydro power plants are out of operation). Several thermal power production units would have to lower production levels or have to shut down because of insufficient cooling means. There may not be enough reactive power to support voltage levels because air conditioners at full power spend much more reactive power.

The peak demand may begin to exceed the maximum generation and import capacity. Lack of generation capacity together with lack of import capabilities could lead to a scarcity situation. There may be restrictions in the use of electricity for certain times and users because of adequacy problems. Dry periods and low water levels across large parts of Europe cause a lack of production in several countries.

4.28 Earthquake

With this scenario, it is considered an earthquake of greater magnitude that might damage transmission infrastructure and power plants.

Depending on the magnitude and location of the epicentre, control centres of power plants or other grid infrastructure might be out of operation for prolonged period of time. If major substations are affected, severe earthquakes could massively degrade the TSO and its normal operational performance. If operational control centres are impacted system control could be endangered.

The scenario may cause damage on building structures, displacement of equipment cabinets and batteries as well as GIS components, porcelain damage of apparatus and the displacement of unsecured transformers. Damage to road infrastructure could impact repair times due to access restrictions. It may also cause a fault or failure of grid elements such as transformers and civil structures. There may be limited or no access to the transmission infrastructure which leads to reduced cross-border capacities. There may be unavailability of transmission elements and power plants, unusual power flows and possible load shedding to keep system security functioning during peak hours or all the time.

There could be a massive reduction of transmission capacity, and the inability to balance the system. In case of damaged hydro power plants (pump and reservoir storages) or other generation units, there may be insufficient amount of ancillary services.

4.29 Forest fire

The forest fire scenario could be strongly associated with the dry period scenario. Forest fires could start and spread because of the wind combined with a dry period. A longer period of drought or dry weather could exsiccate forest, heather or steppe kinds of landscape.

The fires cannot be controlled for a few weeks. They could be aggravated by violent heat storms (strong wind and lighting spreading or creating new fires). Uncontrolled wildfires may initiate unavailability or inoperability of some generation units or transmission and distribution infrastructure. This may trigger structural degradation or a massive violation of N-1, which may lead to cascading. Windy conditions could help the fire spread faster. The fire may spread towards urban areas. Several high and low voltage power lines and substations are tripped off because of burning trees falling on the electrical grid infrastructure. Other power lines might be disconnected due to the firefighters' work to control the fires.

There may be load reduction and/or load shedding, low hydro power production and a high level of wind production. A lack of generation capacity, together with a lack of import capabilities, lead to a scarcity situation, including balancing. There could be the postponement of the maintenance or repair of affected power lines due to difficult working conditions for personnel (up to the limitation in transfer capacity), as well as asset degradation and direct damage to overhead lines, including interconnectors. The wind, associated with the reduced number of available lines, complicates the system operation.

5. Roles and responsibilities of the competent authority

According to Odluka, MINGOR is the designated national governmental authority of Croatia, responsible for carrying out tasks of RPR. MINGOR ensures that all relevant risks relating to security of electricity supply are assessed in accordance with the rules laid down in RPR and in Chapter IV of IEM.

Where a seasonal adequacy assessment or other qualified source provides concrete, serious and reliable information that an electricity crisis may occur in Croatia, MINGOR shall, without undue delay, issue an early warning to the Commission, the competent authorities of the Member States within the same region and, where they are not in the same region, the competent authorities of the other non-directly connected Member States. MINGOR shall issue an early warning to relevant bodies of neighbouring nonEU countries as well. MINGOR shall also provide information on the causes of the possible electricity crisis, on measures planned or taken to prevent an electricity crisis and on the possible need for assistance from other Member States. Early warning form is given in Annex 1.

When confronted with an electricity crisis, MINGOR shall, after consulting HOPS and HEP ODS, in coordination with the Government of the Republic of Croatia, declare an electricity crisis and inform without undue delay the competent authorities of the Member States within the same region and, where they are not in the same region, the competent authorities of the other non-directly connected Member States. MINGOR shall inform the Commission and relevant bodies of neighbouring nonEU countries as well. Electricity crisis information form is given in Annex 2.

It is the responsibility of MINGOR to declare that the electricity crisis is ended when there is no longer significant shortening of electricity and/or it is possible to supply electricity to customers again.

In addition, the MINGOR is responsible for performing and coordinating electricity crisis training simulations, drafting policies regulation and rules of legislation on Risk preparedness in the electricity sector. Tasks related to drafting policies regulation and rules of legislation may be delegated to HOPS and HEP ODS.

According to Odluka, for the implementation of operational tasks related to risk preparedness planning and risk management MINGOR, in accordance with article 3(3) of RPR, designates the following bodies, to which the tasks referred to in Chapters II, III and V. RPR are delegated:

1. Hrvatski operator prijenosnog sustava d.o.o.
2. HEP – Operator distribucijskog sustava d.o.o.
3. Hrvatski operator tržišta energije d.o.o.

HOPS and HEP ODS are especially responsible for the development of risk preparedness plans in the domain of security of electricity supply and the proposal of draft to the MINGOR.

6. Procedures and measures in the electricity crisis

The procedures and measures which are mentioned under this chapter are prepared, coordinated, implemented, activated and tested according to the legislative basis, which derives from European and national law. In case of electricity crisis that are not covered and/or elaborated by this document and the applicable regulations, action plans are adopted by consensus of all relevant stakeholders.

6.1 National procedures and measures

6.1.1 National procedures in the cases of an electricity crisis

In addition to the European legislation, in the Republic of Croatia, the “Energy Act”, “Network code for the electricity transmission system” and “Network code for the electricity distribution system” define the basic rules for the preparation, coordination, implementation and activation of the national procedures of TSO, DSO and other relevant parties. These procedures contain specific measures which are appropriately activated in different conditions and scenarios in the electrical system. For some of the procedures, the individual legislative documentation applies.

List of national legislation relevant for the national procedures:

- Energy Act (Zakon o energiji) **Error! Reference source not found.**;
- Network code for the electricity transmission system (Mrežna pravila prijenosnog sustava) **Error! Reference source not found.**;
- Network code for the electricity distribution system (Mrežna pravila distribucijskog sustava) [7.]
- Information security Act (Zakon o informacijskoj sigurnosti) [8.]
- Cyber Security Act of essential service operators and digital service providers (Zakon o kibernetičkoj sigurnosti operatora ključnih usluga i davatelja digitalnih usluga) **Error! Reference source not found.**;
- Regulation on cyber security of essential service operators and digital service providers (Uredba o kibernetičkoj sigurnosti operatora ključnih usluga i davatelja digitalnih usluga) **Error! Reference source not found.**;
- Critical Infrastructure Act (Zakon o kritičnim infrastrukturama) **Error! Reference source not found.**;
- Rulebook on the methodology for making risk analysis of critical infrastructure operations (Pravilnik o metodologiji za izradu analize rizika poslovanja kritičnih infrastruktura) [12.];
- Electricity market act (Zakon o tržištu električne energije) **Error! Reference source not found.**;
- Defence Act (Zakon o obrani) **Error! Reference source not found.**;
- Defense plan of the Republic of Croatia - Plan obrane Republike Hrvatske [15.];
- Civil Protection System Act (Zakon o sustavu civilne zaštite) **Error! Reference source not found.**;
- Policy on the holders, content and procedures for drafting planning documents in civil protection and the way of informing the public in the process of their adoption (Pravilnik

o nositeljima, sadržaju i postupcima izrade planskih dokumenata u civilnoj zaštiti te načinu informiranja javnosti u postupku njihovog donošenja) [17.]

- National action plan for civil protection (Državni plan djelovanja civilne zaštite) [18.]

Based on this legislative background, the internal procedures and rules for operation in crisis scenarios are designed. This approach applies for all the relevant parties – TSO, DSO, significant grid users (SGU) etc.

Based on NCER **Error! Reference source not found.** and applicable national legislation, "The power system defence plan from major disruptions" (Plan obrane EES-a od velikih poremećaja) [20.] was designed by HOPS, including following parts:

- System Defence Plan (Plan obrane),
- System Restoration Plan (Plan ponovne uspostave),
- The Terms and Conditions To Act as Defence Service Providers on a Contractual Basis (Uvjeti za rad kao pružatelji usluge obrane sustava na ugovornoj osnovi) **Error! Reference source not found.**,
- The Terms and Conditions to Act as Restoration Service Providers on a Contractual Basis (Uvjeti za rad kao pružatelji usluge obrane sustava na ugovornoj osnovi) **Error! Reference source not found.**
- The List of Significant Grid Users (Popis ZKM-ova i mjera koje moraju provesti na svojim postrojenjima) **Error! Reference source not found.**
- The list of high priority significant grid users (Popis ZKM-ova visokog prioriteta te uvjeta za njihovo isključenje i ponovno stavljanje pod napon) **Error! Reference source not found.**
- The Rules for Suspension and Restoration of Market Activities (Pravila za obustavu i ponovno pokretanje tržišnih aktivnosti) **Error! Reference source not found.**,
- The Security Plan for Critical Infrastructure Protection (Sigurnosni plan za zaštitu kritične infrastructure) [26.]
- The Business Continuity Plan (Plan kontinuiteta poslovanja) [27.]
- The Test Plan of Equipment and Capabilities Considered in the System Defence Plan and the Restoration Plan (Plan ispitivanja opreme i sposobnosti relevantnih za Plan obrane sustava i Plan ponovne uspostave sustava) [28.]

System Defence Plan

System Defence Plan contains the procedures activated when the transmission system is in an emergency state determined according to SOGL **Error! Reference source not found.**.

System Defence Plan contains the following national procedures:

- Frequency deviation management procedure.
- Voltage deviation management procedure.
- Power flow management procedure.
- Assistance for active power procedure.
- Manual demand disconnection procedure.

System Restoration Plan

System Restoration Plan contains the procedures activated when the transmission system is in emergency or blackout state determined according to the SOGL **Error! Reference source not found.**.

System Restoration Plan contains the following national procedures:

- Re-energisation procedure.
- Frequency management procedure.
- Resynchronisation procedure.

Based on the provisions from the System Restoration Plan, the national procedure of a "bottom-up" strategy is designed. It is implemented in the internal operational rules for island operation.

The Terms and Conditions to Act as Defence Service Providers on a Contractual Basis

The terms and conditions to act as defence service providers on a contractual basis are prepared by HOPS in compliance with articles 4 and 11 of NCER **Error! Reference source not found.**. The aim of these terms and conditions is to define the characteristics of the service to be provided and the possibility of and conditions for aggregation.

