MINISTRY OF ENERGY
Directorate for Prevention and Management of Risks in the Energy Sector

ROMÂNIA

MINISTRY OF ENERGY

RISK PREPAREDNESS PLAN IN THE ENERGY SECTOR

- ELECTRICITY -

Final draft – May, 2022

The Competent Authority for Ensuring the Electricity Supply

Transmission System Operator – C.N.T.E.E. Transelectrica S.A.

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Table of content

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Abbreviations

CAEES	the Competent Authority for Ensuring the Electricity Supply
CGS	Critical Grid Situations
DASf	Automatic discharge of frequency load
DES	Department for Emergency Situations
DSO	Distribution System Operator
EDG	Electricity Distribution Grid
EENS	Expected Energy Not Supplied
ENTSO-E	European Network of Transmission System Operators for Electricity
ETG	Electricity Transmission Grid
IES	Inspectorate for Emergency Situations
LOLE	Loss of Load Expectancy
LOLP	Loss Of Load Probability
MCES	Ministerial Committee for Emergency Situations
ME	Ministry of Energy
MIA	Ministry of Internal Affairs
COM	Ministerial Operative Center
NCCNA	National Commission for the Control of Nuclear Activities
NES	National Electricity System
NFF	Nuclear Fuel Factory
NOC-ES	National Operative Center in the Energy Sector
NRA	National Regulatory Authority
OHL	double circuit Overhead Line
OP	Operating Procedure
OC-Ent	Operative Centers at the Level of Entities within the NES
OPL	Overhead Power Line
PNS	Power Not Supplied
RIS	Romanian Intelligence Service
RPP	Risk Preparedness Plan
RSC	Regional Security Coordinator
SCADA-EMS	Supervisory Control and Data Acquisition – Energy Management Systems
SCADA-DMS	Supervisory Control and Data Acquisition – Distribution Management Systems
TSO	Transmission System Operator – C.N.T.E.E. Transelectrica S.A.
UEL	Underground Electrical Lines
UNO-DEN	the National Operative Unit – National Energy Dispatcher

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Introduction

In general, the National Risk Preparedness Plan for the Energy Sector is a component part of the National Disaster Risk Management Plan developed by the National Committee for Emergency Situations.

The emergency management cycle is a continuous and integrated process that includes measures of planning, organization, coordination and implementation, in order to prevent the danger of a disaster, to reduce the risk of occurrence, to prepare the response and to limit the effects. It also includes intervention measures for mitigation and restoration.

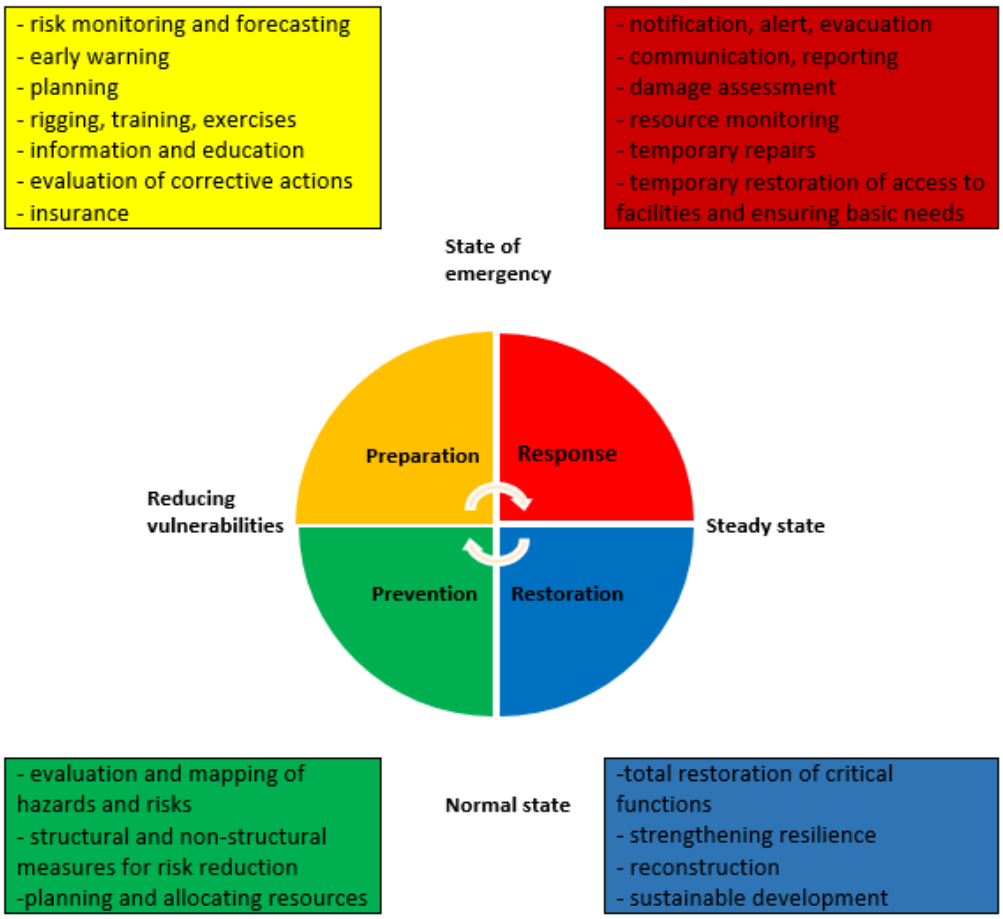

Fig.1 The cycle of emergency situations management

Thus, the National Risk Preparedness Plan for the Electricity Sector aims to:

- identify and evaluate the main risk scenarios;
- identify and evaluate the main assets in the NES whose operation may be affected in the event of a crisis situation;

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- to establish the roles and responsibilities of the factors involved in resolving of the energy crisis situations;
- to establish the measures that need to be taken to reduce the risk of energy crisis situations (*prevention and preparedness measures*);
- to establish the measures that need to be taken to reduce the economic and social impact caused by energy crisis situations (*measures to limit the effects*);
- to establish the measures that need to be taken to restore the safe operation of the NES in the event of an energy crisis situation (*restoration measures*).

It is important to highlight that National Electricity Risk Preparedness Plan is the basis for the elaboration of the regional risk plans, in accordance with the provisions 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, regional plans which will establish the mode of action and the necessary measures to be taken by the countries from an European region affected by an energy crisis situation.

In Romania, the Competent Authority responsible for the preparation and implementation of the Risk Preparedness Plan (RPP) is the Ministry of Energy (ME) through the Directorate for Prevention and Management of Risks in the Energy Sector - by the Competent Authority for Ensuring the Electricity Supply (CAEES).

Following the EU's accession to the Paris Agreement and the publication of the Energy Union Strategy, the Union has taken on an important role in combating the climate change through its main five dimensions: energy security, decarbonisation, energy efficiency, the internal energy market and research, innovation and competitiveness.

Thus, the European Union is committed to leading the global energy transition by meeting the objectives set out in the Paris Agreement on Climate Change, which aims to supply clean energy throughout the European Union. To meet this commitment, the European Union has set energy and climate targets for 2030, as follows:

- The target for reducing domestic greenhouse gas emissions by at least 40% by 2030, compared to 1990;
- The target for renewable energy consumption of 32% in 2030;
- The target for improving energy efficiency by 32.5% in 2030;
- The goal of interconnecting the electricity market at a level of 15% by 2030.

As presented in the Country Report of Romania, European Semester 2017, the value of 7% of the interconnection capacity was calculated by the group of experts established by the

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European Commission with reference to the interconnection targets in the field of electricity (interconnection target group), using data transmitted by TSO C.N.T.E.E. Transelectrica S.A. for the Winter Outlook 2016-2017 half-yearly adequacy report. The value of 7% resulted from the division of the NTC import value of 1.4 GW to the value of the Net Generation Capacity (NGC) of 20.23 GW, values considered for the day of January 11, 2017, at 19:00 CET.

Currently, this indicator has risen to 10-11%. This is due, on the one hand, to the updating of the powers installed in the NES only with groups with a commercial operating license (at the request of the NRA) and, on the other hand, to the increase of NTC values on the border with Bulgaria from 250-300 MW to 900 MW.

Regarding the achievement of the 15% interconnection target until 2030, it is intended that this target will be met mainly through the implementation of the PCIs and the implementation of the other RET development projects included in the RET Development Plan for the period 2020-2029.

Information on the future development of the grid

According to the procedures and criteria of ENTSO-E, in the European Ten-Year Plan for the development of the electricity transmission network - "Ten-Year Network Development Plan (TYNDP) 2018", elaborated by ENTSO-E according to the Regulation of the European Commission no. 714/2009, the following investment clusters were included as Projects of Common Interest, which can be found in the current edition of the Development Plan - period 2020-2029:

Project no. 138 "Black Sea Corridor"

- OPL 400 kV d.c. Smârdan - Gutinaş;
- OPL 400 kV d.c. Cernavodă - Stâlpu, with an entry / exit circuit in Gura Ialomiţei;

Project no. 144 "Mid Continental East Corridor"

- OPL 400 kV d.c. Resița (RO) - Pancevo (Serbia);
- OHL 400 kV Iron Gates - Resița and extension of the 220/110 kV station Resița through the construction of the new 400 kV station;
- switching to 400 kV of 220 kV d.c. Resița - Timişoara - Săcălaz - Arad, including the construction of 400 kV stations in Timişoara and Săcălaz.

The above-mentioned projects are part of the harmonized effort of all European Transmission System Operators (TSOs) to develop trans-European networks and to ensure their interoperability.

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The interconnection lines of the National Electricity Transmission System with those of the neighbouring countries of Romania are presented below:

Nr. Crt.	Border	OHL Interconnection
1	Bulgaria	OHL 400 kV Ţânţăreni - Kozloduy
2	Bulgaria	OPL 400 kV Stupina-Varna
3	Bulgaria	OPL 400 kV Rahman - Dobrudja
4	Serbia	OHL 400 kV Iron Gates - Djerdap
5	Serbia	OHL 400 kV Resita - Pancevo
6	Serbia	OPL 110 kV Jimbolia - Kikinda
7	Serbia	OHL 110 kV Gura Văii - Sip
8	Serbia	OPL 110 kV Ostrovu Mare - Kusjak
9	Hungary	OPL 400 kV Arad - Sandorfalva
10	Hungary	OPL 400 kV Nadab - Bekescsaba
11	Ukraine	OHL 400 kV Roşiori - Mukachevo
12	Republic of Moldova	OHL 400 kV Isaccea - Vucănești
13	Republic of Moldova	OHL 110 kV Rock - Costesti
14	Republic of Moldova	OHL 110 kV Cioara - Huși
15	Republic of Moldova	OHL 110 kV Ţuţora - Ungheni
16	Republic of Moldova	OHL 110 kV Falciu - Goteşti

Romania is part of the priority corridor no. 3 on electricity: "North-South interconnections on electricity in Central and South-Eastern Europe" *("NSI East Electricity")*: interconnections and internal lines in north-south and east-west directions to complete the internal market, and for the integration of production from renewable sources. Member States involved: Bulgaria, Czech Republic, Germany, Greece, Croatia, Italy, Cyprus, Hungary, Austria, Poland, Romania, Slovenia, Slovakia.
The EU Member States that are neighbouring Romania are the following: Bulgaria, Hungary.
The non-EU Member States that are neighbouring Romania are: Republic of Moldova, Serbia, Ukraine

The main entities on which relies the National Electricity Transmission System of Romania, in event of an electricity crisis situation, are the following:

- the TSO – C.N.T.E.E. Transelectrica S.A. which includes the Operational Unit – National Energy Dispatcher (UNO-DEN)
- DOs companies, all distribution operators are included here
- electricity generating companies
- public authorities:
  - Ministry of Energy (ME)
  - Ministry of Internal Affairs (MIA)
  - National Regulatory Authority (NRA)

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Transmission and distribution activities are the subject of concession contracts between public authorities (currently the Ministry of Energy) and operators. In this respect, there are clear obligations stipulated both in the concession contracts and in the licensing methodology, obligations regarding the protection, maintenance and development of the envisaged infrastructure.

In terms of most relevant risk scenarios, for identifying the relevant national risks in Romania, the Competent Authority for Ensuring the Electricity Supply (CAEES) consulted all relevant operators.

