Risk Preparedness Plan For Electricity Sector in Georgia

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Contents

Glossary

AC	Alternating Current (power systems or facilities)
ACER	(EU) Agency for Cooperation of Energy Regulators(https://www.acer.europa.eu/)
aFRR	Automatic Frequency Restoration Reserve
B2B	Back-to-Back – a facility for connecting two line segments of AC electric power transmission through a HVDC conversion system with both ends inthe same switchyard, used to couple asynchronously operated power grids or power grids of different frequencies – with no intermediary DC transmission line
CA	Competent Authority (pursuant to RpR)
CEP	The Clean Energy for All Europeans Package (https://energy.ec.europa.eu/topics/energy-strategy/clean-energy-all-europeans-package_en)
Commission	GNERC
Cross-border flow	Physical flow of electricity on a transmission network of a Party to the Energy Community that results from the impact of the activity of producers, customers, or both, outside that Party to the Energy Community on its transmission network[1]
CyberCG	Energy Community Coordination Group for Cybersecurity and criticalinfrastructure (https://www.energy-community.org/aboutus/institutions/CyberCG.html)
DC	Direct Current (power systems or facilities)
DSO	Distribution System Operator
Electricity crisis	A present or imminent situation in which there is a significant electricity shortage, as determined by the Contracting Parties and described in their risk-preparedness plans, or in which it is impossible to supply electricity to customers[2]
ENTSO-E	European Network for Transmission System Operators for Electricity(https://www.entsoe.eu/)
EENS	Expected Energy Not Served – crisis impact assessment (ANNEX II)
EnC	Energy Community (https://www.energy-community.org/)
EnCS	Energy Community Secretariat (https://www.energy-community.org/)
FRR	Frequency Restoration Reserve – a type of ancillary service in power system operation
GNERC	Georgia National Energy and water supply Regulatory Commission (https://gnerc.org/en/home)

[1] Pursuant to Article 2(4) of the CEP – Risk-preparedness Regulation together with Article 2(3) of the CEP – Electricity Regulation as adapted in the draft proposal for their adoption by the EnC Ministerial Council
[2] Pursuant to Article 2(9) of the CEP – Risk-preparedness Regulation as adapted and adopted by the EnC Ministerial Council in 2021

GSE	Georgian State Electrosystem JSC – national electricity transmission system operator of Georgia and main grid owner (https://www.gse.com.ge/home)
GWh	Gigawatt-hour
HVDC	High-Voltage-Direct-Current technology or mode of operation of a powersystem component or facility
HPP	Hydro Power Plant
ICS	Industrial Control Systems
IGES	Inter-institutional Group for Energy Security
IPS/UPS	Wide synchronous transmission grid area consisting of: Integrated Power System (IPS) – including the national networks of Georgia, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Belarus and Mongolia, and the Unified Power System of Russia (UPS)
LOLE	Loss of Load Expectation – crisis impact assessment (ANNEX II)
mFRR	Manual Frequency Restoration Reserve
Ministry	Ministry of Economy and Sustainable Development of Georgia
MMS	Market Management System
MoESD	Ministry of Economy and Sustainable Development of Georgia – the national Competent Authority pursuant to Article 3 of the Risk–preparedness Regulation [3]
MWh	Megawatt-hour
(N-1) criterion	Rule according to which elements remaining in operation after a fault of one element [network connection, generation unit] within TSO's Control Area must be capable of accommodating the new operational situation without exceeding Operational Security Limits [ENTSO-E]
NTC	Net Transfer Capacity [MW] is the maximum capacity of a transmission line for exchange of power between two areas, compatible with security standards applicable in both areas and taking into account the technical uncertainties on future network conditions
PTR	Physical Transmission Right is a right entitling its holder to physically transfer a certain volume of electricity between two bidding zones within a given period of time. The transfer takes place in a specific direction via a nomination to TSOs
RpP	Risk-preparedness Plan (this document)
RpR	Risk-preparedness Regulation [3] (ANNEX III)
SoS	Security of Supply (of electricity)
SoS CG	Energy Community Security of Supply Coordination Group (https://www.energy-community.org/aboutus/institutions/SOSCG.html)
SoS Rules	Rules on Security of Electricity Supply of Georgia enacted by Order №1–1/520 of Minister of Economy and Sustainable Development [7] (ANNEXIII)
TSO	Transmission System Operator
TPP	Thermal Power Plant
TTC	Total Transfer Capability [MW] – the maximum amount of electric