The Terms and Conditions to Act as Restoration Service Providers on a Contractual Basis

The terms and conditions to act as restoration service providers on a contractual basis are prepared by HOPS in compliance with articles 4 and 23 of NCER **Error! Reference source not found.**. The aim of these terms and conditions is to define the characteristics of the service to be provided, the possibility of and conditions for aggregation and the target geographical distribution of power sources with black start and island operation capabilities as well.

The List of Significant Grid Users

The list of significant grid users (SGUs) is prepared by HOPS in compliance with articles 4, 11 and 23 of NCER **Error! Reference source not found.**. The aim of the list is to define the list of SGUs responsible for implementing on their installations the measures that result from mandatory requirements set out in Regulations (EU) 2016/631, (EU) 2016/1388 and (EU) 2016/1447 and/or from national legislation and the list of the measures to be implemented by these SGUs.

The List of High Priority Significant Grid Users

The list of high priority significant grid users (HPSGUs) is prepared by HOPS in compliance with articles 4, 11 and 23 of NCER **Error! Reference source not found.**. The aim of the list is to define principles applied to define those and the terms and conditions for disconnecting and re-energising the high priority grid users.

The Rules for Suspension and Restoration of Market Activities

The rules for suspension and restoration of market activities are prepared by HOPS in compliance with article 36 of NCER **Error! Reference source not found.**. The aim of these rules is to define the rights and obligations of market participants in the event of market suspension or market restoration.

This document defines the conditions in which the transmission system operator can suspend market activities. The basic procedure for suspension and restoration of market activities is defined and communication procedure detailing the tasks and actions expected from each party in its different roles during the suspension and restoration of market activities.

The Security Plan for Critical Infrastructure Protection

The Security Plan for Critical Infrastructure Protection is prepared by HOPS in compliance with article 26 of SOGL **Error! Reference source not found.**. The security plan contains a risk assessment of assets owned and operated by HOPS, covering major physical or cyber threat scenarios. The security plan considers potential impacts to the European interconnected transmission systems, and include organizational and physical measures aiming at mitigating the identified risks.

The Business Continuity Plan

The business continuity plan is prepared by HOPS in compliance with article 24 of SOGL **Error! Reference source not found.**. The business continuity plan is prescribing its responses to a loss of critical tools, means and facilities, containing provisions for their maintenance, replacement and development. The list of critical tools, means and facilities is determined according to 24(1) of SOGL.

The Test Plan of Equipment and Capabilities Considered in the System Defence Plan and the Restoration Plan

The Test Plan of Equipment and Capabilities Considered in the System Defence Plan and the Restoration Plan is prepared by HOPS in compliance with articles 4 and 43 of NCER [19.]. The aim of the Test plan is to identify the equipment and capabilities relevant for the system defence plan and the restoration plan that have to be tested, including the periodicity and conditions of the tests as well.

The civil protection system activation

Civil protection is a system of organizing participants, operational forces and citizens to achieve the protection and rescue of people, animals, material and cultural goods and the environment in major accidents and disasters and to eliminate the consequences of terrorism and war destruction. Croatian Civil Protection System Act [16.] regulates the system and operation of

civil protection, rights and obligations of state administration bodies, local and regional self-government units, legal entities and citizens.

The civil protection system is organized at the local, regional and state level, and connects the resources and capabilities of participants, operational forces and citizens into a single unit to reduce the risk of disasters, provide a rapid and optimal response to threats and dangers and mitigate the consequences of large accidents and disasters. The civil protection system regularly operates through preventive and planned activities, development and strengthening the readiness of participants and operational forces of the civil protection system.

Measures and activities in the civil protection system are implemented by the following participants:

- Croatian Government,
- the State Administration, state administration bodies and other state bodies,
- Croatian Army and the police,
- units of local and regional self-government.

In accordance with the Civil Protection System Act, a Policy on the holders, content and procedures for drafting planning documents in civil protection and the way of informing the public in the process of their adoption [17.] has been developed. Based on it and based on disaster risk assessments for the Republic of Croatia and major accident risk assessments of local and regional self-government units, the following documents are being developed, among others:

- National action plan for civil protection,
- action plans for civil protection of local and regional self-government units,
- operational plans for civil protection of legal entities on the manner of organizing the implementation of measures and activities in the civil protection system.

National action plan for civil protection specifies:

- the disaster for which the plan is drawn up;
- scope of planning;
- the idea of implementing protection, rescue and disaster relief for which a plan has been drawn up;
- the necessary forces and means for protection, rescue and assistance to implement the ideas for protection, rescue and assistance in the event of an accident and the available resources;
- organisation and implementation of observation, information and alerting;
- activation of forces and means for protection, rescue and assistance;
- management and leadership;
- protection measures and protection, rescue and assistance tasks;
- personal and mutual protection,
- crisis communication.

National action plan for civil protection has been prepared specifically for certain types of disasters:

- floods;
- earthquakes;
- large fires in the natural environments;
- extreme temperatures, epidemics and pandemics, snow and ice and drought;
- industrial accidents with hazardous substances;
- nuclear and radiological accidents.

In action plans for civil protection of local and regional self-government units the application of the National action plan for civil protection specific to that unit is elaborated, including the necessary contents specific for each of the levels of participants in the civil protection system for which the plan is being developed, names of operational forces, addresses of forces and participants, contacts, inspection of material assets and equipment, etc.

Operational plans for civil protection of legal entities on the manner of organizing the implementation of measures and activities in the civil protection system are developed if those entities are designated as relevant for major accidents and disasters solving.

Croatian Computer Emergency Response team (CERT)

CERT is the designated national computer security incident response team (CSIRT) that operates within the framework of the CARNET (Croatian Academic and Research Network). CERT monitors incidents at a national level, provides early warning, alerts, announcements and dissemination of information to relevant stakeholders about risks and incidents, responds to incidents and provides risk and incident analysis and situational awareness. CERT performs risk and incident handling in accordance with article 32 of the Cyber Security Act of essential service operators and digital service providers **Error! Reference source not found.**.

CERT is a member of the CSIRTs network, established in accordance with article 12 of the NIS Directive, the member of the world Forum of Incident Response and Security Teams (FIRST), the group of national response centres at CERT/CC and the European response centre working group (TF-CSIRT) and is accredited by the Trusted Introducer programme.

Information flow for information security incidents

The information flow follows “Cyber Security Act of essential service operators and digital service providers” [9.] requirements prescribed in Chapter IV Incident Notification. The aim is to ensure timely and effective response to information security incidents and stakeholder informing. The first information comes from essential service operators and digital service providers to CSIRT.

The competent CSIRT may, after prior consultation with the key service operator and the competent authority sectoral body, inform the public of individual incidents that have a significant effect on the continuity of the service provided the operator provides, if public

awareness is necessary to prevent the spread and strengthen the effect of the incident or to address an ongoing incident.

The competent CSIRTs and, where appropriate, the CSIRTs of the other affected Member States may inform the public of individual incidents that have a significant effect on the continuity of a particular digital service or request from a provider digital services to do so if the publication of incident information is in the public interest, especially if necessary to prevent the spread and strengthen the effect of the incident or to address an ongoing incident.

6.1.2 Preventive and preparatory measures

In preparation for emergency situations, HOPS pays special attention to the operation of critical infrastructure. Critical infrastructure is determined in accordance with Critical infrastructure act [11.] and Rulebook on the methodology for making risk analysis of critical infrastructure operations and their limit values and the priorities for the operation of the critical infrastructure sectors **Error! Reference source not found.**. For this purpose and following some other European legislative HOPS has prepared a document The Security Plan for Critical Infrastructure Protection **Error! Reference source not found.**. For this purpose they have implemented various preventive and preparatory measures:

Measures for substations classified as critical infrastructure:

- integrated technical system for the protection of critical infrastructure facilities;
- entrance control and video surveillance;
- the redundancy of key equipment in substations;
- adjusted dynamics and intensity of electric power device maintenance;
- selective and highly reliable protection system;
- installation of own reactive power sources;
- training of operators with procedures related to ensuring the operation of critical infrastructure;

Measures for power lines classified as critical infrastructure:

- adjusted dynamics and intensity of maintenance;
- overloading protection and dynamic thermal rating system;
- available montage pylons that enable fast repair of power lines
- training of operators with procedures related to ensuring the operation of critical infrastructure;

Measures for national and regional control centres and their backups:

- strict entry rules;
- physical and technical protection;
- the redundancy of key equipment in control centres;
- assurance of the continued availability of a sufficient team of operational staff;

- optimisation of the work organisation of control centres;
- highly reliable state of the art control system, introduction of support tools in the field of smart grids as power control tools;
- regular training of operational staff to deal with emergencies;
- regular intrusion testing and elimination of identified vulnerabilities in order to improve cyber security;
- monitoring the state of the art and technology in the field of cyber security;
- introduction of a system for detecting deviations in the SCADA system (SCADA anomaly detection);
- establishment of a system for the encryption of traffic on communication links between stations and control centres and among control centres.

Measures for company information communication technology safety enhancement:

- evaluation of the change management process, monitoring of changes in services and configurations;
- duplicate connections at the physical level;
- duplicate hardware;
- renting reservations for alternative connections to ensure high availability;
- IPS/IDS (Network Intrusion Detection and Prevention System);
- SIEM (Security information and event management);
- firewall;
- restricting gate traffic;
- establishment of technical mechanisms and tools for appropriate response in the event of security threats and attacks;
- introduction of artificial intelligence for detecting and recognising threats and attacks(predictive analytics and machine learning);

To manage the risks associated with critical infrastructure, HOPS adopted a comprehensive set of measures, which are divided into continuous and additional. Continuous measures are implemented in all situations, and in the event of an increased threat to critical infrastructure, an emergency or crisis, their implementation may escalate. Additional measures shall be implemented in the event of an increased threat to critical infrastructure, an emergency or a crisis if continuous measures, even if their implementation is escalating, are not sufficient. Risk management measures for individual critical infrastructure facilities are listed below and defined in more detail in the organisational regulations and document The Security Plan for Critical Infrastructure Protection **Error! Reference source not found.**

Under normal operating conditions, the operation of the transmission system is subject to strict quality standards, which define the permissible deviations of frequency and voltage, the number and duration of power outages of transmission network users and the assurance of n-1 criterium. The requirements and rules of operation of the system in this state are prescribed in legislative acts (SOGL **Error! Reference source not found.**, EBGL **Error! Reference source not found.**, Network code for the electricity transmission system **Error! Reference**

source not found., Power supply quality conditions [31], etc.) in a number of internal and joint operating instructions, operating agreements, etc.

Thanks to constant monitoring of risks and meeting the N-1 criterion, HOPS is always ready for various operating conditions.