Section 1

SUMMARY OF ELECTRICITY CRISIS SCENARIOS

The estimation of the impact for each national crisis scenario, with mention of the technical parameters EENS (%) – Expected Energy Not Supplied and LOLE (hours) – Loss of Load Expectation, is determined by conducting a dedicated study: "NES adequacy study on medium and long term. Determination of available production capacity and structure and active power requirements", study in which the input data were agreed.

In this study were determined the indicators of global adequacy of the NES for 2020 stage, respectively for 2025 stage, in two scenarios:

- reference scenario and
- conservative scenario

The NES global adequacy indicators determined for the 2020 stage are:

Loss Of Load Probability LOLP	0,77 %
Loss Of Load Expectation LOLE	67,7 hours
Energy Not Served ENS	16,9 GWh
Power Not Supplied PNS	250 MW

For the 2020 stage, two risk analyzes were performed: natural gas deficit during the Winter Evening Peak regime (WEP), and respectively natural gas deficit - with a Thermal Minimum regime (TMin), resulting in the following indicators:

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Indicator	WEP	TMin
Loss Of Load Probability LOLP	0,81 %	0,06 %
Loss Of Load Expectation LOLE	70,9 hours	5,0 hours
Energy Not Served ENS	75,5 GWh	7,9 GWh
Power Not Supplied PNS	1065 MW	1589 MW

The NES adequacy global indicators determined for the 2025 stage in the two scenarios analyzed (Reference and Conservative) are as follows:

Indicator	Reference scenario	Conservative scenario
Loss Of Load Probability LOLP	1,80 %	1,10 %
Loss Of Load Expectation LOLE	158 hours	96,4 hours
Energy Not Served ENS	32,62 GWh	19,3 GWh
Power Not Supplied PNS	206 MW	200 MW

We also mention that, for the two analyzed stages 2020 and 2025, the adequacy indicators of NES were determined in nine types of regimes, with each regime being analyzed in at least one scenario, as follows:

no.	Regime	Scenarios
1	Winter Evening Peak regime	Reference scenario, 2020/2025
2	Summer Evening Peak regime	Reference scenario, 2020/2025
3	Summer Night Minimum regime	Reference scenario, 2020/2025
4	High Hydraulic Power (snow melt / flood)	Reference, Optimistic, Pessimistic, 2025
5	Reduced hydraulic power (drought)	Reference, Optimistic, Pessimistic, 2025
6	Large wind / photovoltaic generation	Reference, Optimistic, Pessimistic, 2025
7	Reduced wind / photovoltaic generation	Reference, Optimistic, Pessimistic, 2025
8	Thermal Minimum regime (deviation of the minimum temperature forecast)	Reference, Optimistic, Pessimistic, 2025
9	Thermal Maximum regime (deviation of the maximum temperature forecast)	Reference, Optimistic, Pessimistic, 2025

Analysis regimes developed within the scenarios

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Table 1.1. Electricity crisis scenarios identified at national and regional level

Crisis scenario Scenario rating		Summary of the crisis scenario
1	**Cyberattack on assets that are part of the electricity grid** Likelihood: Unlikely Impact: Major	The attacker acts as an employee and disconnects lines, transformers or changes the operating instructions of some generating units, modifies the power reserves, modifies the operating schedule of the dispatchable units. During the attack, computer systems may be blocked for use by personnel other than the attacker. This affects the possibilities for taking measures to control and restore the NES. Disruptions occur in the electricity market. Disconnection of production units and equipment in ETG and EDG leads to high power flows to deficient areas and has the effect of overloading equipment and voltage deviations and difficulties in compensating reactive power, including a blackout. For certain time intervals there are problems in ensuring the fulfillment of the safety criterion N-1. Also, the low level of production and the loading of certain lines can affect the static and dynamic stability of the NES. Given the low production of power plants and high power flows to deficient areas, there is a risk of extensive damage to the NES that could lead to a lack of electricity supply to a large number of consumers. The attack could extend to other computer systems belonging to other TSOs in the region and could lead to inability to receive or secure support from other countries in the region.
2	Cyberattack on entities not connected to electrical grid (non-grid assets) Likelihood: Unlikely Impact: Critical	The attacker penetrates the computer communication and data transmission systems of the participants in the energy market and acts as an employee working with these systems and manipulating the conditions of operation of the energy market (the requests and offers on trading platforms, operating programs of generating units) . During the attack, computer systems may be blocked for use by personnel other than the attacker. Disruptions occur in the electricity market. Modification of the operating program may lead to shutdown of generating units and the production of imbalances which may further lead to frequency deviations or high power flows to deficient areas, deviations of the voltage level and difficulties in compensating the reactive power. For certain time intervals, there are problems in ensuring that the N-1 safety criterion is met. Also, the low level of production and the loading of certain lines can affect the static and dynamic stability of the NES.

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		Under the conditions of low production in power plants and high power flows to deficient areas, there is a risk of extensive damage to the NES that could lead to a lack of electricity supply to a large number of consumers. The attack can have very serious consequences in the context of high consumption within the NES, such as periods of extremely high temperatures or heavy rainfall.
3	Physical attack on critical assets Likelihood: Unlikely Impact: Critical	The attacker destroys technical equipment (lines, transformers, generators, electrical equipment in stations or power plants, servers of central control systems, central telecommunications installations). In the event of a physical attack on power lines, stations or power plants, equipment is triggered and some equipment becomes unavailable for a very long time. In the event of a physical attack on the servers of the central control systems, central telecommunications installations, the long-term operation and control capacity of the NES is affected. There are difficulties in ensuring that the N-1 safety criterion is met. Triggering of production units and equipment in ETG and EDG leads to large power flows to deficient areas and has the effect of voltage deviations and difficulties in compensating for reactive power. Problems occur in the supply of network areas over a very long period, related to the time required to repair /replace the destroyed /damaged assets. In the face of reduced production in power plants and high power flows to deficient areas, there is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
4	Physical attack on control centers Likelihood: Unlikely Impact: Major	The attacker, who acts as an employee, disconnects lines, transformers or changes the operating instructions of some generating units, modifies the power reserves, modifies the operating schedule of the dispatchable units. These lead to high power flows to deficient areas and result in voltage deviations and difficulties in compensating for reactive power. The attacker's objectives are also to destroy the SCADA - EMS, SCADA - DMS, the f - P controller, central control systems, planning and operating systems, IT centers, data storage systems, station control systems and major power plants or telecontrol centers. Affected control centers can no longer manage, operate or monitor the facilities. This affects the possibilities for taking measures to control and restore the NES. There are disruptions in the electricity market. High power flows to deficient areas can lead to congestion on the interconnection lines and even to the impossibility of securing electricity exports. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.

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5	Insider attack – Actions of sabotage by an internal employee Likelihood: Very unlikely Impact: Critical	The attacker destroys technical equipment (lines, transformers, generators, electrical equipment in stations or power plants) or performs other actions that lead to disconnection or triggering of lines or transformation units, to accidental shutdown of production of groups in power plants. Some equipment becomes unavailable for a very long time. There are difficulties in ensuring that the N-1 safety criterion is met. Triggering of production units and equipment in ETG and EDG leads to large power flows to deficient areas and has the effect of voltage deviations and difficulties in compensating for reactive power. Problems occur in the supply of network areas over a very long period, related to the time required to repair /replace the destroyed /damaged assets. In conditions of low production in power plants and high power flows to deficient areas, there is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
6	Solar Storm Likelihood: Unlikely Impact: Disastrous	The solar storm leads to the Carrington effect, which leads to widespread damage to transformer units and line insulators. Malfunctions of the protections occur. All computer systems are affected. There are major and long-lasting disruptions in communication systems that significantly make it difficult to respond in a crisis situation. Equipment is triggered and some equipment is unavailable for a very long time. Controlled disconnections take place to prevent overloading of the transformer units. A controlled blackout may occur due to developments at European level. Coordinated action is being taken at ENTSO-E level given that the situation has been anticipated and some organizational measures have been taken to respond in the event of a crisis. There are problems in supplying network areas over a very long period of time related to the time required to repair/replace damaged assets.
7	Storm Likelihood: Unlikely Impact:	There are line triggering caused by electric shocks, conductor breaks, tree falling on the lines, galloping of conductors. Triggering can be simultaneous for lines on the same corridor, the same poles or on very close lines. Damage to insulators, conductors or falling trees can lead to long-term downtime.

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	Minor	Triggers appear in stations due to defects in the bar fields by materials / tree branches brought by the wind. Pillars may fall due to the phenomenon of galloping of transmission lines. There are disturbances in the road transport network which leads to delays in carrying out the works to repair the malfunction and/or the lines. Production at wind generating unit is declining sharply due to wind intensifications. There are problems in ensuring that the N-1 safety criterion is met. Problems occur in the supply of network areas over a very long period, related to the time required to repair /replace the destroyed /damaged assets. The low level of generating units as well as the high power flows to the deficit areas can lead to congestion on the interconnection lines and even the impossibility of securing exports of electricity. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
8	Cold spells Likelihood: Possible Impact: Major	The mentioned weather conditions last at least 3 weeks. There are difficulties in ensuring the adequacy of the NES due to a low level of production in power plants. This causes a limitation or total loss of reserves. In conditions of very low temperatures, accidental events occur that lead to the unavailability of equipment in the transmission and distribution network. Under these conditions, interconnection capacities that may limit the level of electricity imports are required to the maximum. There are disruptions in the electricity market due to large variations in the trading price of electricity or an insufficient level of supply. Low production in some plants leads to high power flows to deficient areas, overloading of grid elements and has the effect of voltage deviations and difficulties in compensating for reactive power. For certain time intervals, there are problems in ensuring that the N-1 safety criterion is met. Also, the low level of production and the loading of certain lines can affect the static and dynamic stability of the NES. It is impossible to intervene in some areas and increases the time required for intervention and remediation. In the event of extremely low temperatures, accidental triggering of electrical equipment (power lines, transformers or autotransformers) may occur, which can lead to overloading of other equipment and exacerbation of the grid congestion.

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		At the same time, there is a risk of the impossibility of operating some switching equipment, in case of interventions or maneuvers necessary to maintain the safe operation of the electrical grid. There is high media pressure, as well as from the public and the political environment, to resolve the crisis situation quickly, in order to ensure the energy needs of the population. The cold spells can affect the entire region, making it impossible to receive or support other countries in the region. Also, the low level of production as well as the high power flows to the deficit areas can lead to congestion on the interconnection lines and even the impossibility of securing electricity exports. In the mentioned conditions of low production in power plants and high power flows to deficient areas, there is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
9	Precipitation and flooding Likelihood: Likely Impact: Major	Equipment triggering are caused by flooding of power stations. Landslides or floods affects the stability of the poles causing unavailability/triggering of lines. There is a reduction in production in the affected hydropower plants. Disruptions occur in the road transport network which leads to delays in carrying out the malfunction repair / line repair works. There are problems in supplying network areas over a very long period of time related to the time required to repair/replace damaged assets. Can occur congestion on interconnection lines, and even the inability to secure electricity exports. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
10	Winter incident Likelihood: Possible Impact: Critical	There are several line triggering caused by snow, ice or frost deposits, or falling trees on the lines. Pillars may fall due to phenomenon of galloping of transmission lines. Production at wind powerplants is declining or stopping altogether due to ice deposits on the turbine blades. Damage to insulators, conductors and falling trees can lead to long-term outages. Disruptions occur in the road transport network which leads to delays in carrying out the malfunction repair / line repair works. There are problems in ensuring that the N-1 safety criterion is met. There are difficulties in supplying the grid areas over a very long period of time related to the time required to repair /replace the damaged assets.