	power that can be transferred reliably over the inter-control area transmission system under a given set of operating conditions considering the effect ofoccurrence of the worst credible contingency
TYNDP	Ten-Year Network Development Plan
ICT	Information and Communication Technology
OHL	Overhead transmission line

INTRODUCTION

The requirements, contents and template for preparation of the Risk-preparedness Plan are stipulated in Chapter III (Articles 10, 11, and 13), Article 21 and ANNEX I of the Risk-preparedness Regulation [3],and Article 7 and Article 8 of the draft Order №1-1/520 of Minister of Economy and Sustainable Development of Georgia dated 2 December 2020 – *Rules on Security of Electricity Supply* [7] (hereafter – "SoS Rules").

Pursuant to the SoS Rules, with the other requirement determined therein, the Risk-preparedness Plan also takes into account the requirements stipulated by the Resolution No. 453 of the Government of Georgia dated October 6, 2017 "On the development of rules for preparation of emergency management plan" [14].

To ensure an effective approach to electricity crisis prevention and management a Risk-preparednessPlan is prepared on the basis of identified most relevant national electricity crisis scenarios.

The Risk-preparedness Plan includes national and regional measures that are planned or taken to prevent, prepare for and mitigate electricity crises.

The Risk-preparedness Plan describes effective, proportionate and non-discriminatory measures addressing all identified electricity crisis scenarios. The plan is technical and operational in nature, its function being to help prevent the occurrence or escalation of an electricity crisis and to mitigate its effect. The Risk-preparedness Plan should be updated regularly.

The Risk-preparedness Plans should be made public, while ensuring confidentiality of sensitive information.

Having the Risk-preparedness Plan in place enables Georgia to timely prepare for the electricity crises and mitigate or prevent the consequences of the crisis and in this way to maintain the security of electricity supply for the consumers in Georgia. The Risk-preparedness Plan is also a good instrument to establish common and coordinated actions with the neighbouring countries in order to cope with regional electricity crises. Since Georgian neighbouring countries are not members of the EU or the Energy Community, they are not obliged to apply the same regulation, so any cooperation related to emergency situations should be based on bilateral agreements.

According to Article 7 of the SoS Rules, "…based on electricity security risks and crisis scenarios the Risk-preparedness Plan shall be developed by MoESD in cooperation with the TSO, Inter-Institutional Group for Energy Security (IGES), GNERC, distribution system operators, electricity producers, if necessary, other energy enterprises and relevant organizations representing the interests of household and non-household consumers. MoESD immediately informs Energy Community Secretariat about the approval of the Plan. The plan shall be updated at least once every four years byMoESD."

Risk-preparedness Plan has the structure and contents defined by the Security of Supply Rules which is in compliance with the Risk-preparedness Regulation, according to which the mentioned document was drawn up. The structure consists of the following sections:

SUMMARY OF THE ELECTRICITY CRISIS SCENARIOS

A brief description of the electricity crisis scenarios identified at national level using the methodology for identifying electricity crisis scenario (in line with the Article 5 of SoS rules) in accordance with the procedure including the description of the assumptions applied.

ROLES AND RESPONSIBILITIES OF THE COMPETENT AUTHORITY

Defines the role and responsibilities of the competent authority (MoESD) and the bodies to which tasks have been delegated (e.g. DSOs, energy producers, Gas TSO, GNERC, relevant Ministries, etc). Describes which tasks, if any, have been delegated to other bodies.