Normal operating state is a state in which system variables, such as frequency, voltages and loads on electricity elements, are within the permitted limits, the N-1 criterion is met, the required scope of balancing services is available and all system users have access to the transmission network. The operator has the following measures at his disposal:

- buying or selling electricity on the balancing market;
- activating the aFRR reserve to compensate for deviations;
- activating the mFRR to compensate for deviations;
- activating agreed international assistance;
- if the system operator cannot compensate the deviations with the measures referred to in the previous points of this article, it may:
    - require a change in the consumption or production of balance responsible parties that cause deviations, or
    - in the event of surpluses or shortages of electricity, request a reduction / increase in production at operating generating units and, if necessary, their shutdown.
- in the event that the measures referred to in the previous two points do not eliminate the deviations, TSO may take measures in accordance with the procedures for relieving the transmission system;
- topology change (TR taps, PST taps, elements off/on, busbar separation);
- use of compensating devices;
- engagement of reactive energy under contracts (at power plants, compensation devices) and
- request DSOs to regulate compensation devices.

Measures for return to normal operating state take precedence over the individual interests of the SGUs or balance responsible parties and all of the above are obliged to carry them out as soon as possible after the HOPS' request. HEP ODS has the task to support HOPS, within its capabilities, in its return to normal system state.

6.1.3 National measures to mitigate electricity crises

Electricity crisis could be a present or imminent situation in which there is a significant electricity shortage. This means that the possibility of HOPS to apply market measures has already been taken into account, i.e. in the event of a lack of electricity in the system, HOPS can use one of the following options:

- activating or procuring energy from the balancing service providers (individual network users and aggregators who have successfully completed prequalification process and demonstrated ability to provide needed services) which have a contract for balancing

capacity and submitted balancing energy bids and other requirements as set out in balancing capacity contract
- activating or procuring energy from balancing service providers (individual network users and aggregators who have successfully completed prequalification process and demonstrated ability to provide needed services) based on their voluntary bids for balancing energy
- exchange with other transmission system operators
- purchasing and selling of electricity on market principles from electricity market participants and on the electricity exchange

As long as there are enough market measures available, the electricity crisis should not be declared.

In general, all non-market measures which are activated in crisis scenarios are prepared in internal operational procedures.

“The power system defence plan from major disruptions”, Annex “The electricity consumption limitation and emergency load shedding plan for Croatian power system” provides a legal frame and measures for limiting consumption in the event of local or overall adequacy issues which cannot be solved in any other way.

Network code for the electricity transmission system **Error! Reference source not found.** provides a basic frame for disturbed operation. Disturbed operation is considered to be an alert state, an emergency state, a blackout state and a restoration state. Article 38 of the Network code for the electricity transmission system nominates HOPS to be responsible and authorised to take appropriate measures to prevent the spread of disturbances and to restore normal operating conditions in the shortest possible time upon the occurrence of disturbed operation. For this purpose, HOPS, in coordination with HEP ODS and SGUs, prepared The terms and conditions to act as defence service providers on a contractual basis [21.] and The terms and conditions to act as restoration service providers on a contractual basis [22.].

Measures for return to normal operating state take precedence over the individual interests of the SGUs or balance responsible parties and all of the above are obliged to carry them out as soon as possible after the HOPS’ request. HEP ODS has the task to support HOPS, within its capabilities, in its return to normal system state.

Network code for the electricity transmission system provides a frame for measures in the alert state of operation. TSO actions are:
- restricting new access to cross-zonal transmission capacity;
- buying or selling electricity to compensate for deviations from the schedule;
- changing the topology of the transmission system;
- postponing the planned switching of network and shutdowns/starts of production units until normal operating condition is established;
- relieving the system by redispatch;
- limiting the consumption or production of SGUs and consumers;

- freezing the secondary frequency control if it deviates more than ± 200 mHz from the nominal frequency for more than one minute and activating the available power reserves in order to establish the nominal frequency value.

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In the event of an emergency state, TSO may take the following measures to prevent the spread of disturbances and to restore to normal operating state:

- suspension of work on the power grid elements and their activation as soon as possible;
- change of active power of production units outside the agreed/required scope for participation in primary, secondary or tertiary frequency regulation;
- reduction of desired values of voltage regulators, blocking of voltage regulators on transmission and distribution network transformers, deactivation of U/Q optimisation;
- start of a production unit that is in operational readiness and has not been leased by the system operator as part of system services;
- cancellation of granted access to cross-zonal transmission capacity in accordance with the auction rules;
- deactivation of the transfer point, which endangers the stable operation of the power system;
- relief the transmission system.

According to article 39 of Network code for the electricity transmission system TSO prevents the occurrence of a voltage collapse with the following possible measures:

- by increasing the production of reactive power of production units;
- by switching on/off or increasing the production of reactive power of compensation devices;
- by redispatch or active power flow redistribution;
- by disconnected power lines switching on;
- in coordination with HEP ODS, by lowering the desired value of the voltage regulator in the HOPS/HEP ODS interface transformer stations;
- in coordination with HEP ODS, by system operation at uniform maximum allowable voltages in the transmission network;
- in coordination with HEP ODS, by calling on the DSO to activate compensation devices, to increase the reactive power production at the production units connected to the distribution network and to reduce the voltage in the distribution network;
- by blocking the operation of voltage regulators or the installation of devices for automatic blocking of voltage regulators on transformers with taps;
- by relieving the transmission system.

Network code for the electricity distribution system [7.] provides a basic frame for disturbed operation in distribution network. Disturbed operation is considered to be a disturbed state and an emergency state. Article 74 of the Network code for the electricity distribution system nominates HEP ODS to be responsible and authorised to take appropriate measures to prevent the spread of disturbances and to restore normal operating conditions in the shortest possible time upon the occurrence of disturbed operation.

In the event of an disturbed state, HEP ODS may take the following measures to prevent the spread of disturbances and to restore to normal operating state:

- stopping or limiting the consumption of consumers or production of network users

In the event of an emergency state, HEP ODS may take the following measures to prevent the spread of disturbances and to restore to normal operating state:

- underfrequency load shedding (triggered by underfrequency protection, according to underfrequency load shedding plan, regulated by the Network code for the electricity transmision system)
- emergency load shedding (according to emergency load shedding plan created by DSO).

System Defence Plan

Following article 11 of NCER [19.] HOPS has designed a System Defence Plan as the integral part of "The power system defence plan from major disruptions" **Error! Reference source not found.**. The plan includes the following technical and organisational measures in accordance with articles from 15 to 22 of NC ER **Error! Reference source not found.**:

- System protection schemes:
  - Automatic under frequency control scheme;
  - Automatic over frequency control scheme;
  - Automatic scheme against voltage collapse;
- System Defence Plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure.

Automatic under frequency control scheme is a mechanism used for preventing power system degradation in the event of major disturbances such as outages of major power plants, or a significant part of interconnected system, etc. Chapter 4.4.1 of System Defence Plan specifies measures for power generating modules in order to maintain frequency. These measures are turbine regulator settings and the settings of the limited frequency sensitive mode (underfrequency). Same chapter specifies a scheme for automatic low frequency demand disconnection and the rules HEP ODS and SGUs shall follow as well.

Automatic over frequency control scheme is a mechanism used for preventing power system degradation in the event of major disturbances such as outages of major loads, transmission lines, transformers or substations. Similar as for under frequency, Chapter 4.4.2 of System Defence Plan specifies turbine regulator settings and the settings of limited frequency sensitive mode (overfrequency).

Automatic scheme against voltage collapse is a mechanism used for identifying insufficient extent of reactive power in the system that could lead to voltage collapse. The chapter 4.4.3.

of the System Defence Plan specifies blocking scheme for on load tap changer that HOPS, HEP ODS and demand facilities shall follow and the thresholds that shall trigger these measures.

Frequency deviation management procedure is used when the frequency in HOPS's control area meet the conditions for the emergency state. Its main aim is to change injections of active power in the control area. The chapter 4.4.5 of System Defence Plan specifies measures that HOPS has at its disposal. In this event, HOPS holds the right to determine desired active power settings for SGUs and balancing service providers or to disconnect them. Other measures used in this procedure are switching energy storage units from load mode to generation mode and manual disconnection of the energy storage unit.

Voltage deviation management procedure is used when voltage meets conditions for emergency state. Its main aim is to change the injections of reactive power in the control area. In this event, as described in the chapter 4.4.4 of System Defence Plan, HOPS holds the right to determine desired reactive power settings for HEP ODS and SGUs.

Power flow management procedure is used when power flows go beyond operational security limits. Its main aim is to change injections of active power in the control area. As stated in the chapter 4.4.6 of System Defence Plan HOPS holds the right to determine desired active power settings for SGUs and balancing service providers or to disconnect them.

Assistance for active power flow procedure is a procedure that ensures adequacy in HOPS' control area for day ahead and intraday timeframe. As stated in the chapter 4.4.7 of System Defence Plan, in the event that all available bids for balancing energy are activated, HOPS holds the right to demand the rest of active power from power generating modules and balancing service providers to be offered on the local energy market. HOPS could request assistance for active power from other TSOs that are in the normal or alert state.

Manual demand disconnection procedure is used, when all other procedures are not sufficient to restore the system from emergency to normal state. The procedure is described in chapter 4.4.8 of System Defence Plan.

System Restoration Plan

Following article 23 of NCER [19] HOPS has designed a System Restoration Plan as the integral part of “The power system defence plan from major disruptions” **Error! Reference source not found.**. The plan includes the following technical and organisational measures in accordance with articles from 26 to 34 of NCER **Error! Reference source not found.**:

- Re-energisation procedure,
- Frequency management procedure,
- Re-synchronisation procedure.

Re-energisation procedure in the System Restoration Plan contains the set of measures for top-down and bottom-up strategies, which are activated when the transmission system is in the black out state according to article 18 of SOGL [29]. The main priority of the re-energisation

procedure is the quick restoration of 400/220 kV transmission system, which in case of bottom-up strategy enables the Resynchronisation with the neighbouring TSOs.

Top-down re-energisation strategy is based on the request of TSO in black out state to the neighbouring TSO who shall provide the assistance for active power, unless it would lead their system to the emergency or blackout states. When applying a top-down re-energisation strategy, HOPS manages the connection of load and generation with the aim to regulate the frequency towards the nominal frequency with a maximum tolerance of the maximum steady-state frequency deviation and keeps power interchange inside agreed active power assistance limits.

In general the following measures are activated during top-down re-energisation strategy:

- Operation of HEP ODS and SGUs according to the instructions of HOPS in real-time.
- Resynchronisation of power generating models to the existing transmission system.

Bottom-up re-energisation strategy is based on island operation of network parts, which is initiated with black start of power generating modules. For each island, operational rules apply which contains the set of measures for:

- Frequency and voltage management,
- Monitoring and management of island operation,
- Resynchronisation of islands.