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		High power flows to deficient areas can lead to congestion on interconnection lines and even the impossibility of securing the electricity exports. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
11	Fossil fuel shortage Likelihood : Unlikely Impact: Disastrous	Initially, production is re-dispatched to other non-fossil fuel production units. Production units affected by fuel shortages are maintained in a technical level of failure. The prolongation of the crisis leads to the total shutdown of some production units. As a result, there are difficulties in ensuring the adequacy of the NES. There are disruptions in the electricity market due to large variations in the trading price of electricity or insufficient level of supply. Reduced production in some power plants leads to high power flows to deficient areas and has the effect of overloading grid elements and deviations from the voltage level, and difficulties in compensating for reactive power. For certain time intervals, there are problems in ensuring that the N-1 safety criterion is met. Also, the low level of production and overloading of certain lines as well as a low level of inertia can affect the static and dynamic stability of the NES. The crisis could affect the entire region, leading to inability to receive or to secure support of other countries in the region. Also, the low level of electricity production as well as the high power flows to the deficit areas can lead to congestion on the interconnection lines and even the impossibility of securing the electricity exports. In conditions of low production in power plants and high power flows to deficient areas, there is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
12	Nuclear fuel shortage Likelihood: Very unlikely Impact: Disastrous	**CONFIDENTIAL**

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13	Local technical failure Likelihood: Very unlikely Impact: Minor	Some equipment is triggered, and some equipment becomes unavailable over a very long period of time. Increases the risk of overloads on important transformer lines and units, including interconnection lines, and then cascade failures occur. There may be a separation of the system and some areas may operate in insularized mode. There are difficulties in ensuring the adequacy of NES due to a low level of production in power plants. This causes limitation or total loss of reserves. There are major deviations from the NES's operating parameters. The safety criterion N-1 is no longer ensured. Also the low level of production and the loading of certain lines can affect the static and dynamic stability of the NES. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
14	Multiple failures caused by extreme weather Likelihood: Very unlikely Impact: Minor	Extreme weather results in the accidental shutdown of several pieces of equipment (possibly equipment of the same type of construction) in a very short period of time. Disruptions occur in the road transport network which leads to delays in carrying out works to repair defects / repair equipment. Difficulties may occur in repair work at power stations due to the large number of affected equipment (possibly equipment of the same type of construction) and insufficient equipment in the security stock. There are problems in ensuring that the N-1 safety criterion is met. There are problems in supplying the grid areas for a very long time related to the time required to repair /replace the damaged assets. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
15	Simultaneous multiple failures Likelihood: Very unlikely Impact: Major	Separation of a grid area may occur, where there are not enough production units to ensure the consumption of the area. Deviations of the operating parameters outside the permissible limits occur. There are problems in ensuring that the N-1 safety criterion is met. Difficulties may occur in the repair work at power stations due to the large number of affected equipment (possibly equipment of the same type of construction) and insufficient equipment in the security stock. There are problems in supplying the grid areas for a very long time related to the time required to repair /replace the damaged assets.

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		Congestion can occur on interconnection lines and even the inability to secure the electricity exports. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
16	The complexity of control mechanisms of the power systems Likelihood: Very unlikely Impact: Major	As a result of the equipment triggering in the ETG, very high power flows occur, which are completely different from the flows analyzed in the planning of NES operation. Increases the risk of overloading on important transformer lines and units, including interconnection lines, and the risk of cascading failures. There may be a separation of the system and some areas may operate in insularized mode. There are difficulties in ensuring the adequacy of the NES due to a low level of production in power plants. This causes limitation or total loss of reserves. There are major deviations from the operating parameters of the NES. The safety criterion N-1 is no longer ensured. Also, the low level of production and the overloading of certain lines can affect the static and dynamic stability of the NES. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
17	Human errors Likelihood: Unlikely Impact: Major	Increases the risk of overloading on important transformer lines and units, including interconnection lines, and the risk of cascading failures. There may be a separation of the system and some areas may operate in insularized mode. There are difficulties in ensuring the adequacy of the NES due to a low level of production in power plants. This causes limitation or total loss of reserves. There are major deviations from the operating parameters of the NES. The safety criterion N-1 is no longer ensured. Also, the low level of production and the overloading of certain lines can affect the static and dynamic stability of the NES. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
18	Unwanted power flows Likelihood: Unlikely	Very high power flows occur, which are completely different from the flows analyzed in the planning of NES operation. Increases the risk of overloading on important transformer lines and units, including interconnection lines.

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	Impact: Disastrous	The operation of the system is hampered by large forecast errors, and there may be cascading of equipment triggering and even loss of control over a network area. Disruptions can affect all energy markets in the region or across Europe, respectively the operation of the interconnected systems of ENTSO-E members. Forecast errors / imbalances in different control blocks can lead to frequency incidents / deviations in the synchronous network area. Limitations on energy imports / exports may occur. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
19	Serial equipment failure Likelihood: Very unlikely Impact: Minor	Improper behavior in the operation of several pieces of equipment leads to equipment triggering or damage. Also, some equipment is accidentally removed from operation for repair or verification. The safety criterion N-1 is no longer ensured. Separation of a grid area in which there are not enough production units to ensure consumption of the area may occur. Deviations from the operating parameters of the NES are exceeded outside the permissible limits. Difficulties may occur in repair work at control stations due to the large number of affected equipment of the same type, and insufficient equipment in security stocks. There are problems in supplying grid areas over a very long period of time related to the time required to repair / replace the damaged assets. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
20	Strike, riots, industrial action Likelihood: Very unlikely Impact: Major	Lack of personnel leads to a decrease in fuel reserves for power plants, decreases the quality of operating services, increases response time to remedy defects, some maintenance work is stopped. Due to the small number of staff there is a risk of mistakes, due to insufficient training of available staff or fatigue. There are problems with forecasting the consumption on the energy market due to the unpredictability of the unfolding of protest events. The occurrence of accidental events in NES can lead to extensive damage in the context of lack of qualified personnel.
21	Industrial / nuclear accident Likelihood:	Access is no longer allowed in the affected area, which makes it impossible to properly operate or operate the NES facilities in that area. The activity of some production units is affected by the lack of staff or by deficiencies in the supply of fuels. As a result, there are difficulties in ensuring the adequacy of the NES.

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	Very unlikely Impact: Disastrous	The distribution network in the affected area is severely affected. Some areas of the NES may also operate in insularized mode. In the event of a nuclear accident, there are disruptions in the electricity market due to large variations in the trading price of electricity or an insufficient level of supply. If the system reaches a state of emergency (defined according to the European Emergency & Restoration Network Code) it is possible to suspend the electricity market. Reduced production in some power plants leads to high power flows to deficient areas and has the effect of voltage deviations and difficulties in compensating for reactive power. For certain time intervals, there are problems ensuring that the N-1 safety criterion is met. Also, the low level of production and the loading of certain lines can affect the static and dynamic stability of the NES. In conditions of low production in power plants and high power flows to deficient areas, there is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
22	Unforeseen interaction of energy market rules Likelihood: Possible Impact: Major	The result of trading in the energy market can lead to very different trading volumes and directions than the usual ones, including very steep variations. The usual methods of analysis and planning of NES operation lead to unsatisfactory results, this being correlated with significant forecast errors when performing transactions on the energy market. Increases the risk of overloads on important transformer lines and units, including interconnection lines. System operation is hampered by large forecast errors and equipment crashes and even loss of control over a grid area can occur. Disruptions can affect all energy markets in the region or across Europe, respectively the operation of the interconnected systems of ENTSO-E members. Forecast errors / imbalances in different control blocks can lead to frequency incidents / deviations in the synchronous network area. Limitations on energy imports / exports may occur. There may be manual disconnections of some consumers or even extensive damage that may result in a large number of consumers not being supplied with electricity. Some participants in the energy market suffer considerable financial losses due to incorrect decisions or trading mistakes, or due to the unpredictable behavior of the other participants.
23	Unusually big RES forecast errors	There is an imbalance (positive or negative) between the forecasted power and that which can be produced in renewable energy power plants.

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	Likelihood: Very unlikely Impact: Major	There are disruptions in the electricity market due to large variations in the trading price of electricity, or due to an insufficient level of supply. Reduced production in some power plants leads to high power flows to deficient areas, and has the effect of voltage deviations and difficulties in compensating for reactive power. Problems with ensuring the fulfillment of safety criterion N-1 occur for certain time intervals. Also, the low level of production and the loading of certain lines as well as a low level of inertia can lead to affect the static and dynamic stability of the NES. In conditions of low production in power plants and high power flows to deficient areas, there is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
24	Pandemic Likelihood: Possible Impact: Insignificant	Operational personnel in dispatch centers, power stations and power plants are affected, leading to an acute shortage of qualified personnel needed to ensure the safe operation of the NES. Also, the lack of staff at all NES entities leads to a decrease in fuel reserves for power plants, to an increase in response time to remedy defects, and cessation of maintenance work. Due to the small number of staff, there is a risk of mistakes due to insufficient training of available staff or fatigue. There are problems with forecasting energy consumption in the energy market due to the unpredictability of pandemic events. The occurrence of accidental events in the NES can lead to extensive damage in the context of lack of qualified personnel and high response time.
25	Heatwave Likelihood: Unlikely Impact: Major	Triggering of lines due to expansion of OHL conductors, equipment triggering due to sealing defects (oil / SF6 gas leaks), incorrect operation of digital terminals due to excessive heating of cabinets, shutdown of computer and process systems and communications. Vegetation fires can occur in the transformation stations correlated with the production of short circuits in the grid and by the melting of some materials when the fault current passes through equipment with imperfect contacts. Vegetation fires may also occur in the safety lane of power lines. These can lead to equipment triggering or damage. During peak hours, energy consumption from internal resources is not covered and a significant amount of energy needs to be imported. Under these conditions, interconnection capacities that may limit the level of electricity imports are required to the maximum. The proper voltage level in some areas of the network is not ensured due to a shortage of reactive power caused by the widespread use of air conditioners (coolers).

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		There are difficulties in ensuring the adequacy of NES due to a low level of production in power plants. This causes limited or total loss of reserves. There are disruptions in the electricity market due to large variations in the trading price of electricity or an insufficient level of offers /supply. Reduced production in some plants leads to high power flows to deficient areas and results in deviations in voltage levels and difficulties in compensating for reactive power. Problems with ensuring the fulfillment of safety criterion N-1 occur for certain time intervals. Also, the low level of production and the overloading of certain lines as well as a low level of inertia can lead to affect the static and dynamic stability of the NES. Drought can affect the entire region, making it impossible to receive or support other countries in the region. Also, the low level of electric energy production as well as the high power flows to the deficit areas can lead to congestion on the interconnection lines and even the impossibility of securing electricity exports. In conditions of low production in power plants and high power flows to deficient areas, there is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
26	Dry period Likelihood: Unlikely Impact: Minor	During peak hours, energy consumption from internal resources is not covered and a significant amount of energy needs to be imported. Under these conditions, interconnection capacities that may limit the level of electricity imports are required to the maximum. Adequate voltage levels in certain grid areas are not ensured due to a shortage of reactive power caused by the widespread use of AC devices. There are difficulties in ensuring the adequacy of NES due to a low level of production in power plants. This causes limitation or total loss of reserves. Disturbances in the electricity market occur due to large variations in the trading price of electricity or an insufficient level of offers. Reduced production in some plants leads to high power flows to deficient areas and results in deviations in voltage levels and difficulties in compensating for reactive power . Problems with ensuring the fulfillment of safety criterion N-1 occur for certain time intervals. Also, the low level of production and the overloading of certain lines as well as a low level of inertia can lead to affect the static and dynamic stability of the NES. Drought can affect the entire region, making it impossible to receive or support other countries in the region. Also, the low level of electric energy production as well as the high power flows to the deficit areas can lead to congestion on the interconnection lines and even the impossibility of securing electricity exports.

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		In conditions of low production in power plants and high power flows to deficient areas, there is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity. Under the action of heat, accidental triggering of electrical equipment (power lines, transformers or autotransformers) may occur, which can lead to overloading of other equipment and exacerbation of grid congestion.
27	Earthquake Likelihood: Very likely Impact: Disastrous	Damage or triggering of the equipment in power stations, falling of some poles on the transmission lines may occur. Accidental shutdowns of generators in power plants in the area affected by the earthquake may occur. Industrial accidents may occur with fires, production shutdowns, gas emissions or hazardous substances spills. Damage may occur to GIS buildings in power stations, electrical equipment foundations or transformers. Disruptions occur in the road transport network which leads to delays in carrying out works to repair defects / repair lines and transformer units. The functioning of communication systems is disrupted due to the phenomenon of widespread panic. Rescue or firefighting teams are required. Difficulties may occur in repair work at station faults due to the large number of equipment affected and insufficient equipment in security stocks. There are problems ensuring that the N-1 safety criterion is met. There are problems in supplying grid areas over a very long period of time related to the time required to repair /replace the damaged assets. Congestion of interconnection lines and even the inability to secure electricity exports may occur. There is risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
28	Forest fire Likelihood: Unlikely Impact: Major	Large areas of the forest are engulfed in wildfires. Violent storms occur in some areas, accompanied by lightning strikes that increase the number of fire outbreaks. Triggering of lines appears, caused by fire flames. Line disconnections are required to allow personnel to intervene in order to extinguish or stop the spread of fires.