PROCEDURES AND MEASURES IN THE ELECTRICITY CRISIS

National procedures and measures

All measures planned or taken to mitigate electricity security risks are defined in this section, as well as to prevent, prepare for and mitigate electricity crises and emergency situations as identified pursuant to Article 5. In particular:

- Describes procedures to be followed in the cases of an electricity crisis, including the corresponding schemes on information flows;
- Describes preventive and preparatory measures;
- Describes the measures designed to prepare for and to prevent the risks identified pursuant to Article 5, including definition and allocation of responsibilities, duly taking into consideration existing preventive and preparation measures implemented by TSO, such as operational testing, early warning systems, network software automatics and systematic trainings. Where non-market-based measures are considered, they must be duly and must comply with regional and, where applicable, bilateral measures. Non-market-based measures may include forced demand disconnection, or the provision of extra supplies outside normal market functioning (e.g. reserves);
- Provides a framework for manual load shedding, stipulating under which circumstances loads areto be shed. Specifies with regard to public safety and personal security which categories of electricity users are entitled to receive special protection against disconnection and justify the need for such protection. Specifies how the TSO and the DSOs should act in order to decrease the consumption;
- Includes information on related and necessary plans for developing the future grid that will help to cope with the consequences of identified emergency situations;
- Describes the mechanisms used to inform the public about the electricity crisis.

Regional and bilateral procedures and measures (only when and if relevant)

- Describes the agreed mechanisms for cooperation within the region and for ensuring appropriate coordination before and during the electricity crisis, including the decision-making procedures for appropriate reaction at regional level;
- Describes any regional and bilateral measures that have been agreed, including any necessary technical, legal and financial arrangements for the implementation of those measures. Provides information on, inter alia, the maximum quantities of electricity to be delivered at regional or bilaterallevel, the trigger for the assistance and possibility to request its suspension, how the electricity will bedelivered, and the provisions on fair compensation between neighbours. Describes the national measures necessary to implement and enforce the regional and bilateral measures agreed;
- Describes the mechanisms in place for cooperation and for coordinating actions, before and duringthe electricity crisis, with other countries outside of the region as well as with third countries within the relevant synchronous area.

CRISIS COORDINATOR

Indicates and defines the role of the crisis coordinator. Specifies the contact details.

The role of the crisis coordinator fulfils the Inter-Institutional Group for Energy Security (IGES) mentioned in Article 5 of the SoS rules.

STAKEHOLDER CONSULTATIONS

Describes the mechanism used for and the results of the consultations carried out, for thedevelopment of this plan, with:

- relevant electricity and natural gas undertakings, including relevant producers or their tradebodies;
- relevant organisations representing the interests of non-industrial electricity customers;
- relevant organisations representing the interests of industrial electricity customers;

- regulatory authorities;
- the transmission system operator;
- relevant distribution system operators.

EMERGENCY TESTS

- Indicates the calendar for the biennial national (and, when applicable also regional) real timeresponse simulations of electricity crises;
- indicates procedures agreed and the actors involved.
- for the updates of the plan: briefly describes the tests carried out since the last plan was adopted andthe main results. Indicates which measures have been adopted as a result.

GENERAL INFORMATION

COMPETENT AUTHORITY

Articles 132(1) of the Law on Energy and Water Supply of Georgia [9] grants the competence for providing security of electricity supply to the **Ministry of Economy and Sustainable Development**. TheMinistry must exercise some of these rights and competences in cooperation or consultation with the Government or GNERC.

According to Article 3 of the Regulation (EU) 2019/941, as adapted and adopted by the Ministerial Council Decision No 2021/13/MC-EnC, "Contracting Parties shall, without delay, notify the Energy Community Secretariat and the Security of Supply Coordination Group and make public the name and the contact details of their competent authorities designated pursuant to paragraph 1 and any changes to their name or contact details." In order to establish smooth connection with the Competent authorities, the Energy Community Secretariat needs to be informed about the contact person(s) from this authority, together with her/his contact details.