In general the following measures are activated during bottom-up re-energisation strategy:

- Black start of power generating modules and reconnection to non-voltage transmission system;
- Switching of the power generating modules to house load operation and operation in island operating mode;
- Operation of HEP ODS and SGUs according to the instructions of HOPS in real-time;
- Resynchronisation of islands until the whole transmission system is connected.

Frequency management procedure contains the set of measures with the aim to restore system frequency back to nominal frequency. It is activated under the following conditions:

- In preparation of the resynchronisation procedure, when synchronous area of Continental Europe (CE SA) is split on two or more islands;
- In case of higher frequency deviation;
- In case of activation of bottom-up strategy.

In general the following measures are activated during the frequency management procedure:

- Switching of load frequency controller to proper operating mode;
- Appointment of frequency leader (in case of split CE SA or higher frequency deviation);
- Operation of SGUs according to the instructions of TSOs in real time.

Resynchronisation procedure contains the following set of measures:

- Appointment of resynchronisation leader - in case the CE SA is split;
- The measures allowing the TSO to apply a resynchronisation strategy - operation of the TSOs, DSOs and SGUs according to the instructions of resynchronisation leader;
- The maximum limits for phase angle, frequency and voltage differences for connecting lines.

The rules for suspension and restoration of market activities

The rules for the suspension and restoration of market activities is prepared by HOPS in compliance with articles 36 of NCER **Error! Reference source not found.**. The aim of these rules is to define the rights and obligations of market participants in the event of market suspension or market restoration.

A measure of market suspension may be used in the event of at least one of the following situations:

- if the TSO's transmission system is in the blackout state;
- the TSO has exhausted all the options provided by the market and the continuation of market activities under the emergency state would deteriorate one or more of the conditions referred to in article 18(3) of SOGL **Error! Reference source not found.**;
- the continuation of market activities would decrease significantly the effectiveness of the restoration process to the normal or alert state;
- tools and communication means necessary for the TSOs to facilitate market activities are not available.

More detailed conditions for the activation of market suspension are specified in article 6 of The rules for suspension and restoration of market activities [25.], where thresholds of load and generation disconnections, the share and geographic distribution of unavailable transmission system elements, the inability of significant share of market participants to participate in the market and the absence of properly functioning tools and communication means necessary to perform market activities are defined.

In the event of one or more of the above conditions, the HOPS may temporarily suspend one or more of the following activities:

- the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
- the submission by a balancing service provider of balancing capacity and balancing energy bids;
- the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
- the provision of modifications of the position of balance responsible parties;
- the provision of schedules referred to in article 111 of SOGL [29.];
- long term capacity allocation;
- day ahead market coupling;
- intraday market coupling;

- intraday market activities at CROPEX;
- the procurement of balancing services referred to in articles 29.-35. of NC ER [19.].

Market suspension activities shall be carried out in accordance with rules specified in articles 8 to 17 of The rules for suspension and restoration of market activities [25.].

The rules and procedure for market restoration are specified in article 19 of The rules for suspension and restoration of market activities [25.].

The rules for settlement in case of suspension of market activities

The rules for settlement in case of suspension of market activities are a part of Terms and conditions for balancing service providers [32.] (article 18 of EBGL **Error! Reference source not found.**), prepared by HOPS in compliance with article 39 of NCER **Error! Reference source not found.**. The article 25 of Terms and conditions for balancing service providers specifies that in case of force majeure, disturbed and/or extraordinary operation of the transmission and/or distribution network (i.e. during suspension of market activities) same rules are applied as in normal operation (usual market activities).

6.1.4 National framework for load shedding and users entitled for special protection against disconnection

The frame for manual load shedding is defined in “The power system defence plan from major disruptions” [20.], chapter Manual demand disconnection procedure (emergency load shedding) and Annex “The electricity consumption limitation and emergency load shedding plan for Croatian power system”. This procedure is used when all other procedures don't suffice to restore the system from emergency state to normal state.

Accordingly, HOPS adopts abovementioned Annex twice a year (for summer and winter period), which consists of three tables:

- Table 1: Power limit - given is the absolute amount of power (MW) that each distribution area or transmission-connected demand facility, depending on the percentage share in peak power, must limit in the period from 00-24 hours.
- Table 2: Daily limit of electricity consumption - is the energy (MWh) which must be limited for a particular distribution area or a transmission-connected demand facility in the period from 00-24 hours.
- Table 3: Daily allowed consumption of electricity - daily allowed quantities of electricity are given for an individual distribution area or a transmission-connected demand facility, and they are derived from Tables 1 and 2.

Regarding consumers connected directly to the transmission network, there is no high priority significant grid users [24.], i.e. no consumer is omitted from disconnection during load shedding. Thus, underground gas storage Molve is usually exempt from load shedding plan because its disconnection will indirectly cause further aggravation of the situation due to problems with the power supply of gas-fired thermal power plants.

According to article 79 of Network code for the electricity distribution system:

- HEP ODS shall perform load shedding in stages, in accordance with the order received from the transmission system operator.
- HEP ODS is obliged to prepare a plan for the implementation of load shedding

Emergency load shedding plan defines:

- plan activation mechanism
- plan of consumption limitation and emergency load shedding in distribution system, tailor-made for each of 21 distribution area in Croatia,
- mutual reporting and communication with HOPS,
- reference to operation procedures.

The plan is made taking into account individual consumers of special interest such as: hospitals, police, army, water supply, gas supply, etc., and taking into account, as far as possible, provisions related to the categories of vulnerable and protected customers , as prescribed in Electricity market act [13].

6.1.5 Mechanisms to inform public about electricity crisis

Where a seasonal adequacy assessment or other qualified source provides concrete, serious and reliable information that an electricity crisis may occur or when confronted with an electricity crisis in Croatia HOPS shall, without undue delay, inform MINGOR and share all necessary information about it. If needed, MINGOR shall declare an electricity crisis. HOPS and MINGOR will agree on the coordinated informing of all significant stakeholders about pending or already declared electricity crisis.

HOPS will inform all electricity operators: HEP ODS, SGUs, HROTE, HEP Opskrba, CROPEX, ancillary service providers and other market participants. All companies have their own internal protocols for corporate crisis communications among leadership, supervisory boards, crisis staff and public relations departments. They may inform public regarding electricity crisis via Official web pages, Facebook, Twitter etc. Communication between HOPS and other parties takes place in accordance with established procedures for communication with the listed partners and are defined in the operating instructions, agreements and is in compliance with information security law.

MINGOR will inform other governmental authorities. Governmental authorities have their own protocols for internal communication. For the purpose of public informing they use national media. Governmental authorities also communicate with army and police forces in case their support is needed. Another governmental institution, which deals with all kind of crisis situations is The directorate of civil protection. It communicates with the public in accordance with the chapter Crisis communication in National action plan for civil protection. Depending on the scale of crisis, they communicate with national and regional information centres. For this purpose, they use local and national media, radio, etc.

CERT will inform HOPS and MINGOR on cyber security threats and the potential risk of an electricity crisis. CERT, HOPS and MINGOR will decide together on how to inform the public,

depending on whether it is a potential electricity crisis or an electricity crisis has already occurred.

In the event of crisis situations, all parties act in accordance with their internal Rules of Procedure on the management of Company and Corporate communicating according to the following principles:

- centralisation of all communication activities,
- only the CEO of the company or a person authorised by the director communicates with the external public, respectively,
- individuals in the field are not allowed to make statements,
- timely and high-quality information to all target publics on the course of eliminating the causes,
- non-conflicting communication,
- protection of individuals who solve the causes of the crisis from additional burdens in communication processes.

6.2 Regional and bilateral procedures and measures

Similar to the national procedures/measures the regional and bilateral procedures/measures are also designed and harmonised based on the requirements from European and national legislation.

6.2.1 Agreed mechanisms for cooperation within the region

EAS-ENTSO/E-wide awareness system

EAS is an information platform allowing partner TSOs a real-time global view on the European grid. In case a stressed situation arises, a better comprehension of the conditions can be gained and in the case of disturbance, it is possible to identify the origins and to be helpful in problem solving.
In both cases and as much as possible, EAS enables partner TSOs:

- to enhance their assessment of the nature and the size of the disturbance,
- to make decision to react or not without aggravating the situation,
- to coordinate measures for resolving balance and transmission problems and restoration of the transmission system,
- to seek cross-border cooperation.

EAS uses system state definitions based on the article 18 of SOGL [29.]. Using the below colour indication in Table 1, the TSOs are able to inform others about their system state on Pan-European level:

Table 1: colour indication of the system state

System state	Colour indication
Normal state	green

Alert state	yellow
Emergency state	red
Blackout state	black
Restoration state	blue

When activating a non-normal system state, the TSO shall send one of predefined messages, named “Main Message” as defined in EAS usage procedure. To specify the cause and the issue, one or more optional predefined messages giving additional information to other TSOs can be activated. Further principles and guidance for the operational use of EAS are described in the ENTSO-E Awareness System – Usage Procedure **Error! Reference source not found.**

STA process- Short term adequacy process

STA process follows the Short Term Adequacy methodology **Error! Reference source not found.**, developed pursuant to Article 81 of SOGL **Error! Reference source not found.**.The STA process is performed at ENTSO/E level and it aims at forecasting potential adequacy issues. Forecasted load and generation capacity per type are submitted every day by all ENTSO/E TSOs for a rolling D-7 to D-1 timeframe. The results of the cross-regional adequacy analysis for the next 7 days are made available every day by latest at 11 p.m.

In case of adequacy issues detected in the cross-regional assessment, the regional STA process is triggered. During the regional STA, impacted and neighbouring TSOs fill a template listing their potential regular or extraordinary remedial actions to solve the problem. Regional STA process is currently in external parallel run phase and is expected to go live in second half of 2021.

Regional Adequacy Assessment will be triggered automatically in case remaining capacity of any area on the deterministic calculation of cross regional (CR) STA is less than 0 MW for any timestamp between D-1 and D-3 timestamp. In case Regional Adequacy Assessment will be activated automatically appropriate remedial actions applied by TSOs to mitigate the lack of adequacy will be addressed. Regional Adequacy Assessment can also be triggered manually by the TSO stating clear reasons. Concerned RSCs and TSOs are identified by using Dynamic Zone Matrix created by TSOs. In order to ensure efficient mitigation of adequacy risks, TSOs and RSCs must work in cooperation. This TSOs-RSCs coordination starts with a teleconference. It allows the stakeholders to name an RSC leader, confirm the adequacy issues and prioritise the regional studies. Finally, when the adequacy problems and the involved TSOs-RSCs are identified, the Regional Adequacy calculation can start.