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		Fires can also spread to the territory of the stations, leading to the triggering and damage of equipment. There is a reduction of production in wind power plants, due to the intensification of the wind. Disruptions occur in the road transport network, which leads to delays in carrying out works to repair defects / repair lines and transformer units. There are problems in ensuring that the N-1 safety criterion is met. Problems occur in the supply of some grid areas over a very long period of time related to the time required to repair / replace the damaged assets. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.
29	Armed military conflict, war Likelihood: Unlikely Impact: Critical	In the event of regional armed conflict or war, unforeseen events can trigger a crisis in the supply of electricity, starting from: - national / european shortage of resources due to the deterioration of the supply / logistics cycle; - the difficulty of switching from one type of fuel, deficient or missing, to another type of fuel for the electricity generation; - the requests for mutual assistance between the Member States in order to maintain the security of the interconnected system; - unforeseen unavailability of production sources in some area of the NES, and the limited capacity of ETG to ensure the transmission of the necessary power from other grid areas, in safe conditions. There is the risk of extensive damage to the NES which could lead to a large number of consumers not being supplied with electricity.

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Section 2.

THE ROLE AND RESPONSIBILITIES OF THE COMPETENT AUTHORITY

2.1. The role and responsibilities of the Romanian CAEES

The Romanian Competent Authority for Ensuring the Electricity Supply has the following specific responsibilities:

- identifies and assesses the security risks in electricity supply, in accordance with national and international methodology and regulations;
- ensures cooperation with the national transmission system operator (TSO), the distribution operators (DSOs), electricity generation companies, the regulatory authority (NRA), the Electricity Coordination Group (ECG), the European Network of Transmission System Operators (ENTSO-E), regional coordination centers and other relevant stakeholders , depending on requirements;
- prepares and then periodically updates the Risk Preparation Plan based on regional and national electricity crisis scenarios, in collaboration with the significant entities in the electricity sector;
- ensures, through the Director of the Competent Authority for Ensuring the Electricity Supply (CAEES) within the Ministry of Energy, the participation in the Group for the management of energy crisis situations at national level;
- ensures the fulfillment of the measures established by the RPP in order to prevent the occurrence of energy crisis situations;
- completes the necessary formalities for the performance of the Competent Authority's tasks in accordance with the Regulation (EU) 2019/941 and with the provisions of the Commission;
- completes the necessary formalities for the adoption of the Risk Preparedness Plan (RPP) and for the organization of tests / simulations of electricity crises in cooperation with the transmission system operator (TSO) and other relevant stakeholders;
- develops and establishes procedures for the implementation and monitoring of operational procedures in the field of prevention and management of risks in the electricity sector.

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2.2. The role and responsibilities of the entities within the NES in the event of an energy crisis

2.2.A. The role and responsibilities of the TSO – C.N.T.E.E. Transelectrica S.A.:

- Assess the possibility of an electricity crisis situation by analyzing the adequacy of the NES on short and medium term, for all the risk scenarios.
- Informs the National Operative Center in the Energy Sector (CONSE) about the possibility of a crisis situation.
- Ensures the functioning of the energy market.
- Take measures to prevent crisis situations that do not affect the functioning of the electricity market;
- Requests to NRA to suspend the energy market, when this is necessary
- Applies technical and commercial safety measures in the event of crisis affecting the functioning of the electricity market;
- Ensures the adequacy of the NES.
- Ensures that the N-1 safety criterion is met.
- Ensures the static and dynamic stability of the NES.
- Provides power reserves.
- Ensures the restoration of the NES.
- Ensures the repair of defects / damages produced in the ETG.
- Provides communication channels in order to implement control and restoration actions.
- Implement the measures ordered by the higher decision-making structures.

2.2.B. The role and responsibilities of the DSOs:

- Participates in restoration of the NES.
- Implement the measures ordered by the higher decision-making structures.
- Ensures that the N-1 safety criterion is met.
- Provides interventions to remedy defects / breakdowns in the EDG.
- Provides communication channels in order to implement control and restoration actions.

2.2.C. The role and responsibilities of the electricity generation companies:

- Participates in NES restoration.
- Implement the measures ordered by the higher decision-making structures.
- Ensures the maintenance of the production units at the level notified on the energy market, respectively at the level ordered by the dispatcher.
- Ensures system services necessary to maintain the operational safety of NES.

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- Ensures the fuel reserves necessary to maintain the production units in operation.
- Provides interventions to remedy defects / breakdowns in the electricity production units.
- Provides communication channels in order to implement control and restoration actions.

2.2.D. The role and responsibilities of the economic operators that provide system services:

- Ensures the power reserves according to the level notified on the energy market, at the level established by order of dispatcher.
- Provides communication channels in order to implement control and restoration actions.

2.3. Tasks delegated to other entities in the event of an energy crisis

The management of the entities within NES will act through the heads of subordinate organizational entities for the following aspects:

- communication with local authorities;
- providing shelters, first aid and medical care;
- ensuring the supply of materials, food, medicine or other necessary goods;
- providing the necessary financial funds for the purchase of necessary materials or services;
- ensuring protection to essential staff as well as to the families of members of the intervention teams.

The management of the entities within NES will also act to:

- promptly ensuring the equipment / spare parts from the intervention / security stock necessary for the intervention / restoration actions;
- assure the maintenance of backup power supplies from uninterruptible sources (Diesel groups, accumulator batteries, UPS etc.)
- assure that communications are operational;
- assure the operating condition of the safety lighting;
- assure the logistics/ organization for carrying out the transports of materials;
- provides food and drinking water for all staff involved in intervention and remediation;
- provides the necessary pumps for the evacuation of water from the premises;
- ensures the intervention with personnel from third party companies, based on agreements concluded with the mounting construction / services companies in the field of electricity, with companies that own machinery / equipment.

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Section 3.
PROCEDURES AND MEASURES
IN THE EVENT OF AN ELECTRICITY CRISIS

3.1. National procedures and measures

In accordance with the requirements of *Law no. 123/2012 of electricity and natural gas*, and those of *NRA Order no. 142/2014 on the approval of the Regulation on establishing safeguard measures in crisis situations arising in the operation of the NES*, establishes a set of safety measures to be applied in order to prevent or limit the effects of exceptional situations that may occur in the operation of the NES.

3.1.A. Measures concerning the functioning of the energy market

The basic principle of action in the event of a crisis is to allow the functioning of the electricity market even in situations where both supply and demand are limited, and the price of electricity fluctuates sharply.

The *NRA Order no. 142/2014* provides two categories of safeguard measures, which are applied by both the Transmission System Operator (TSO) and the Distribution System Operators (DSOs) to the final consumers of electricity supplied directly from the NES power stations. The first category consists of technical measures without impact on the electricity market, the second category is represented by technical and commercial measures, the last of which being the limitation of electricity consumption to certain categories of industrial consumers, but without resorting to the interruption of their electricity supply.

The measure of limiting/ reducing consumption is gradually applied, as a last resort measure, only to those industrial consumers who have the technical possibility to reduce consumption by properly adapting the technological process, this measure being conditioned by the issuance of a Romanian Government Decision, at least 5 days before the time of application and with a prior notice to consumers of at least 24 hours. The final customers to whom the consumption restriction measures apply have provided for this obligation in the contract of transmission or distribution, as the case may be.

The measure to suspend the electricity market will only be taken in special situations, as a last resort when all the measures listed below have been exhausted, namely:

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3.1.A.1. Measures without impact on the electricity market

Safeguard measures which applies to prevent a crisis in the operation of the NES and which do not affect the functioning of the electricity market:

- groups will be loaded to the maximum power available (including the starting-up of the backup groups);
- the increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair);
- reduction of dispatchable consumption declared as an offer to load on the electricity balancing market;
- requesting emergency assistance from the neighboring TSOs;
- switching to operation in the minimum voltage band in the EDG.

3.1.A.2. Technical and commercial measures with impact on the electricity market

Safeguard measures, technical and commercial, which applies to prevent a crisis in the operation of the NES and which can affect the functioning of the electricity market:

- in the production units that can operate on alternative fuel, the measure of increasing the technological reserves of the system will be applied, in order to use them as appropriate;
- the measure to reduce/cancel the available interconnection capacity;
- the measure to reduce/cancel the notified export transactions;
- gradual limitation of electricity consumption, under the conditions established by a Government decision and in accordance with the provisions of the Limitation Regulation.

Once the crisis has been triggered, the TSO may apply technical and commercial safeguards measures to prevent crisis situations affecting the functioning of the electricity market, namely:

- In the production units that can operate on alternative fuel, the measure of increasing the technological reserves of the system will be applied, in order to use them as appropriate;
- the measure to reduce/cancel the available interconnection capacity;
- the measure to reduce/cancel the notified export transactions.

3.1.B. Measures regarding the manual disconnection

In unforeseen situations, which jeopardize the operation of NES, at the TSO level there is also the possibility of manually disconnecting certain categories of industrial consumers for a limited period of time, after which these consumers are then re-powered at a minimum technological power level, so that security of both facilities and personnel must not be endangered.

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The manual interruption of consumption is performed only in exceptional situations arising in the operation of the SEN in accordance with the *Operating Procedure (OP) no. TEL-07.III AV-DN/24_The development and application of the manual disconnection normative for certain categories of end customers, gradually, in exceptional situations arising in the operation of NES* (hereinafter referred to as the "*Manual disconnection normative*").

This *Manual disconnection normative* applies as a last resort, in situations that could not be anticipated in the operation of the NES, which endangers the operation of the NES or an area, to prevent the spread or aggravation of this situation.

Manual disconnection normative applies in the following exceptional situations of operation of the NES:

- switch to NES isolated mode operating, after DASf actuation, if the frequency cannot be restored and maintained at values > 49 Hz, due to lack of available active power;
- isolation of a NES area, if the frequency and / or voltage cannot be restored to values that allow synchronization of power generating sets or synchronization of that area to the NES, due to the lack of active power available in the zone;
- through the grid supplying an area of the NES (lines, transformers, autotransformers) appear loads which exceed the permissible limit values in terms of equipment (thermal limit), they may not be removed by other measures during the overloaded operating time;
- in an area of the NES, or in most of it, after all control measures have been taken, the voltages are kept at most equal to the value of the consumer sacrifice voltage (360 kV for the 400 kV network, 180 kV for the mains 220 kV and 85 kV for the 110 kV network) and this situation may jeopardize the stability of operation;
- when the fall below the normal limits of the reserve compared to the static stability limit of traffic through a characteristic section through which a deficient zone is fed, until the start of the slow tertiary reserve in that zone or, when it is missing, until the application of the Normative for limiting/ reducing the consumption of electricity, gradually applied, in crisis situations in the operation of the NES;
- when there is a short-term shortage of active power (4 ÷ 48 hours), which leads to an hourly deviation from the scheduled balance which is inadmissible according to ENTSO-E rules, until the mobilization of the slow tertiary reserve or, when it is missing, until to the application of the Normative for limiting/ reducing the consumption of electricity, in installments, in crisis situations in the operation of NES.

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Please note that all consumers for whom the Normative for the limitation/ reducing the consumption of electricity and the *Manual disconnection normative* are applicable are industrial consumers, the domestic consumers being excluded.

Also, the number of industrial consumers connected to ETG is low and they do not have special protection against disconnection.

3.1.C. Special protection against disconnection

Manual disconnection normative applies only to final customers covered by applicable law. These end customers are industrial consumers who, through the technological process used, have the ability to be disconnected for a predetermined period and then must be re-fed at the minimum technical power.

Manual disconnection normative applies until the previously established conditions disappear, as result of change in situation of the NES, or until successful implementation of recovery measures (mobilization of control energy, commissioning of grid elements) or, when this is not possible, until the application of the Normative for the limitation/ reducing the consumption of electricity.