ITA - Inter TSO agreements

HOPS has established, and revise if necessary, inter TSO agreements with below (within the region) TSOs with the common objective of secure operation of interconnected power system:

- MAVIR (revised during 2021) [35.],
- ELES (revised during 2021) [36.].

Inter TSO agreements typically consist of the following chapters and subchapters:

- Load-Frequency Control (Demarcation of control block/areas, Control power reserve),
- Scheduling, Accounting and Capacity Allocation (Scheduling, Accounting, Capacity Allocation),
- Operational Security (External Contingency list, External Observability area, Operational limits and parameters, N-1 Security, Synchronising equipment settings, Protection settings, Voltage control and reactive power management, Short circuits, Stability, Transmission network development),
- Coordinated Operational Planning (Relevant network elements, Outage planning coordination, Switching and Permits for work, Capacity assessment),
- Emergency operation (Awareness of system states, Underfrequency plan, System restoration, Frequency management at major deviations, Resynchronisation),
- Communication (Communication infrastructure, Real time data exchange, Official language, Means of verbal and written communication, Authorized personnel),
- Operational training,
- Metering Devices for Accounting.

where the Emergency operation chapter is particularly important for the purpose of managing energy crisis.

LFC block operational agreement

The LFC areas of HOPS, ELES (within the region) and NOSBiH (outside the region) form the LFC block SHB. Pursuant to Article 119 of the SOGL, the members of the control block have concluded an LFC block operational agreement which contains provisions essential both for preventing and limiting the electricity crisis [37.]. The most important chapters of the agreement are the following:

- Organization of automatic frequency restoration process in LFC block SHB,
- FRCE target parameters,
- Allocation of responsibilities in order to fulfil the FRCE target parameters,
- Actions aiming to reduce FRCE in real-time operation,
- Further measures aiming to reduce FRCE,
- General principles for reserve dimensioning,
- Operational procedures in case of exhausted FRR in LFC block SHB,
- Escalation procedure for cases of severe risk of insufficient reserve capacity on FRR in the LFC block,
- Procurement of common mFRR in LFC block SHB,
- Activation of common mFRR,
- Activation of additional measures,
- Transmission capacities and security issues.

Cost coverage and financial settlement

Article 36 of Network code for the electricity transmission system **Error! Reference source not found.** provides a frame for financial settlement. Until the end of May 2021. unplanned quantities of electricity exchange between LFC areas were settled in the agreed time period in accordance with the ENTSO-E rules, the return of settled unplanned deviations was compensated in the agreed time period in accordance with the compensation program, separately according to the prescribed tariffs and seasons in accordance with the ENTSO-E rules, but starting from 1 June 2021. the financial compensation mechanism is in force, which means the financial settlement rules applicable to intended exchanges of energy as a result of the frequency containment process and the ramping periods, as well as all unintended exchanges of energy.

6.2.2 Agreed regional and bilateral measures

Agreement on mutual emergency assistance service (MEAS)

ITA establishes conditions and rules under which the Parties shall provide each other upward and downward Mutual Emergency Assistance Service (abbr. MEAS). The subject of this Agreement is the provision of emergency assistance from abroad through import (injection) of emergency energy or export (reduced import, if applicable) in order to cover the needs of each Party. Apart from being an integral part of the inter TSO agreement, it can also be regulated as separate agreements [40. - 41.].

MEAS procedure is specified below:

- MEAS can be requested only in real time and the energy delivery has to follow on the same dispatching day. The request can be submitted any time during the dispatching day. Dispatching day in the sense of MEAS agreement means a timeframe starting with the beginning of intraday process for delivery day D on the common border (e.g. dispatching day for delivery day D is from 22:00 in D-1 to 24:00 in D).
- The respective herein mentioned undertakings of providing reserve power for MEAS will only be addressed by the Reserve Connecting Party if and only if there is sufficient production capability in its system and sufficient cross-zonal transmission capacity.
- The Parties agree that at no time there is or will be, according to the terms and conditions of MEAS Agreement, any reservation of the reserve provision service to each Party, unless specified otherwise in MEAS Agreement.
- As a result of this, the Parties agree that no flat fee or any fixed payment for available reserve capacity (in EUR/MW) is or will be applied amongst them for their respective undertakings hereunder.
- When requesting MEAS the Reserve Receiving Party shall specify the time period of requested MEAS, which can be of minimum 1 hour and maximum depending on the agreement of Parties.
- The above-mentioned request shall be made by phone by the Reserve Receiving TSO. The request shall include start of activation, expected end of activation and exchange profile.

- The Reserve Connecting TSO will reply to the request as soon as possible by confirming, amending or rejecting the requested exchange profile by phone. The communication shall include the offered price for setting the exchange.
- The Reserve Receiving Party will reply to the offer as soon as possible by confirming (activating) or rejecting the offer by phone.
- Activation shall be confirmed by email with the Confirmation of Emergency Energy Delivery form as soon as possible, but not later than 6 hours after the start of activation of MEAS.
- MEAS shall be included in the relevant Exchange Schedules (CAS, TSO ID SAX) of the Parties. The sending/receiving of agreed modified Exchange Schedules including MEAS and finalisation of accepted change have to be completed before the start time of the energy delivery.
- Delivery does not have to start at a full hour. Preferably, delivery should start and end at any time according to a schedule resolution of 15 minutes. However, in exceptional cases delivery can also start regardless of quarterly intervals provided that confirmation process for schedule exchanges can be met.

Measures in critical network situations

ITA specifies the measures in critical network situations for the contracting parties. It describes the following topics **Error! Reference source not found.**:

- Under-frequency control scheme;
- Over-frequency control scheme;
- Voltage deviation management procedure for low voltage;
- Voltage deviation management procedure for high voltage;
- Power flow deviation management

Information on the common network restoration strategy

ITA provides information on the common network restoration strategy as described below **Error! Reference source not found.**:

Common provisions:

- When a neighbour TSO detects or is informed by the other TSO about a blackout, separation or collapse, the first action is to make a diagnostic of the grid and especially in the border area. In a second step, TSO can reinforce the grid respecting given constraints of neighbouring TSOs and their internal constraints. The aim of these actions is to reinforce the grid to give a stronger support to the neighbour and to have the most stable grid to allow reconnection with a higher security.
- Contracting TSOs shall do their best efforts in mutual helping, considering the respect of their internal rules (N-1 security,...). The active power exchanges between TSOs shall be jointly defined during the transitory stage of system restoration and the physical flows shall reach commercial ones only once the TSO affected by the collapse is able to maintain the commercial flows without impact on its own system.

- Discussions concerning the cost of measures adopted by supporting TSO will be put aside in real time during the grid restoration phase and between the operators. Such discussions can only take place on ex-post.

Restoration of the HOPS grid after blackout accident:

- Priorities of the HOPS grid restoration

Objective of HOPS system restoration strategy is to put the power system in a safe way into normal operation as soon as possible. According to the provisions of System Restoration Plan priorities of HOPS system restoration are:

  - restoration of the transmission system operation takes precedence over the re-energisation of load,
  - restoration of 400/220 kV grid,
  - providing of restoration paths for energisation of consumers,
  - synchronisation of generators to parts of network that are still energised,
  - maintaining the appropriate voltage,
  - maintaining system frequency in case of island operation,
  - exchange of information with other TSOs about the system state,

- Basic Strategies of the HOPS grid restoration:
  - HOPS has prepared the top-down and bottom-up re-energisation strategies in the System Restoration Plan
  - In the top down strategy with help of the neighbouring TSOs grids, there are 4 main directions: from the West (Slovenia), from the North (Hungary) and from the East (Serbia and Bosnia and Herzegovina)
  - In combination with a top-down strategy the bottom-up strategy is also reasonably activated

These procedures are described in articles 63 and 64 of Network code for the electricity transmission system **Error! Reference source not found.** and The Power System Defence Plan From Major Disruptions [20.].

6.2.3 Agreed mechanisms for cooperation outside the region

EAS-ENTSO/E-wide awareness system

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In both cases and as much as possible, EAS enables partner TSOs:

- to enhance their assessment of the nature and the size of the disturbance,
- to make decision to react or not without aggravating the situation,
- to coordinate measures for resolving balance and transmission problems and restoration of the transmission system,
- to seek cross-border co-operation.

EAS uses system state definitions based on the article 18 of SOGL [29]. Using the below colour indication in Table 2, the TSOs are able to inform others about their system state on Pan-European level:

Table 2 : colour indication of the system state

System state	Colour indication
Normal state	green
Alert state	yellow
Emergency state	red
Blackout state	black
Restoration state	blue

When activating a non-normal system state, the TSO shall send one of predefined messages, named “Main Message” as defined in EAS usage procedure. To specify the cause and the issue, one or more optional predefined messages giving additional information to other TSOs can be activated. Further principles and guidance for the operational use of EAS are described in the ENTSO-E Awareness System – Usage Procedure **Error! Reference source not found.**

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In case of adequacy issues detected in the cross-regional assessment, the regional STA process is triggered. During the regional STA, impacted and neighbouring TSOs fill a template listing their potential regular or extraordinary remedial actions to solve the problem. Regional STA process is currently in external parallel run phase and is expected to go live in second half of 2021.

Regional Adequacy Assessment will be triggered automatically in case remaining capacity of any area on the deterministic calculation of cross regional (CR) STA is less than 0 MW for any timestamp between D-1 and D-3 timestamp. In case Regional Adequacy Assessment will be activated automatically appropriate remedial actions applied by TSOs to mitigate the lack of adequacy will be addressed. Regional Adequacy Assessment can also be triggered manually by the TSO stating clear reasons. Concerned RSCs and TSOs are identified by using Dynamic Zone Matrix created by TSOs. In order to ensure efficient mitigation of adequacy risks, TSOs and RSCs must work in cooperation. This TSOs-RSCs coordination starts with a teleconference. It allows the stakeholders to name an RSC leader, confirm the adequacy issues and prioritise the regional studies. Finally, when the adequacy problems and the involved TSOs-RSCs are identified the Regional Adequacy (RA) calculation can start.

ITA - Inter TSO agreements

HOPS has established, and revise if necessary, inter TSO agreements with below (outside the region) TSOs with the common objective of secure operation of interconnected power system:

- EMS (revised during 2021) [38.],
- NOSBiH and Elektroprenos BiH (last revision 2018) [39.].