Manual consumption limitation applies in the foreseeable situations regarding the operation of the NES, in accordance with *OP no. TEL-07.III AV-DN/13_How to elaborate and implement the Normative for limitation the consumption of electricity, gradually applied, in crisis situations in the operation of NES.*

The *Normative for limitation the consumption of electricity* applies in the following crisis situations in the operation of NES:

- national fuel shortages;
- energy shortages, determined by the evolution of the international economy;
- energy shortages, determined by the country's defense needs;
- energy shortages, caused by the need to protect the environment;
- energy shortages in a deficient area of the NES, due to unavailability of production sources in the area and the limited capacity of the grid to ensure the transport of the necessary power from other areas, safely.

The determination of the likelihood of a crisis occurring in the operation of the NES shall be made by the TSO on the basis of short-term and medium-term analyzes of the adequacy of the NES, taking into account:

- fuel stocks and the conditions for carrying out the economic activities that provide them (extractive industry, transport);

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- the state of the National Natural Gas Transmission System;
- the volume of water reserves in the accumulation lakes;
- availability of electricity generation units;
- electricity consumption in the NES, or in an area of the NES;
- availability of ETG and EDG.

Also, at the regional and european level, the STA process is carried out daily (Short Term Adequacy forecasts), by the Regional Security Coordinator (RSC), based on the daily analyzes for the next seven days.

The *Normative for limitation the consumption of electricity* applies only following the adoption of a Government Decision, as the last safeguard measure taken in crisis situations in the operation of the NES that can be foreseen in the medium and long term, which endangers the operation of the NES or of an area of the NES.

In critical situations in the NES, economic operators included in the above mentioned normative are notified in written by the TSO on the provision of the application of the *Normative for limitation the consumption of electricity*. The normative applies only to final customers covered by applicable law. These end customers are industrial consumers who, through the technological process used, have the ability to reduce their electricity consumption.

3.1.D. Prevention and preparedness measures

Prevention and preparedness measures at the design and planning stage

- Analysis of the in-service behavior of electrical equipment (determination of equipment with high failure rate and elimination of non-conformities).
- Analysis of the operation behavior of the lines (detection of areas where there are frequent triggers due to extreme weather phenomena).
- Imposition of specifications for the purchase of electrical equipment to assure its proper operation in case of low temperatures.
- Imposition by the design regulations of increased earthquake safety conditions for the lines of maximum importance for the NES, for the buildings of the stations and control centers, for the foundations of the electrical equipment and of the transformation units.
- Imposition by the design regulations of increased safety conditions for the lines of maximum importance for NES (use of active conductors with low coefficient of expansion, use of pipes with a high degree of mechanical strength).

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- Use of electrical equipment with composite tires instead of porcelain in areas with high seismic activity.
- Expertise of old generation equipment.

Prevention and preparedness measures in development and investment works

- Initiation of major investment/ maintenance works to reduce the effects of galloping of transmission lines, to improve the level of line insulation, etc).
- Replacement of concrete pillars/ ruler (strip) with metal pillars/ ruler.
- Realization of the development plan of the Electric Transmission Grid (ETG).
- Realization of the development plan of the Electricity Distribution Grid (EDG).
- Installation of monitoring systems on the lines.
- Periodic audit and updating / upgrading of computer systems security.
- Use of modern and high-performance forecasting techniques based on multicriteria analysis, leading to a robust sizing of NES power reserves.

Prevention and preparedness measures in the maintenance works

- Realization of the development plan of the Electric Transmission Grid (ETG).
- Realization of the development plan of the Electricity Distribution Grid (EDG).
- Carrying out the maintenance plan for the electricity generation companies.
- Maintenance of control systems.
- Maintenance of system automations.
- Maintenance of automation in power plants
- DASf maintenance, DASU maintenance.
- Maintenance of heating systems.
- Elimination of weaknesses and deficiencies in transmission and distribution networks;
- Filling with oil, SF6 gas.
- Elimination of hot spots.
- Equipment operation checks.
- Diesel Group Checks.
- Battery checks.
- Periodic checks on the condition of the pillar foundations in the areas adjacent to the river courses.
- Checks on the route of the lines where there is a risk of landslides.
- Checking the operation of the plotter switches at the transformer units.
- Carrying out the maintenance of the safety lanes of the lines and the removal of dry vegetation inside the safety lanes.
- Mowing the vegetation inside the stations.
- Maintain the switching equipment (separators) in proper condition to allow ice-free handling on contacts.

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- Maintenance of station constructions (concrete bars and pillars, equipment foundations) and foundations and systems for anchoring line poles.
- Maintain proper operation of AC installations in relay cabins, accumulator batteries and telecommunication cameras.
- Maintaining the cooling systems of the transformer units in good working order.
- Snow removal of roads and access roads to stations.

Prevention and preparedness measures on endowments

- Fuel ensurance for the Diesel Groups.
- Assure fuel supply reservation with Diesel Groups, UPS and accumulator batteries.
- Proper equipment with fire extinguishers in stations.
- Providing disinfectants, masks and gloves for employees.

Prevention and preparedness measures as well as instruction and courses

- Training of personnel in the prevention and extinguishing of fires in electrical installations.
- Training staff on the risks of breaches in cybersecurity systems.
- Professional training of operative personnel.

Other prevention and preparedness measures

- Staff information and education programs on national pandemic control programs.
- Employee temperature measurement.
- Individualization of employees' work schedule (shift work or staggered schedule, telework programs).
- Periodic ventilation, sanitation and disinfection of workspaces.
- Restrictions on access to the control rooms of dispatcher control centers and telecontrol centers and to the control rooms of ETG stations respectively.

3.1.E. Mitigation and restoration measures

Mitigation and restoration measures regarding the personnel

- Charts of consemn.
- Ensure technical intervention personnel.
- Ensure auxiliary intervention personnel (financial, commercial, logistics, IES).

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- Ensure the reservation for operational staff and technical staff for intervention and operation (use of management staff or semi-qualified staff or with similar qualifications to ensure continuity, reduce the number of shifts, extend the work schedule, etc).

Mitigation and restoration measures regarding the necessary materials and equipment

- Ensure the intervention/ spare poles and accessories for lines (insulators, clamps, conductors).
- Ensure the temporary UEL cables.
- Ensure the mobile cells.
- Ensure the equipment (electrical equipment) from the safety/ intervention stock.
- Elaboration of standard offers for intervention works (replacement of equipment, poles, transformation units) and evaluation of an average replacement / remediation time.
- Ensure the Diesel groups.
- Ensure accumulator batteries and UPS.
- Ensure fuel supply reservation for Diesel groups
- Ensure oil and SF6 gas reserves.
- Ensure winter materials (clothing, food, etc)
- Ensure car fleet disponibility.

Other mitigation and restoration measures

- Ensure redundant/ independent means of communication (fail-safe).
- Provide spaces with special facilities (accommodation, food, sanitation, medical and psychological services) to protect staff with essential responsibilities for the operation of the NES.
- Conclude agreements with companies specialized in construction and assembly works in the electrical field.
- Conclude agreements with companies that have equipment for intervention.

3.1.F. The entity responsible for declaring the crisis situation

In accordance with the National Disaster Risk Management Plan in Romania, the National Emergency Management System contains the following components:

- emergency committees;
- Department of Emergency Situations (DES);
- General Inspectorate for Emergency Situations;

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- professional emergency services and voluntary emergency services;
- operative centers and centers for coordination and management of the intervention;
- operative centers for emergencies;
- the commander of the action/ intervention.

In the event of an emergency situation, the following entities act within the Ministry of Energy:

- Ministerial Committee for Emergency Situations (MCES), respectively
- Ministerial Operative Centre (COM) and, as an operative component of COM, will act:
  - **the National Operative Center in the Energy Sector (NOC-ES).**

The entity responsible for declaring the crisis situation is the National Operative Center in the Energy Sector (NOC-ES).

The following persons are part of the NOC-ES structure:

- Representative of the Ministry of Energy - Chairman;
- President of CNTEE Transelectrica S.A. (TSO)
- President of Hidroelectrica S.A.
- President of Nuclearelectrica S.A.
- Director of S.N.T.G.N. Trasgaz S.A.
- Director of Electrocentrale București S.A.
- Director of OMV Petrom S.A.
- President of Complexul Energetic Oltenia S.A.
- President of Complexul Energetic Hunedoara S.A.
- President of Distribution Electric Energy România S.A.
- President of Distribution Energy Oltenia S.A.
- President of E – Distribution S.A.
- Director of DelgazGrid S.A.
- Director of UNO-DEN
- Director of Directorate for Prevention and Management of Risks in the Energy Sector, within Ministry of Energy
- Director of Competent Authority for Ensuring the Electricity Supply (CAEES), within Ministry of Energy

Roles and responsibilities of the **NOC-ES**:
- assesses the crisis situation;
- it is the entity responsible for declaring a crisis situation, when it's necessary/ required
- applies and coordinates the measures contained in the Risk Preparedness Plan (RPP);

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- interacts with the other crisis management entities, organized at national level;
- provides support to other national ministries / agencies / departments;
- coordinates the provision of the necessary assistance and resources (materials, equipment and staff) at national level;
- allocates the necessary resources for the restoration actions;
- allocates the necessary financial resources for the restoration actions;
- provides the information office on the development of events and measures taken in situations of electricity crisis.

Other Operational Centers at the level of Entities within NES (OCs-Ent)

The structure of OCs-Ent is:

- Representative of the administrative management;
- Manager of the technical operation and maintenance department;
- Manager of department of emergency situations;
- Manager of department for labor protection.

Roles and responsibilities of the OCs-Ent:

- implements the measures decided by NOC-ES in the affected areas, with priority given to the safety and health of personnel, minimization of damage to NES assets, as well as to the environment and other assets;
- provides support for the firefighting personnel or security incident personnel;
- ensures the evacuation of non-essential personnel (technical or non-technical) from the affected areas;
- provides the communication points;
- report to NOC-ES all the relevant information regarding the measures taken and request assistance/ support if necessary;
- ensures the recording and storage of the necessary information to be used in the post-factum analysis of the causes that led to the crisis situation and the measures taken;
- coordinates with local authorities to ensure medical needs, public order.

3.1.G. The main stages of action in the event of a crisis situation are as follows:

- declaration of the crisis situation;
- information/ communication about the crisis situation;
- assessment of the situation and risks;
- identification of the necessary resources (human, material and equipment);
- choosing the response strategy, in accordance with the Risk Prevention Plan (RPP);
- implementation of the response strategy;
- field analysis of the effects of the crisis;

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- post-incident analysis and establishing measures for future prevention;
- cessation of the crisis situation

3.1.G.1. Appropriate mechanisms for information flows

The management of the crisis situation depends most on the quality of the information received (its correctness and promptness) by the decision-makers. In this regard, the information received must be sourced directly from the site and reported by qualified personnel.

The information is immediately reported to NOC-ES (directly, or through OCs-Ent). Depending on the crisis situation, NOC-ES will take the following measures:

- will issue **Pre-Alert** information: providing information on the possible occurrence of a crisis situation;
- will issue an **Alert** notification: informing that although the crisis situation is not imminent, elements have appeared that have worsened / aggravated the previous state;
- will issue a **Danger** notice: informing that the crisis situation is imminent and those responsible must take the necessary measures to minimize the damage / loss that will be caused by the crisis situation.
- declaration of the **Crisis** situation

The following command centers will be used for information and coordination of actions:

- the National Operative Unit – National Energy Dispatcher (UNO-DEN);
- Local operational centers at the level of Territorial Energy Dispatchers;
- The local operative centers at the level of the Territorial Units within CNTEE Transelectrica S.A .;
- Local operations center at the level of Energy Distribution Dispatchers;
- Local operational centers at the level of the Regional Units within the Distribution Operators (DOs);
- Local operational center at the level of the Energy Dispatchers of the Production Units.
- Local operative center at the level of the Energy Dispatchers of the Large Consumption Units.

These control centers will transmit all relevant information regarding:

- status and mode of operation of the NES;
- the measures ordered by NOC-ES;
- the manner of implementation of the actions / measures ordered by NOC-ES;
- issues related to the evolution of the crisis situation.