Inter TSO agreements typically consist of the following chapters and subchapters:

- Load-Frequency Control (Demarcation of control block/areas, Control power reserve),
- Scheduling, Accounting and Capacity Allocation (Scheduling, Accounting, Capacity Allocation),
- Operational Security (External Contingency list, External Observability area, Operational limits and parameters, N-1 Security, Synchronising equipment settings, Protection settings, Voltage control and reactive power management, Short circuits, Stability, Transmission network development),
- Coordinated Operational Planning (Relevant network elements, Outage planning coordination, Switching and Permits for work, Capacity assessment),
- Emergency operation (Awareness of system states, Underfrequency plan, System restoration, Frequency management at major deviations, Resynchronisation),
- Communication (Communication infrastructure, Real time data exchange, Official language, Means of verbal and written communication, Authorized personnel),
- Operational training,
- Metering Devices for Accounting.

where the Emergency operation chapter is particularly important for the purpose of managing energy crisis.

LFC block operational agreement

The LFC areas of HOPS, ELES (within the region) and NOSBiH (outside the region) form the LFC block SHB. Pursuant to Article 119 of the SOGL, the members of the control block have concluded an LFC block operational agreement which contains provisions essential both for preventing and limiting the electricity crisis. The most important chapters of the agreement are the following:

- Organization of automatic frequency restoration process in LFC block SHB,
- FRCE target parameters,
- Allocation of responsibilities in order to fulfil the FRCE target parameters,
- Actions aiming to reduce FRCE in real-time operation,
- Further measures aiming to reduce FRCE,
- General principles for reserve dimensioning,
- Operational procedures in case of exhausted FRR in LFC block SHB,
- Escalation procedure for cases of severe risk of insufficient reserve capacity on FRR in the LFC block,
- Procurement of common mFRR in LFC block SHB,
- Activation of common mFRR,

- Activation of additional measures,
- Transmission capacities and security issues.

Extraordinary procedure in case of alert state due to violation of system frequency limits

This procedure is in accordance with Article 118 of SOGL [29.] and section B-9 of Synchronous Area Framework Agreement for Regional Group Continental Europe (abbr. SAFA) **Error! Reference source not found.**.

Two Coordination Centres located in Swissgrid and Amprion grid are taking turn in monitoring the System Frequency and determining the Stages according to System States defined in article 152 of the SOGL. There are two possible stages:

- Stage 1: a continuous Frequency Deviation of more than 100 mHz over a time period of more than 5 minutes or a continuous Frequency Deviation of more than 50 mHz over a time period of more than 15 minutes.
- Stage 2: a continuing Frequency Deviation of more than 100 mHz over a time period of more than 10 minutes or a continuous Frequency Deviation of more than 50 mHz either over a time period of 20 minutes or manually triggered after Stage 1 took place. Each LFC area can ask for this manual trigger by contacting the responsible Coordination Centre. In case there are contradicting requests from TSOs, the Coordination Centre shall decide on appropriate actions and trigger of Stage 2.

In case of Stage 1 the Coordination Centres shall identify the Impacting TSO that is predominantly responsible for frequency domination and contact immediately their control rooms by phone or teleconference. A TSO shall be identified as Impacting TSO in case the following conditions are fulfilled in ENTSO-E Awareness System (EAS):

- the TSOs with an ACE exceeding the threshold of 375 MW and
- the TSO has declared Alert State.

The Impacting TSOs shall inform the Coordination Centre about:

- the estimated reason for the imbalance
- the Remedial Actions that have already been taken;
- the time period when these actions are expected to become effective;
- if these actions are expected to be sufficient to solve the frequency deviation and
- which further actions are planned.

This first contact aims at clarifying from each Impacting TSO if some actions have been already set up, the delay for these actions and if these actions are expected to be sufficient in order to solve the frequency deviation. The Impacting TSOs are expected to set up all the measures that are possible regarding their own rules (market and security) in order to avoid the second step of this procedure as much as possible.
In case the Impacting TSO expects its taken and planned Remedial Actions to not be sufficient and an improvement of the System Frequency cannot be observed by the Coordination Centre, the Coordination Centre shall start the measures corresponding to Stage 2 without delay. Alternatively, the Impacting TSOs may ask the Coordination Centre for the immediate initiation of Stage 2.

In case of Stage 2 the Coordination Centre shall immediately start a phone conference with all relevant Supporting TSOs (Swissgrid, Amprion, RTE, TERNA and REE). If necessary, the Impacting TSOs may join the conference. As a result of the phone conference, one or more further Remedial Actions to return to Normal State shall be agreed by the participating TSOs. Possible Remedial Actions are:

- activation of additional aFRR by means of enforcing the frequency restoration controller to activate additional reserves, i.e. manually overwriting/adjusting the exchange program while – for example – using virtual tie-lines or cross-border schedules;
- activation of additional mFRR or RR;
- mutual emergency assistance services.

Real time security management with HVDC MONITA in operation

MONITA (MONtenegro-ITAly) High Voltage Direct Current (HVDC) link connects the Italian Peninsula and the Montenegro, i.e. MONITA connects TSOs TERNA and CGES. The change of flows in MONITA influences power flows in all TSOs that are close to the Adriatic Sea.

Normally, TERNA operates HVDC MONITA in the active power control based mode, i.e. set points are consistent with exchange program. In case N-1 security violations affecting the grid of TERNA, CGES, NOSBiH, Swissgrid and/or HOPS, it could be agreed a set point value different from the exchange program (exchanged program is unchanged).

Furthermore, if above mentioned measure is not sufficient, for significant N-1 security violations additional measure, countertrading between TERNA and CGES is applied.

6.3 Electricity crisis scenarios and corresponding mitigation measures

Electricity crisis scenarios and corresponding mitigation measures correlate crisis scenarios and potential measures to mitigate them. Usage of some measure is highly dependent on specific crisis situation and it cannot be prescribed for all possible variations of crisis evolution. Therefore the correct handling of measures requires training and experience. The more severe the crisis evolves the more important correct handling of measures becomes and the more important is the coordination among crisis mitigation involved parties.

The full list of procedures, preventive and preparatory measures, as well as measures to mitigate electricity crisis could be taken is given in Annex 3, and below is a list of procedures and measures that can be used for each individual crisis scenario. Not all envisaged measures and procedures are applied immediately and simultaneously, but the application is based on the severity of the crisis scenario.

6.3.1 Cyberattack on entities connected to electrical grid

In situations where this type of electricity crisis may occur or has already occurred, the following

procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation

- Croatian Computer Emergency Response team (CERT) activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.2 Cyberattack on entities not connected to electrical grid

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:

  - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
  - the submission by a balancing service provider of balancing capacity and balancing energy bids;
  - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
  - the provision of modifications of the position of balance responsible parties;
  - the provision of schedules referred to in article 111 of SOGL;
  - long term capacity allocation;
  - day ahead market coupling;
  - intraday market coupling;
  - intraday market activities at CROPEX;
  - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Croatian Computer Emergency Response team (CERT) activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.3 Physical attack - critical assets

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system

- STA process- Short term adequacy process
- ITA - Inter TSO agreements
- LFC block operational agreement
- Extraordinary procedure in case of alert state due to violation of system frequency limits
- Real time security management with HVDC MONITA in operation

- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.4 Physical attack - control centres

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;

    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
    - operational forces of the civil protection system activation
    - police activation
    - army activation
    - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
    - EAS-ENTSO/E-wide awareness system
    - STA process- Short term adequacy process
    - ITA - Inter TSO agreements
    - LFC block operational agreement
    - Extraordinary procedure in case of alert state due to violation of system frequency limits
    - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
    - Agreement on mutual emergency assistance service (MEAS)
    - Measures in critical network situations:
        - under-frequency control scheme
        - over-frequency control scheme
        - voltage deviation management procedure for low voltage
        - voltage deviation management procedure for high voltage
        - power flow deviation management
    - Information on the common network restoration strategy

6.3.5 Insider attack

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
    - Measures for substations classified as critical infrastructure
    - Measures for power lines classified as critical infrastructure

  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Croatian Computer Emergency Response team (CERT) activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements

- LFC block operational agreement
- Extraordinary procedure in case of alert state due to violation of system frequency limits
- Real time security management with HVDC MONITA in operation

- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.6 Solar storm

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;

        - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
        - the provision of modifications of the position of balance responsible parties;
        - the provision of schedules referred to in article 111 of SOGL;
        - long term capacity allocation;
        - day ahead market coupling;
        - intraday market coupling;
        - intraday market activities at CROPEX;
        - the procurement of balancing services referred to in articles 29.-35. of NC ER
    - The business continuity plan
    - The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
    - The civil protection system activation
        - operational forces of the civil protection system activation
        - police activation
        - army activation
        - fire brigade activation
    - Agreed mechanisms for cooperation inside and outside the region:
        - EAS-ENTSO/E-wide awareness system
        - STA process- Short term adequacy process
        - ITA - Inter TSO agreements
        - LFC block operational agreement
        - Extraordinary procedure in case of alert state due to violation of system frequency limits
        - Real time security management with HVDC MONITA in operation
    - Agreed regional and bilateral measures
        - Agreement on mutual emergency assistance service (MEAS)
        - Measures in critical network situations:
            - under-frequency control scheme
            - over-frequency control scheme
            - voltage deviation management procedure for low voltage
            - voltage deviation management procedure for high voltage
            - power flow deviation management
        - Information on the common network restoration strategy

6.3.7 Volcanic eruption

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
    - Measures for substations classified as critical infrastructure
    - Measures for power lines classified as critical infrastructure
    - Measures for national and regional control centres and their backups
    - Measures for company information communication technology safety enhancement
- System defence plan procedures:

- Frequency deviation management procedure;
- Voltage deviation management procedure;
- Power flow management procedure;
- Assistance for active power procedure;
- Manual demand disconnection procedure

- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation

- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.8 Storm

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;

        - long term capacity allocation;
        - day ahead market coupling;
        - intraday market coupling;
        - intraday market activities at CROPEX;
        - the procurement of balancing services referred to in articles 29.-35. of NC ER
    - The business continuity plan
    - The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
    - The civil protection system activation
        - operational forces of the civil protection system activation
        - police activation
        - army activation
        - fire brigade activation
    - Agreed mechanisms for cooperation inside and outside the region:
        - EAS-ENTSO/E-wide awareness system
        - STA process- Short term adequacy process
        - ITA - Inter TSO agreements
        - LFC block operational agreement
        - Extraordinary procedure in case of alert state due to violation of system frequency limits
        - Real time security management with HVDC MONITA in operation
    - Agreed regional and bilateral measures
        - Agreement on mutual emergency assistance service (MEAS)
        - Measures in critical network situations:
            - under-frequency control scheme
            - over-frequency control scheme
            - voltage deviation management procedure for low voltage
            - voltage deviation management procedure for high voltage
            - power flow deviation management
        - Information on the common network restoration strategy

6.3.9 Cold spell

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
    - Measures for substations classified as critical infrastructure
    - Measures for power lines classified as critical infrastructure
    - Measures for national and regional control centres and their backups
    - Measures for company information communication technology safety enhancement
- System defence plan procedures:
    - Frequency deviation management procedure;
    - Voltage deviation management procedure;
    - Power flow management procedure;
    - Assistance for active power procedure;
    - Manual demand disconnection procedure

- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme

        - voltage deviation management procedure for low voltage
        - voltage deviation management procedure for high voltage
        - power flow deviation management
    - Information on the common network restoration strategy

6.3.10 Precipitation and flooding

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
    - Measures for substations classified as critical infrastructure
    - Measures for power lines classified as critical infrastructure
    - Measures for national and regional control centres and their backups
    - Measures for company information communication technology safety enhancement
- System defence plan procedures:
    - Frequency deviation management procedure;
    - Voltage deviation management procedure;
    - Power flow management procedure;
    - Assistance for active power procedure;
    - Manual demand disconnection procedure
- System restoration plan procedures
    - Re-energisation procedure,
    - Frequency management procedure,
    - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
    - Market suspension of the following activities:
        - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
        - the submission by a balancing service provider of balancing capacity and balancing energy bids;
        - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
        - the provision of modifications of the position of balance responsible parties;
        - the provision of schedules referred to in article 111 of SOGL;
        - long term capacity allocation;
        - day ahead market coupling;
        - intraday market coupling;
        - intraday market activities at CROPEX;
        - the procurement of balancing services referred to in articles 29.-35. of NC ER

- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.11 Winter incident

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure

- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.12 Fossil fuel shortage

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation

- police activation
- army activation
- fire brigade activation

- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.13 Nuclear fuel shortage

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The business continuity plan

- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.14 Local technical failure

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:

    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.15 Multiple failures caused by extreme weather

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:

- Measures for substations classified as critical infrastructure
- Measures for power lines classified as critical infrastructure
- Measures for national and regional control centres and their backups
- Measures for company information communication technology safety enhancement

- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process

- ITA - Inter TSO agreements
- LFC block operational agreement
- Extraordinary procedure in case of alert state due to violation of system frequency limits
- Real time security management with HVDC MONITA in operation

- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.16 Loss of ICT systems for real-time operation

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;

    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
    - operational forces of the civil protection system activation
    - police activation
    - army activation
    - fire brigade activation
- Croatian Computer Emergency Response team (CERT) activation
- Agreed mechanisms for cooperation inside and outside the region:
    - EAS-ENTSO/E-wide awareness system
    - STA process- Short term adequacy process
    - ITA - Inter TSO agreements
    - LFC block operational agreement
    - Extraordinary procedure in case of alert state due to violation of system frequency limits
    - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
    - Agreement on mutual emergency assistance service (MEAS)
    - Measures in critical network situations:
        - under-frequency control scheme
        - over-frequency control scheme
        - voltage deviation management procedure for low voltage
        - voltage deviation management procedure for high voltage
        - power flow deviation management
    - Information on the common network restoration strategy

6.3.17 Simultaneous multiple failures

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
    - Measures for substations classified as critical infrastructure
    - Measures for power lines classified as critical infrastructure
    - Measures for national and regional control centres and their backups
    - Measures for company information communication technology safety enhancement

- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits

- Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.18 Power system control mechanism complexity

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;

        - the provision of schedules referred to in article 111 of SOGL;
        - long term capacity allocation;
        - day ahead market coupling;
        - intraday market coupling;
        - intraday market activities at CROPEX;
        - the procurement of balancing services referred to in articles 29.-35. of NC ER
    - The business continuity plan
    - The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
    - The civil protection system activation
        - operational forces of the civil protection system activation
        - police activation
        - army activation
        - fire brigade activation
    - Agreed mechanisms for cooperation inside and outside the region:
        - EAS-ENTSO/E-wide awareness system
        - STA process- Short term adequacy process
        - ITA - Inter TSO agreements
        - LFC block operational agreement
        - Extraordinary procedure in case of alert state due to violation of system frequency limits
        - Real time security management with HVDC MONITA in operation
    - Agreed regional and bilateral measures
        - Agreement on mutual emergency assistance service (MEAS)
        - Measures in critical network situations:
            - under-frequency control scheme
            - over-frequency control scheme
            - voltage deviation management procedure for low voltage
            - voltage deviation management procedure for high voltage
            - power flow deviation management
        - Information on the common network restoration strategy

6.3.19 Human error

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
    - Measures for substations classified as critical infrastructure
    - Measures for power lines classified as critical infrastructure
    - Measures for national and regional control centres and their backups
    - Measures for company information communication technology safety enhancement
- System defence plan procedures:
    - Frequency deviation management procedure;
    - Voltage deviation management procedure;
    - Power flow management procedure;
    - Assistance for active power procedure;

- Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme

- over-frequency control scheme
- voltage deviation management procedure for low voltage
- voltage deviation management procedure for high voltage
- power flow deviation management

- Information on the common network restoration strategy

6.3.20 Unwanted power flows

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER

- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.21 Serial equipment failure

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure

- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.22 Strike, riots, industrial action

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation

- police activation
- army activation
- fire brigade activation

- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.23 Industrial/nuclear accident

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:

- Market suspension of the following activities:
  - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
  - the submission by a balancing service provider of balancing capacity and balancing energy bids;
  - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
  - the provision of modifications of the position of balance responsible parties;
  - the provision of schedules referred to in article 111 of SOGL;
  - long term capacity allocation;
  - day ahead market coupling;
  - intraday market coupling;
  - intraday market activities at CROPEX;
  - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.24 Unforeseen interaction of energy market rules

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system

- STA process- Short term adequacy process
- ITA - Inter TSO agreements
- LFC block operational agreement
- Extraordinary procedure in case of alert state due to violation of system frequency limits
- Real time security management with HVDC MONITA in operation

- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.25 Pandemic

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;

        - the submission by a balancing service provider of balancing capacity and balancing energy bids;
        - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
        - the provision of modifications of the position of balance responsible parties;
        - the provision of schedules referred to in article 111 of SOGL;
        - long term capacity allocation;
        - day ahead market coupling;
        - intraday market coupling;
        - intraday market activities at CROPEX;
        - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
    - operational forces of the civil protection system activation
    - police activation
    - army activation
    - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
    - EAS-ENTSO/E-wide awareness system
    - STA process- Short term adequacy process
    - ITA - Inter TSO agreements
    - LFC block operational agreement
    - Extraordinary procedure in case of alert state due to violation of system frequency limits
    - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
    - Agreement on mutual emergency assistance service (MEAS)
    - Measures in critical network situations:
        - under-frequency control scheme
        - over-frequency control scheme
        - voltage deviation management procedure for low voltage
        - voltage deviation management procedure for high voltage
        - power flow deviation management
    - Information on the common network restoration strategy

6.3.26 Heatwave

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
    - Measures for substations classified as critical infrastructure
    - Measures for power lines classified as critical infrastructure
    - Measures for national and regional control centres and their backups

- Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement

- Extraordinary procedure in case of alert state due to violation of system frequency limits
- Real time security management with HVDC MONITA in operation

- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.27 Dry period

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;

    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.28 Earthquake

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:

- Frequency deviation management procedure;
- Voltage deviation management procedure;
- Power flow management procedure;
- Assistance for active power procedure;
- Manual demand disconnection procedure

- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation

- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy

6.3.29 Forest fire

In situations where this type of electricity crisis may occur or has already occurred, the following procedures, preventive and preparatory measures are taken, as well as measures to mitigate electricity crisis:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;

        - long term capacity allocation;
        - day ahead market coupling;
        - intraday market coupling;
        - intraday market activities at CROPEX;
        - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation
    - operational forces of the civil protection system activation
    - police activation
    - army activation
    - fire brigade activation
- Agreed mechanisms for cooperation inside and outside the region:
    - EAS-ENTSO/E-wide awareness system
    - STA process- Short term adequacy process
    - ITA - Inter TSO agreements
    - LFC block operational agreement
    - Extraordinary procedure in case of alert state due to violation of system frequency limits
    - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
    - Agreement on mutual emergency assistance service (MEAS)
    - Measures in critical network situations:
        - under-frequency control scheme
        - over-frequency control scheme
        - voltage deviation management procedure for low voltage
        - voltage deviation management procedure for high voltage
        - power flow deviation management
    - Information on the common network restoration strategy

7. Crisis coordinator

RPR prescribes the appointment of crisis coordinator, which could be a person, a group of persons, a team composed of the relevant national electricity crisis managers or an institution tasked with acting as a contact point and coordinating the information flow during an electricity crisis.

In accordance with the above and in accordance with the responsibilities set out in Chapter 6.1.5 of this Plan, the following team is appointed to perform the duty of crisis coordinator:

- MINGOR, Minister of Economy and Sustainable Development
- MINGOR, Secretary of State for Energy
- MINGOR, Director of the Energy Directorate
- HOPS, CEO
- HOPS, Director of System Operation Department
- HOPS, Director of Market Department
- HEP ODS, CEO
- HEP ODS, Director of System Operation Department

The contact data of crises coordinator members could be found on MINGOR and HOPS websites.

8. Stakeholders consultations

The Risk preparedness plan is developed and agreed after internal consultations with the following stakeholders:

- Ministry of Economy and Sustainable Development as competent authority;
- HOPS;
- HEP ODS;
- HROTE.

The consultations took place via several teleconferences.

Further consultations will be held as public consultations with the expected participation:

- relevant electricity and natural gas undertakings, including relevant producers or their trade bodies;
- relevant organisations representing the interests of non-industrial electricity customers;
- relevant organisations representing the interests of industrial electricity customers;
- HERA as a regulatory authority;
- other transmission system operators.

9. Emergency tests

9.1 Schedule of real time response simulations

Regional:

HOPS participates in inter-TSO dispatch meetings organized by TSOs, where each TSO organizes dispatcher training for its own and neighbouring TSO dispatchers. There are no precise schedules for these trainings, but they are held once a year for each TSO that hosts the training.

National:

Currently, national real-time response simulations for emergency states are not scheduled in advance. These simulations are performed within regular training of operators with procedures related to ensuring the operation of critical infrastructure. In the future, it is planned to establish some further real time crisis simulations, with the first step in mind to annually test the communications protocols and regularly update contact list of personnel for emergency state operations.

9.2 Agreed procedures and involved parties

9.2.1 Regional procedures

Currently Ministry of Economy and Sustainable Development in investigating and consulting with other member states in the region on possible future procedures for emergency real time response simulations.

On TSO level, HOPS participates in inter-TSO real time response simulation in the CEE region in cooperation with DUtrain Independent training and service centre for power system control. Every training contains two test scenarios, one regarding system Alert state and one regarding system emergency state. Trainings take place on DUtrain simulations platform.

Possible scenarios:

- CEE is split into several islands;
- Damaged cross border lines;
- Blackout of control areas;
- Loss of supply in major areas;
- High flows with lack of power;
- Exceptional contingencies, etc.

Procedure for system alert state:

1. TSO remotely access the DUtrain simulation platform;

2. Alert state is predefined and triggered;
3. TSOs analyse the situation;
4. Available mFRR is predefined;
5. Repeating actions until the system state is returned to normal:
    - TSOs coordinate among each other via teleconference and agree on remedial actions/measures;
    - Nomination of frequency leader;
    - Frequency leader coordinates the situation;
    - TSOs perform coordinated measures.

Procedure for system Emergency state (example: CEE is split into several islands):

1. TSO remotely access the DUtrain simulation platform;
2. Emergency state is predefined and triggered;
3. Scenario starts without initial status analysis;
4. System analysis – frequency/topology/available production;
5. Repeating actions until the system state is returned to normal:
    - TSOs of each island coordinate among each other via teleconference and agree on remedial actions/measures;
    - Nomination of frequency leader of the island;
    - Frequency leader coordinates the situation;
    - Nomination of resynchronisation leader;
    - TSOs perform coordinated measures;
    - Synchronisation of two islands;
    - Prior to reconnection, new frequency leader for the combined area shall be nominated.

HOPS plans to join to already involved parties (TSOs of the CEE region): ELES, 50Hertz, Amprion, APG, Čeps, MAVIR, PSE, SEPS, Tennet.

9.2.2 National procedures

Current procedures for real time training simulations are taking place on training simulator within regular training of operators. Participating parties are operators in the national and regional control centres.

Procedure:

- Definition of emergency scenario (example: regional blackout, system restoration following the bottom-up procedure);
- Operator of national control centre coordinates with operator of the regional control centre;
- Operator follows procedure from System restoration plan.

It is planned to include dispatchers from HEP ODS in the above procedures as well.

Future procedures:

At first stage of emergency tests development, the aim is to test information flow among participating parties. At later stages, it is planned to develop more procedures to be followed.

Procedure for information flow testing:

- TSO triggers an electricity crisis test scenario;
- TSO informs MINGOR
- TSO informs HEP ODS, SGUs, HROTE, HEP Opskrba, CROPEX, ancillary service providers and other market participants about electricity crisis test by phone and email;
- MINGOR informs other governmental authorities, police, army, The directorate of civil protection and other institutions by phone and email;
- TSO creates a short report about the emergency test simulation indicating the involved actors and their response time;
- TSO shares the report among all the participating parties.

Actors: TSO, MINGOR, HEP ODS, SGUs, HROTE, HEP Opskrba, CROPEX, police, army, The directorate of civil protection

10. Next steps

This risk preparedness plan is the beginning of a holistic consideration of electricity crisis problem solving. Some shortcomings were noticed, and in some cases the lack of appropriate adopted documents, as provided by the relevant rules.

Real time response simulations are planned for the next period. The experience gained through these simulations, as well as the already mentioned shortcomings will be the basis for amendments to the relevant acts, as well as the procedures carried out in cases of electricity crisis.

According to article 10(8) of RPR, MINGOR shall adopt and publish first risk preparedness plan by 5 January 2022 and update it every four years thereafter. If it will be found necessary, MINGOR, in cooperation with HOPS, HEP ODS and HROTE, will develop a new version of the plan even earlier.

11. Literature

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[15.] Defense plan of the Republic of Croatia - Plan obrane Republike Hrvatske
[16.] Civil Protection System Act - Zakon o sustavu civilne zaštite, NN 82/15, 118/18, 31/20, 20/21
[17.] Policy on the holders, content and procedures for drafting planning documents in civil protection and the way of informing the public in the process of their adoption (Pravilnik o nositeljima, sadržaju i postupcima izrade planskih dokumenata u civilnoj zaštiti te načinu informiranja javnosti u postupku njihovog donošenja)
[18.] National action plan for civil protection - Državni plan djelovanja civilne zaštite
[19.] Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2196&from=EN,
[20.] The Power System Defence Plan From Major Disruptions – Plan obrane EES-a od velikih poremećaja
[21.] The Terms and Conditions To Act as Defence Service Providers on a Contractual Basis - Uvjeti za rad kao pružatelji usluge obrane sustava na ugovornoj osnovi,

[22.] The Terms and Conditions to Act as Restoration Service Providers on a Contractual Basis - Uvjeti za rad kao pružatelji usluge obrane sustava na ugovornoj osnovi)
[23.] The List of Significant Grid Users - Popis ZKM-ova i mjera koje moraju provesti na svojim postrojenjima
[24.] The List of High Priority Significant Grid Users - Popis ZKM-ova visokog prioriteta te uvjeta za njihovo isključenje i ponovno stavljanje pod napon
[25.] The Rules for Suspension and Restoration of Market Activities - Pravila za obustavu i ponovno pokretanje tržišnih aktivnosti)
[26.] The Security Plan for Critical Infrastructure Protection - Sigurnosni plan za zaštitu kritične infrastructure)
[27.] The Business Continuity Plan - Plan kontinuiteta poslovanja
[28.] The Test Plan of Equipment and Capabilities Considered in the System Defence Plan and the Restoration Plan (Plan ispitivanja opreme i sposobnosti relevantnih za Plan obrane sustava i Plan ponovne uspostave sustava)
[29.] Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R1485&from=EN,
[30.] Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2195&from=EN,
[31.] Power supply quality conditions - Uvjeti kvalitete opskrbe električnom energijom, NN 37/17, 47/17, 31/18, 16/20,
[32.] Terms and conditions for balancing service providers - Pravila o uravnoteženju elektroenergetskog sustava, HOPS 11/2019,
[33.] ENTSO-E Awareness System – Usage Procedure
[34.] Coordinated Week ahead adequacy assessment – Short-term adequacy
[35.] Agreement on Network and System Operation Management between HOPS and MAVIR
[36.] Agreement on Network and System Operation Management between HEP-OPS and ELES
[37.] Operational Agreement of LFC block SHB
[38.] Agreement on Network and System Operation Management between EMS and HOPS
[39.] Agreement on Transmission System Operation between HOPS and NOSBiH and Elektroprijenos BiH
[40.] Contract on Provision of Mutual Emergency Assistance from Abroad for Securing the System Services between the Power Systems of Serbia and Croatia concluded between EMS and HOPS
[41.] Contract on Provision of Mutual Emergency Assistance from Abroad for Securing the System Services between the Power Systems of Croatia and Hungary concluded between HOPS and MAVIR
[42.] Synchronous Area Framework Agreement for Regional Group Continental Europe

12. Annex 1: Early warning form

Ministry of Economy and Sustainable Development
Cabinet of Ministers

Radnička cesta 80, 10000, Zagreb
Phone +385 1 3717 111
Fax +385 1 3717 149

To whom it may concern

OUR REFERENCE: YOUR REFERENCE: DATE:

SUBJECT: Electricity crisis – early warning form

Dear Madam or Sir,

We inform you about possible electricity crisis, according to article 14(1) of 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.

The causes of the possible electricity crisis:

Measures planned to prevent an electricity crisis:

Measures taken to prevent an electricity crisis:

Possible need for assistance from other Member States:

The possible impacts of the measures on the internal electricity market:

Yours sincerely,

Minister of Economy and Sustainable Development

Tomislav Ćorić, Ph.D.

13. Annex 2: Electricity crisis information form

Ministry of Economy and Sustainable Development
Cabinet of Ministers

Radnička cesta 80, 10000, Zagreb
Phone +385 1 3717 111
Fax +385 1 3717 149

To whom it may concern

OUR REFERENCE: YOUR REFERENCE: DATE:

SUBJECT: **Electricity crisis infomation form**

Dear Madam or Sir,

We inform you about declared electricity crisis, according to article 14(2) of 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.

The causes of the deterioration of the electricity supply situation:

The reasons for declaring an electricity crisis:

Measures planned to mitigate an electricity crisis:

Measures taken to mitigate an electricity crisis:

The need for assistance from other Member States:

The possible impacts of the measures on the internal electricity market:

Yours sincerely,

Minister of Economy and Sustainable Development

Tomislav Ćorić, Ph.D.

14. Annex 3: The full list of procedures, preventive and preparatory measures, as well as measures to mitigate electricity crisis could be taken

The list:

- The security plan for critical infrastructure protection:
  - Measures for substations classified as critical infrastructure
  - Measures for power lines classified as critical infrastructure
  - Measures for national and regional control centres and their backups
  - Measures for company information communication technology safety enhancement
- System defence plan procedures:
  - Frequency deviation management procedure;
  - Voltage deviation management procedure;
  - Power flow management procedure;
  - Assistance for active power procedure;
  - Manual demand disconnection procedure
- System restoration plan procedures
  - Re-energisation procedure,
  - Frequency management procedure,
  - Re-synchronisation procedure
- The terms and conditions to act as defence service providers on a contractual basis
- The terms and conditions to act as restoration service providers on a contractual basis
- The list of significant grid users
- The list of high priority significant grid users
- The rules for suspension and restoration of market activities:
  - Market suspension of the following activities:
    - the provision of cross zonal capacity for capacity allocation on the corresponding bidding zone borders for each market time unit where it is expected that the transmission system shall not be restored to the normal or alert state;
    - the submission by a balancing service provider of balancing capacity and balancing energy bids;
    - the provision by a balance responsible party of a balanced position at the end of the day-ahead timeframe if required by the terms and conditions related to balancing;
    - the provision of modifications of the position of balance responsible parties;
    - the provision of schedules referred to in article 111 of SOGL;
    - long term capacity allocation;
    - day ahead market coupling;
    - intraday market coupling;
    - intraday market activities at CROPEX;
    - the procurement of balancing services referred to in articles 29.-35. of NC ER
- The business continuity plan
- The test plan of equipment and capabilities considered in the System defence plan and the Restoration plan
- The civil protection system activation

  - operational forces of the civil protection system activation
  - police activation
  - army activation
  - fire brigade activation
- Croatian Computer Emergency Response team (CERT) activation
- Agreed mechanisms for cooperation inside and outside the region:
  - EAS-ENTSO/E-wide awareness system
  - STA process- Short term adequacy process
  - ITA - Inter TSO agreements
  - LFC block operational agreement
  - Extraordinary procedure in case of alert state due to violation of system frequency limits
  - Real time security management with HVDC MONITA in operation
- Agreed regional and bilateral measures
  - Agreement on mutual emergency assistance service (MEAS)
  - Measures in critical network situations:
    - under-frequency control scheme
    - over-frequency control scheme
    - voltage deviation management procedure for low voltage
    - voltage deviation management procedure for high voltage
    - power flow deviation management
  - Information on the common network restoration strategy