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All information available in the territory is centralized at the main command center UNO-DEN which provides information to the NOC-ES.

Information to the public and the media will be centralized through a press officer appointed by NOC-ES.

At the outset of the crisis, OCs-Ent organizes intervention teams that include essential personnel, teams that will act in the following directions:

- operational
  - identifies potential hazards that may arise and takes action to eliminate them;
  - take measures to disconnect / withdraw from safe operation of damaged equipment;
  - take measures to safely shut down production units (if applicable);
  - of the measures arranged according to the course of events and the particularities of the crisis situation.
- mentenance
  - intervenes to repair equipment failures;
  - identifies potential hazards that may arise and takes action to eliminate them;
  - other measures arranged according to the course of events and the particularities of the crisis situation.
- security
  - restricts the access of non-essential personnel;
  - ensures access for essential staff;
  - provides access for evacuation vehicles or ambulances.
- administrative
  - provides assistance for rescue and transportation operations to first aid centers or medical centers;
  - ensures the record of the personnel actively participating in the crisis situation;
  - other measures arranged according to the course of events and the particularities of the crisis situation.
- labor protection
  - ensures the necessary measures in terms of labor protection;
  - provide assistance for measuring gas emissions / concentrations;
  - identifies and collects evidence, information related to labor protection issues necessary for post-incident analysis / investigation;
  - other measures arranged according to the course of events and the particularities of the crisis situation.
- labor medicine
  - ensures rapid access and intervention of medical staff for first aid;

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- ensures the provision of medical care;
- calls for specialist medical care;
- other measures arranged according to the course of events and the particularities of the crisis situation.

- fire fighting
  - intervenes quickly to identify and extinguish fires;
  - calls for the intervention of IES fire brigades;
  - evacuate personnel from fire areas;
  - other measures arranged according to the course of events and the particularities of the crisis situation.
- transportation
  - ensures the availability of the entire car fleet for intervention and evacuation actions;
  - ensures the presence of specialized personnel at the scene of the incident to ensure the intervention in case of minor failures in the intervention vehicles, ambulances, etc .;
  - ensures the refueling of vehicles, equipment, Diesel Groups;
  - provides assistance in organizing transport conditions;
  - other measures arranged according to the course of events and the particularities of the crisis situation.
- comunication
  - ensures the functionality of the communication network;
  - intervenes to repair defects in communications equipment;
  - other measures arranged according to the course of events and the particularities of the crisis situation.

Essential personnel, their identification criteria:

The leaders of each organizational unit within the NES entities establish the *essential personnel* in crisis management.

The following categories of *essential personnel* will be identified:

- technical and non-technical management personnel;
- operating personnel (operational management, operational maintenance);
- communications personnel;
- maintenance personnel;
- procurement personnel;
- personnel for transportation and handling of materials;

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- emergency personnel;
- personnel responsible for labor protection;
- personnel responsible for occupational medicine and occupational health
- personnel for external communication

3.1.G.2. Information flow diagram

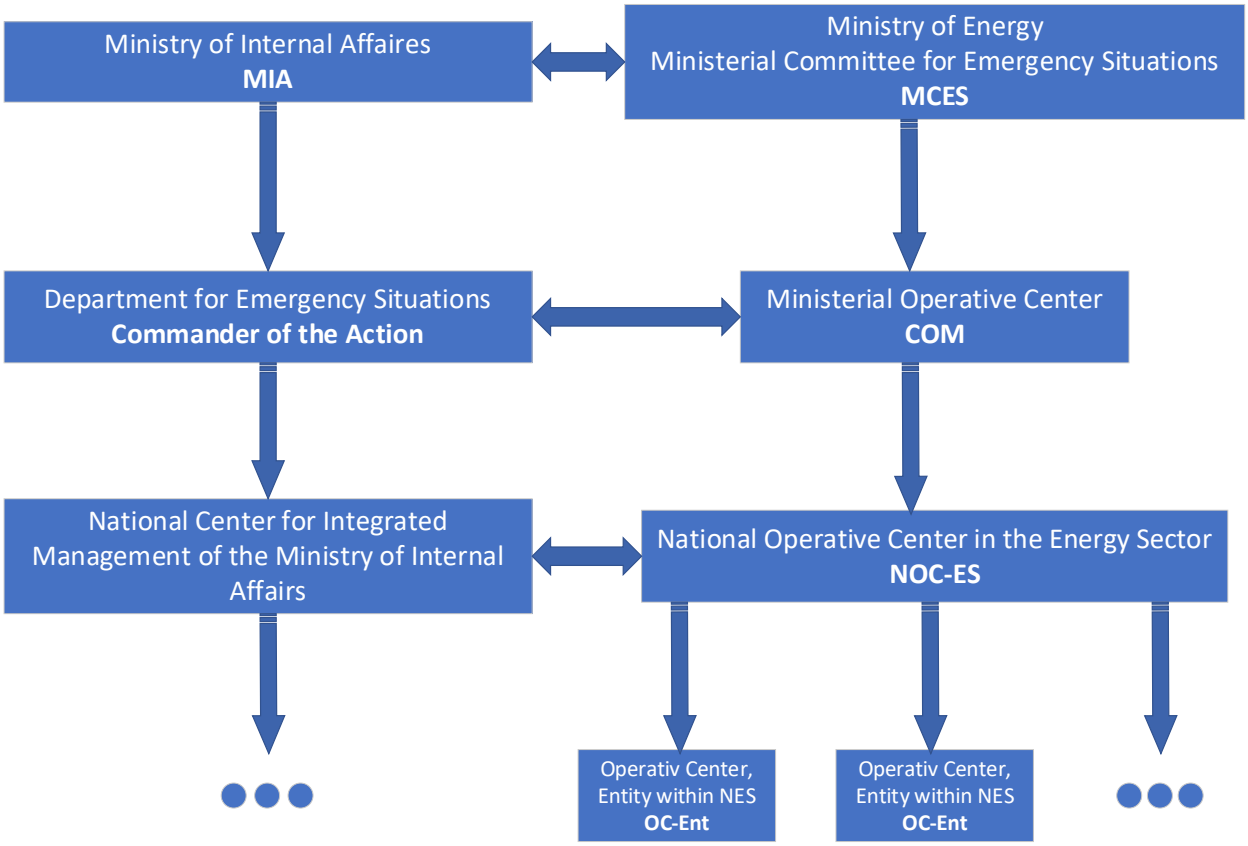

Figure 2. Organizing of the Emergency Management System in the Energy Sector

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3.1.H. Operating Procedures (OP)

TSO internal procedures and NRA Order:

- *OP no. TEL-07.III AV-DN/145_NES protection plan against major disruptions and Restoration plan for operating of the NES after being left completely or partially without voltage*.

This procedure establishes the principles to be considered in the design and construction of ETG installations, in the planning of the development of the NES, as well as in the operational management and command activity for:

- Prevention of disturbances which, by extension, can become major disturbances.
- Stopping the development of major disturbances, and thus preventing the partial or total remaining of the power system without voltage (blackout / collapse).
- Time limitation and as an extension area. Limitation of adverse effects associated with major disturbances and / or possible partial or total failure of the powerless system (blackout / collapse).
- Fast and efficient restart of the power system after a possible partial or total failure of the power system without voltage (blackout / collapse).

- *OP no. TEL-07.III AV-DN/544_Principles of elimination of breakdowns in the transmission and distribution electrical grid of 110 kV - 400 kV .*

This procedure establishes the principles of elimination of breakdowns in the transmission and distribution grid of 400 kV - 110 kV to ensure next: the correct operation of operational command personnel (OCP), avoid damage to the equipment, avoid the spread of damage, prevent human accidents, reduce the time required to re-supply electricity and return to safe operation.

- *Instructions for elimination of breakdowns in the absence of phone connections in the transmission and distribution electrical grid of 110 kV - 400 kV for each station in the ETG and the EDG.*

These instructions are elaborated in accordance with *OP no. TEL-07.III AV-DN/544_ Principles of elimination of breakdowns in the transmission and distribution electrical grid of 110 kV - 400 kV (described above)*.

- *OP no. TEL-07.III AV-DN/24_The development and application of the manual disconnection normative for certain categories of end customers, gradually, in exceptional situations arising in the operation of NES.*

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The purpose of this procedure is to establish how the disconnection normative are drawn up and applied, in order to maintain a permanent balance of production with consumption, through manual disconnections of certain categories of final customers.

- OP no. TEL-07.III AV-DN/13_How to elaborate and implement the Normative for the limitation/ reducing the consumption of electricity, gradually applied, in crisis situations in the operation of NES.

The purpose of this procedure is to establish how the limitation normative is drawn up and implemented, as a last resort safeguard measure in crisis situations in the operation of the NES, in order to maintain a permanent balance of production and consumption by reducing domestic electricity consumption.

- OP no. TEL-07.III AV-DN_The action of the D.E.C. to major disturbances in the continental-european interconnection.

This procedure establishes the operating principles of the NES in the event of a major disturbance in the continental-european interconnection, the mode of operation of the DEC dispatcher to prevent the spread of disturbances and to restore a normal operating situation.

- OP no. TEL-07.III/123 AV-DN_The management of the NES in case of partial or total unavailability of the SCADA-EMS teleinformation system.

This procedure establishes the principles for the operation of the NES in conditions of partial or total unavailability of the SCADA-EMS system, respectively the way of transmitting in the territory the information on the occurred unavailability, informing and requesting rapid intervention and restarting the teleinformation system, informing the interconnection partners about the alert status as well as the communication possibilities and the action model of the operative personnel from the ETG stations and from the power plants with UD.

- OP no. TEL-07.III RE DN/178_Participation of power plants in the frequency adjustment in the NES.

This procedure shows how power plants participate in frequency adjustment in the NES (in primary, secondary and tertiary regulation of the active power).

- OP no. TEL-07.III RE DN-119_Automation of isolation on own services of some groups from the power stations when the frequency decreases

In accordance with the *OP_SEN Defense Plan against Major Frequency Disturbances (PAPM-f)*, SEN operates a frequency-based automation system to prevent total downtime (interruption of service) and to restore the parameters of the mode after the disturbance, at acceptable values. In case of unsuccessful operation of the above mentioned automation system, at a frequency at which the maintenance of the system is considered without chance, the isolation on own services of some groups from certain power plants is initiated, on the

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same criterion (of frequency), groups from which to restart the system, in accordance with *OP_Development, approval, and implementation of the NES operation restoration plan at partial or total power failure*.

- *OP no. TEL-19-01_Fight against cyber attacks announced by third parties.*

The purpose of this procedure is to manage cyber security events / incidents that occur in the computer and electronic communications systems of the TSO C.N.T.E.E. Transelectrica S.A. announced by a third party, governmental or non-governmental entities, through the involvement of the external service provider IT&C, S.C. TELETRANS S.A.

- *OP no. TEL-00.38_ Communication activity with the media.*

This procedure establishes the model for promoting in the media the activities and special events of the TSO C.N.T.E.E. Transelectrica S.A., in order to inform the general public transparently, to create and consolidate a positive image of the company to its internal and external target audience.

- *NRA Order no. 142/3.12.2014_Regulation on the establishment of safeguard measures in crisis situations appeared in the operation of the NES*.

This regulation establishes safeguard measures and rules for their application in crisis situations arising in the operation of the NES. By applying safeguard measures, the aim is to maintain a permanent balance of electricity production with scheduled consumption and external trade, by increasing production and reducing domestic electricity consumption.

- *NRA Order no. 23/11.05.2016_ Regulation on the suspension of the operation of the wholesale electricity market and the applicable trade rules*.

This Regulation establishes the conditions under which the operation of the wholesale electricity market may be suspended and the trade rules applicable during the suspension period for the settlement of electricity.

- *The C.N.T.E.E. Transelectrica S.A. regarding Rules on the suspension and resumption of market activities*, in accordance with Article 36 (1) of Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on the state of emergency and the restoration of the National Electricity System (NES).

- NRA *Order no. 213/2020_Rules on the settlement of imbalances, balancing capacity and balancing energy in Romania in case of suspension of market activities*, in accordance with Article 39 (1) of Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on the state of emergency and the restoration of the National Electricity System (NES).

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This Regulation establishes the method of calculating and settling the imbalances of the parties responsible for balancing and establishes a single imbalance price.

- *OP no. TEL-20.28_* The s*ecurity stock management of TSO C.N.T.E.E. TRANSELECTRICA S.A*.

This procedure establishes the way of working and the responsibilities related to the management of the security stock, within CNTEE Transelectrica S.A. The safety stock is used to replace electrical appliances and materials accidentally made unavailable as a result of special events that affect important objectives of the ETG, causing unavailability with major effects on the operational safety of the ETG.

- *Protection and safety plans for the power stations, remote control centers, dispatcher control centers*.

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Table 3.1. National procedures and measures for managing an electricity crisis

Crisis Scenario	Trigger event	National procedures and measures in the event of an electricity crisis Crisis mitigation measures, effects limitation measures and restoration
Cyberattack on the assets that are part of the electricity network	Cyberattack on communications and data transmission infrastructure of dispatching center, on power plants and power stations, or on important consumers. The targets of the attack are SCADA - EMS, SCADA - DMS, f - P controller, central control systems, planning and operating systems, IT centers, data storage systems, control systems of the major stations/ power plants and remote control centers.	- Must be intervened to block the functionality of the systems that were taken over by the attacker, by temporarily shutting down the SCADA systems. The operation of NES will be done in accordance with TSO's OP no. *TEL-07.III/123 AV-DN_The management of NES in case of partial/total unavailability of the SCADA - EMS system*. - Urgent measures are taken in order to restore the triggered equipment in the ETG and/or EDG, and to ensure the equipment availability. - The assistance of the specialized departments is required, either within the respective entity or from the specialized governmental structures (MIA, RIS) in order to eliminate the attacker as well as to establish the necessary actions for the safe re-commissioning of the affected systems. For this purpose, action is taken in accordance with TSO's OP no. *TEL-19-01_Combating cyber attacks announced by a third party*. - Ways must be identified to ensure the safe operation of NES (manual control of the equipment, acting from the protective cabinet/control desks). - The supplementation of the personnel necessary for the operation in stations and power plants must be ensured. - If the cyber attack has led to the power failure of some consumers, urgent measures will be taken to refuel them, including through interventions at the level of installations if necessary. - If a production deficit is reached, measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine).

		- The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Cyberattack – entities not connected to electrical grid (non-grid assets)	Cyberattack on the communications and data transmission infrastructure of the participants in the energy market.	- Must be intervened to block the functionality of the systems that were taken over by the attacker. - The assistance of the specialized departments is required, either within the respective entity or from the specialized governmental structures (MIA, RIS) in order to eliminate the attacker as well as to establish the necessary actions for the safe re-commissioning of the affected systems. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Physical attack on critical assets	There is a physical attack on power lines, substations or power plants, or on central control systems, IT centers or telecommunications.	- The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - In case of unavailability of computer or communication systems, the operation of NES will be done in accordance with to OP no. „TEL-07.III / 123 AV-DN_The management of NES in case of partial/ total unavailability of the SCADA - EMS system". - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment.

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		- To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Physical attack on control centers	Physical attack on coordination centers, remote control centers or power plant control centers.	- Must be intervened to block the functionality of the systems that were taken over by the attacker, by temporarily shutting down the SCADA systems. The operation of NES will be done according to OP no. „TEL-07.III / 123 AV-DN_The management of NES in case of partial/ total unavailability of the SCADA - EMS system". - Urgent measures are taken in order to restore the triggered equipment in the ETG and/or EDG, and to ensure the equipment availability. - Urgent measures are taken in order to restore the triggered equipment in the ETG and/or EDG, and to ensure the equipment availability. - The assistance of the specialized departments is required, either within the respective entity or from the specialized governmental structures (MIA, RIS) in order to eliminate the attacker, as well as to establish the necessary actions for the safe re-commissioning of the affected systems. - Ways must be identified to ensure the safe operation of NES (manual control of the equipment, acting from the protective cabinet/control desks). - The supplementation of the personnel necessary for the operation in stations and power plants must be ensured. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Insider attack - Actions of	Actions of sabotage of an internal employee (of TSO, or a TSO's	- The assistance of the specialized departments is required, either within the respective entity or from the specialized governmental structures (MIA, RIS) in order to eliminate the attacker.

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sabotage by an internal employee	subsidiary, or employee of a company that provides services or works for TSO on a contract basis) directly on TSO's assets or indirectly on NES, by taking control of the dispatching center, of the remote control center, or of the rooms for command and control.	- Re-commissioning actions of the triggered equipment and repairing/replacing actions of the damaged/destroyed assets will be initiated immediately. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Solar storm	There is a solar storm (coronal mass ejection) that severely affects northern and central Europe but also the rest of Europe. This event was predicted by the space agencies a few days earlier and measures were taken at national and ENTSO-E level.	- Coordinated action is being taken at ENTSO-E level, given that the situation has been anticipated and some organizational measures have been taken to respond in the event of a crisis. - The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Storm		

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	There is an intensification of the wind that exceeds the gust speed of 150 km/h. Tornadoes occur and many electric shocks occur. The storm can last for several hours or even days and affects a large area. Very high amounts of precipitation can be recorded.	- The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Cold spells	A cold wave with negative temperatures from 10 ° C to 20 ° C below the seasonal average occurs. Frozen water in storage lakes, rivers and streams and leads to low water levels in storage lakes resulting in reduced production in hydroelectric power plants but also production limitations in coal / gas thermal power plants caused by the inability to insure corresponding cooling. Also, energy production decreases or stops completely in wind farms due to lack of wind. Consumption is significantly increasing due to the increased need to provide heating from electricity sources, especially in	- The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - Urgent measures are taken in order to restore the triggered equipment in the ETG and/or EDG, and to ensure the equipment availability. - The transition to operation in the minimum voltage band in the EDG is ordered. - Using the mass media communication, the population will be asked to reduce the electricity consumption during peak hours. - In the production units that can operate on alternative fuel, the measure of increasing the technological reserves of the system will be applied, in order to use them as appropriate.

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	urban areas. The phenomenon can be accentuated in big cities due to the lack of heating in the district heating network. The cold wave leads to disruptions in the road, rail, sea and air transport network, affecting the fuel supply of power plants, operational interventions in facilities and the entire national economic activity.	- To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Precipitation and flooding	High amounts of precipitation are recorded which lead to flooding of stations and power plants, blockage of water intake to turbines due to floods, debris, trees, etc., landslides leading to damage to lines, destruction of dams.	- Urgent measures are taken in order to restore the triggered equipment in the ETG and/or EDG, and to ensure the equipment availability. - Repairs / replacements to the affected poles and re-commissioning of the unavailable lines will be initiated immediately. - Measures will be taken immediately to remove water from power stations and repair damaged buildings. - Action will be taken immediately to remedy the blockages which have led to power limitations in the affected hydroelectric power stations. - The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.

Academiei Street no.39-41, District 1, Bucharest, ROMÂNIA
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Events caused by winter weather conditions	Temperatures are below average for winter periods and are accompanied by significant amounts of precipitation in the form of snow in some areas, respectively by frost and frost in other areas. Local wind intensifications lead to galloping and falling trees on power lines.	- The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Crisis in fossil fuel supply	The crisis in the supply of fossil fuels occurs during the year with high consumption and low fuel stocks. Production, supply of fossil fuels to power plants (for meteorological, technical, economic reasons, or as a result of protest and protest actions) is disrupted for a long time, or imports of fossil fuels are affected (for technical, meteorological or political reasons). This period coincides with a period in which it is not possible to supplement national energy production from other sources.	- Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - Urgent measures are taken in order to restore the triggered equipment in the ETG and/or EDG, and to ensure the equipment availability. - The transition to operation in the minimum voltage band in the EDG is ordered. - In the production units that can operate on alternative fuel, the measure of increasing the technological reserves of the system will be applied, in order to use them as appropriate. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.

Academiei Street no.39-41, District 1, Bucharest, ROMÂNIA
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Crisis in the supply of nuclear fuels	Lack of nuclear fuel (UO2 powder), caused by: ▪ Deficit of supply resources at national and international level ▪ Delayed delivery of fuel, or non-compliant fuel ▪ Dependence on suppliers (fuel supplier default, import / export bans)	**CONFIDENTIAL**
Local technical failures	There is a fault in an equipment or station that is very important for the operation of the NES (transformer explosion, DRRI operation, fault on the busbars of an ETG station) that exceeds the N-1 level taken into account when planning the operation of the NES.	- Re-commissioning actions of the triggered equipment and repairing/replacing actions of the damaged/destroyed assets will be initiated immediately. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Multiple incidents caused by extreme weather	Extreme weather events affect large areas (extreme winds, hail, heavy rainfall, ice deposits, temperatures far beyond the usual limits).	- The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair).

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Simultaneous incidents	Simultaneous triggering of equipment due to faults in stations or by multiple malfunction protections.	- Urgent measures are taken to re-commission the disconnected/ triggered equipment in the transmission and distribution network. - The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
The complexity of the control systems of the power systems	A sequence of independent events occurs (triggering caused by vegetation of a line, malfunctions of some protections, failure of a switch when triggering) that correlate in an unpredictable way.	- Re-commissioning actions of the triggered equipment and repairing/replacing actions of the damaged/destroyed assets will be initiated immediately. - The measures and provisions provided in *OP no. TEL-07.III AV-DN_The action of the D.E.C. to major disturbances in the continental-european interconnection*, and *OP no. TEL-07.III RS-DN/92_Crisis communication with interconnected transmission network partners*. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced.

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Human errors	There is a human error that leads to the triggering of important equipment for the operation of the NES.	- Re-commissioning actions of the triggered equipment and repairing/replacing actions of the damaged/destroyed assets will be initiated immediately. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Unwanted power circulations	There are major differences between the planned power flows and those recorded in the NES. The event is favored either by the forecast errors regarding the production of wind and photovoltaic power plants or by some external conditions (redispatching of the power	- The measures and provisions provided in *OP no. TEL-07.III AV-DN_The action of the D.E.C. to major disturbances in the continental-european interconnection*, and *OP no. TEL-07.III RS-DN/92_Crisis communication with interconnected transmission network partners*. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair).

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	transit between different European regions).	- Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Equipment defects in series	Abnormal operating behavior of equipment of the same construction type (caused by design deficiencies, maintenance, material defects, poor quality of the insulating environment).	- Re-commissioning actions of the triggered equipment and repairing/replacing actions of the damaged/destroyed assets will be initiated immediately. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Strikes, riots, employee protests	There are strikes, riots or other protests affecting the availability of personnel at several NES entities.	- The necessary personnel will be provided for essential positions in the NES (dispatch centers, operational staff at major stations, maintenance staff). - Re-commissioning actions of the triggered equipment and repairing/replacing actions of the damaged/destroyed assets will be initiated immediately. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment.

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		- To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Industrial / nuclear accident	A nuclear accident or industrial accident occurs at a chemical plant. Nuclear radiation or chemical emissions affect a large area leading to a state of panic followed by evacuation of the population from the affected area. Transportation, procurement and communication services in the affected area and in the adjacent areas also are affected. The accident can be caused by technical malfunctions, earthquakes, sabotage or terrorist acts and can have cross-border effects.	- Dispatch or telecontrol management centers must be relocated to protected locations. - Measures are taken to evacuate the operational staff. - The intervention in the affected areas will be ensured for the operation of the stations and power stations or for the remediation of some malfunctions, together with the specialized teams from IES. - If the impossibility of operating the installations has led to the electricity breakdown for some consumers, the measures of their re-feeding are taken by interventions at the level of installations, with the help and under the protection of the specialized teams from IES. - If a production deficit is reached, measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Urgent measures are taken to remedy the defects occurred to equipment in the transmission and distribution grid, and to ensure their availability also. - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Unforeseen interactions in the energy market	Inappropriate actions may occur from the energy market participants, as a result of unforeseen situations (which create panic among the participants).	The use of algorithms for the automatic execution of transactions by some participants on the Romanian energy market increases the risk of significant disturbances. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups).

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	The event is favored either by some manifestations produced on an energy market in another country that produce unforeseen effects on other energy markets (including the Romanian energy market), or by extreme weather situations or an unusual high/low demand on the Romanian energy market.	- The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Unusually large errors in the forecast of power produced in renewable energy plants	There are large errors in the forecast of production in renewable energy plants (photovoltaic, wind), errors caused by the way the forecast is made or by sudden changes in weather conditions. There are major differences between the planned power flows and those recorded in the NES. Events can be exacerbated by low NES consumption.	- Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Pandemic	An epidemic/ pandemic is affecting the european countries.	- The necessary personnel will be provided for the key positions of the NES (dispatch centers, operational staff at major stations, maintenance staff). - Take the necessary measures to isolate and sanitize workplaces, to provide the necessary materials to personnel in order to prevent infection at work. - Re-commissioning actions of the triggered equipment and repairing/replacing actions of the damaged/destroyed assets will be initiated immediately. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced.

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Heat wave	There is a heat wave that covers a large part of Europe for a long time, with extremely high temperatures. There is a low level of water in the storage lakes which results in reduced production in hydroelectric power plants, but also production limitations in coal / gas thermal power plants and nuclear power plants caused by the impossibility of ensuring proper cooling. Consumption is very high due to the need for air conditioning. There are limitations in the operation of the equipment caused by very high temperatures.	The heat wave can be accompanied by a long period of drought. Extreme weather events (storms / tornadoes or heavy rainfall that can lead to flooding) can also be recorded at the end of the heat wave period. - The necessary cooling systems will be provided for the proper functioning of the command, control and protection systems in the stations, power plants and control centers through the dispatcher. - Measures will be taken immediately to prevent the spread of fire in the substations - The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Drought	Low rainfall leads to low water levels in storage lakes, which result in reduced production in	Drought can be accompanied by extreme temperatures (very high in the summer, or very low in the winter). Extreme weather events (storms/ tornadoes or heavy rainfall that can lead to floods) can also occur at the end of a drought period.

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	hydroelectric power plants and also in production limitations in coal / gas and nuclear power plants due to the inability to ensure proper cooling. Energy production decreases or is lacking in wind farms due to lack of wind.	- Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - The transition to operation in the minimum voltage band in the EDG is ordered. - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Earthquake	There is a high magnitude earthquake affecting a large area. Alerts are issued a few seconds before the earthquake and do not allow protection measures to be taken. Panic occurs among the population in the area affected by the earthquake influences the unfolding of events.	- Repair/ replacement of the affected pillars and re-commissioning of the unavailable lines will be initiated immediately. - Repair/ replacement of defective transformer units will be initiated immediately. - Mobile cells will be used to ensure the operation of stations affected by the earthquake. - Buildings related to lines, power stations, power plants, dispatch centers located in the seismic zone will be inspected immediately to assess the possibility of their safe operation. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - Measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.

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Forest / vegetation fires	Forest/ vegetation fires occur, whose rapid spread is favored by dry weather. In addition, the intensification of the wind leads to the rapid and uncontrolled spread of fires.	- Urgent measures are taken to put back into operation the disconnected/ triggered equipment in the ETG and EDG. - Repairs/ replacements will be initiated immediately for the affected poles and for the re-commissioning of the unavailable lines. - Measures will be taken immediately to prevent the spread of fire in the transformation stations. - The re-commissioning of the triggered equipment will be initiated immediately, either by repairing/replacing the damaged/destroyed assets using equipment from the security stock, or by ensuring temporary equipment operation schemes. - Measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - Groups will be loaded to the maximum power available (including starting-up the backup groups). - The dispatchable Load declared on the Electricity Balancing Market will be reduced. - The increase of available power of NES will be requested, by making available the production units under repair (early re-commissioning of the groups under repair). - Measures are applied in order to extend the availability status of equipment from ETG and EDG, by cancellation of withdrawals from operation of the equipment for the reasons of maintenance or investment. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine). - The measure to reduce/cancel the available interconnection capacity as well as to reduce/cancel the notified export transactions will be ordered.
Armed military conflict, war	There are regional conflict states, there is a need to defend the country	- Dispatching or command centers must be relocated to protected locations. - Measures are being taken to evacuate operational personnel. - In the affected areas, intervention is ensured for the operation of stations/power plants, as well as for repairs, together with the specialized teams within IES. - If the impossibility of operating the installations has led to the interruptions of the electricity supply to some consumers, measures will be taken for powering them again through interventions at the level of the installations, with the help and under the protection of specialized IES teams. - If a production deficit is reached, measures must be applied in accordance with the NRA's Order no. *142/3.12.2014_Regulation on establishing safeguard measures in crisis situations appeared in the operation of the NES*. - To combat the production shortages, emergency aid will be requested from neighboring TSOs according to bilateral agreements (Operational Agreements and Mutual Aid Agreements signed with Bulgaria, Serbia, Hungary and Ukraine).

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In the event of an extensive damage in the NES, the intervention will be carried out in accordance with the instructions for limitation/ elimination of the damage in accordance with the following Operating Procedures:

- OP no. TEL-07.III AV-DN/544_*Principles of breakdowns elimination in the electricity transmission and distribution grid of 110 kV - 400 kV*.

- OP no. TEL-07.III AV-DN/145_*NES protection plan against major disruptions* and *Restoration plan for operating of the NES after being left completely or partially without voltage*.

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3.2. Regional and bilateral procedures and measures

3.2.A. Agreed mechanisms for cooperation within the region
Ensuring coordination before and during the electricity crisis

The Regional Security Coordinators (RSCs), currently provides a set of mandatory services for all the TSOs to which they are affiliated, in accordance with EU legislation, such as:

- establishing common grid patterns;
- coordinated security analysis;
- coordinated capacity calculation;
- coordinating the program of withdrawals from operation;
- short-term forecast of adequacy;
- support for the coordination of defense and restoration plans;

For example, in addition to services mentioned above, the RSC „TSCNET" works with the TSOs and with other RSCs on an early warning system, in order to identify and mitigate the potentially Critical Grid Situations. (CGS).

Starting with 2010, the IT platform „EAS" (ENTSO-E Awareness System) has been developed at the ENTSO-E level. This IT platform provides all partner TSOs with a real-time overview of the european transmission grid, a better understanding of the problem in the event of an emergency situation or disruption. The EAS platform offers TSOs the opportunity to:

- develop the ability to assess the type and size of a disturbance;
- decide to intervene or not, without aggravating the state of the system;
- coordinate measures for solving problems related to consumption/ production/ electricity grid and system restoration;
- option to cooperate with other TSOs.

Throughout the crisis, the european IT platform EAS (ENTSO-E Awareness Systems) will be used, and ENTSO-E and the Regional Coordination Centers will be informed. The coordinated measures established by them shall be taken in accordance with the procedures, regulations and international agreements in force.

Thus, the crisis situation is managed in collaboration and coordination with all TSOs in the region, through the entities within ENTSO-E and the Regional Security Coordination Centers, applying the dedicated procedures in force (Critical Grid Situation procedure, coordination on Short Term Adequacy, frequency monitoring and cross-border exchanges by the Regional Coordination and Monitoring Centers organized within the operators AMPRION - Germany and SwissGrid - Switzerland).

3.2.B. Regional and bilateral action measures in the event of a crisis

- announcing the crisis situation at ENTSO-E level;
- urgent communication and consultation with counterparts at regional and/ or bilateral level to analyze the effects caused by the crisis situation;
- synchronization at bilateral/ regional level in order to implement the response strategy;
- acting in the direction of the crisis management and elimination strategy.

Other measures:

- improving the adequacy indicators of the electricity systems in the region with the help of the pooled power reserve and the additional reserve available at the interface with the neighboring regions, as well as establishing the maximum quantities of electricity to be delivered regionally or bilaterally;
- Improving security of supply (SoS) by eliminating congestion
- substantial increase in net interconnection capacity,
- post-incident analysis and future prevention measures.

3.2.B.1. Trigger factor for support/ assistance

- major disruptions in the NES in a certain part of the country, and the Transmission System does not have the capacity to sustain the deficit from one area to another
- difficulties arise in ensuring the adequacy of the NES as a result of unscheduled triggering of production capacity
- the triggering elements specific to risk scenarios with effects at regional level appear
- the restoration activity of the neighboring Electricity System requires this

3.2.C. Mutual assistance agreements for cooperation and coordination of actions before and during the energy crisis

Within the region of which Romania is a part, the following bilateral operational agreements are in force:

Agreement on Provision of Mutual Emergency Energy Assistance for Ensuring the Reliable Operation of Power Systems of Bulgaria and Romania, which provides for the provision of a quantity of electricity between the two countries in order to assist one of the countries in crisis.
Agreement on Provision of Mutual Emergency Energy Assistance for Ensuring the Reliable Operation of Power Systems of Serbia and Romania, which provides for the provision of a

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quantity of electricity between the two countries in order to assist one of the countries in crisis.
Agreement on Provision of Mutual Emergency Energy Assistance for Ensuring the Reliable Operation of Power Systems of Ukraine and Romania, which provides for the provision of a quantity of electricity between the two countries in order to assist one of the countries in crisis.
Operational Agreement between the TSOs from Romania and Serbia provides for the granting, as the case may be, of aid for the restoration of the NES through the interconnection line OPL 400 kV Porțile de Fier – Djerdap.
Operational Agreement between the TSOs from Romania and Bulgaria provides for the granting, as the case may be, of aid for the restoration of the NES through the interconnection line.
Operational Agreement between the TSOs from Romania and Ungaria provides support, as far as possible, to the restoration of the neighboring system by maintaining the voltage on the interconnection lines, and the supply of a quantity of electricity through the interconnection lines between the two countries.

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Section 4.
CRISIS COORDINATOR

The crisis coordinator in Romania is the National Operative Center in the Energy Sector (NOC-ES), having the roles and responsibilities as specified in sub-section 3.1.F.

The activation of NOC-ES is done at the request of the TSO (UNO-DEN) through the Competent Authority for Ensuring the Electricity Supply within the Ministry of Energy.

Contact date:

- Ministry of Energy
CAEES
the Competent Authority for Ensuring the Electricity Supply
email: autoritateacompetenta.electrica@energie.gov.ro .
39-41 Academiei street, district 1, Bucharest, Romania

- TSO C.N.T.E.E. TRANSELECTRICA S.A.
UNO - DEN
the National Operative Unit – National Energy Dispatcher
Operating Dept. Balancing Market
16-18 Hristo Botev Avenue, district 3, Bucharest, Romania
phone no.: +40 21 303 5638, +40 0756 025 723 .

Section 5.
CONSULTATIONS WITH STAKEHOLDERS

For the development of this plan, consultations were held with the following entities in the energy sector:

- the TSO – C.N.T.E.E. Transelectrica S.A. which includes the Operational Unit – National Energy Dispatcher (UNO-DEN)
- electricity generating companies
- all relevant distribution operators
- regulatory authorities

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Section 6.

PREPARATION TESTS FOR EMERGENCY SITUATIONS

#	PREPARATION TESTS FOR CRISIS SITUATION	OBJECTIVES OF THE TEST	DATE
1	Testing and preparation of the National Operative Unit – National Energy Dispatcher UNO-DEN	*(the information is to be communicated after the completion of the consultations with the involved entities)*	TBA
2	Testing the procedure for transferring the activity to the emergency center of the National Operative Unit – National Energy Dispatcher UNO-DEN	*(the information is to be communicated after the completion of the consultations with the involved entities)*	TBA
3	Testing and verification of the operation of the power supply systems of the internal services of the ETG and EDG stations (Diesel groups, accumulator batteries)	*(the information is to be communicated after the completion of the consultations with the involved entities)*	TBA
4	Testing the functioning of communication systems at national level, with monitoring the information flow	National testing exercise **"Axiopolis 2021"** - Testing the information flow at national level - Testing the decision-making process	2021, Sept.
5	Testing of generating units with starting capacity without voltage source in the system and of generating units with the possibility of insularized or isolated operation on their own services	*(the information is to be communicated after the completion of the consultations with the involved entities)*	TBA
6	Cyber security testing (cyber attack simulation)	*(the information is to be communicated after the completion of the consultations with the involved entities)*	TBA
7	Testing exercise on the earthquake crisis scenario case	*(the information is to be communicated after the completion of the consultations with the involved entities)*	TBA
8	Fire-fighting testing (fire simulation and evacuation)	*(the information is to be communicated after the completion of the consultations with the involved entities)*	TBA

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