Contact information:

i. ***Ms. Margalita Arabidze,*** *Head of Energy Efficiency and Renewable Energy Policy and Sustainable Development Department*
ii. 1, Zviad Gamsakhurdia Embankment, 0114 Tbilisi, Georgia
iii. *marabidze@moesd.gov.ge; +995 322 35 78 27*
iv. *+995 593 72 85 95*
v. *http://www.moesd.gov.ge/index.php?page=home*

OTHER SAGNIFICANT ENERGY AUTHORITIES

Article 132(4) of the Energy Law [9] refers to the competences of the Georgian **National Energy and Water Supply Regulatory Commission** (GNERC) in relation to security of electricity supply:

> *"4. The Commission and other state authorities shall, within their competences, facilitate the security of supply in accordance with this Law and other legal acts."*

The Law defines specific role of the Commission with regards to cooperation with the Ministry on thesecurity of supply activities stipulated in:

- Article 134 of the Law – on the to develop and implement the security of supply rules forelectricity, and
- Article 138 of the Law – on the security supply monitoring function of the Ministry.

Article 135(1) of the Energy Law [9] related to operational security of the electricity network defines the role of the **transmission system operator** (in particular the State TSO – **GSE**):

> *"1. Operational rules and obligations relating to the security of an electricity transmission network shall be determined by a transmission system operator in accordance with this Law, the safety norms for the supply of electricity, electricity transmission network rules, thetechnical rules referred to in Article 97 of the Law, and other legislative and subordinate legal acts of Georgia.*

The main specific tasks of the TSO with respect to network security are defined in Article 135 of the Law – including its role in consultation with the stakeholders and cooperation with the neighbouring TSOs, in Article 53 – the development and implementation of a TYNDP (to be approved by GNERC andadopted by the Ministry), and in Article 136 – indicating the role of the TSO in management of the states of emergency in the electricity sector.

Further to this, the tasks of GSE in the operational security of the transmission system are specified in the Transmission Network Code of Georgia [12].

Other companies and stakeholders involved in the process are:

- **Electricity System Commercial Operator (ESCO).** The company that operates the current electricity market of Georgia.
- **Distribution System operators.** As of today, there are two DSO's operating in Georgia: Telasi JSC, owning and operating the distribution system of Tbilisi, and Energo-Pro JSC, owning and operating the rest of distribution system of Georgia.
- **Energy Generation Undertakings.** The key generation facilities play crucial role in balancing and keeping safe the system. Enguri, Vardnili, Lajanuri, Zhinvali, Khrami 1, Khrami 2 HPPs as well as CCGT 1, CCGT 2, Gas Turbine, and three TPPs are among the most important Generation facilities that provide the majority of the energy produced in the country.
- **Large Consumers.** Zestaponi Alloys Factory, Rustavi Nitrate and Metallurgical Factories are some of the key consumers.

DEFINITION OF THE REGION – LEGAL CONTEXT

The **Risk-preparedness Regulation** [3] provides legal basis for establishment of regions among the Contracting Parties of the Energy Community for the purpose of its implementation. At the same time, Article 21 provides for conditional, temporary and partial derogation of Georgia from this obligation:

> *"Until Georgia is directly connected with another Contracting Party, Article 6 [**Identification of regional electricity crisis scenarios**], Article 12 [**Content of Risk-preparedness Plans as regards regional and bilateral measures**] and paragraphs 2 to 9 of Article 15 [**Cooperation and assistance among Contracting Parties**] shall not apply between Georgia and other ContractingParties."*

Nevertheless, at least paragraph 1 of Article 15:

> *"1. Contracting Parties shall act and cooperate in a spirit of solidarity in order to prevent or manage electricity crises."*

…the remaining content of Article 21:

> *"Georgia and relevant other Contracting Parties may develop, with the support of the Energy Community Secretariat, measures and procedures alternative to those provided for in Article 12, provided that such alternative measures and procedures do not affect the effective application of this Regulation between the other Contracting Parties."*

…and Article 20 **[Cooperation between Contracting Parties and Member States**]:

> *"Where the Contracting Parties and the Member States cooperate in the area of security of electricity supply, such cooperation may include defining an electricity crisis, the process of the identification of electricity crisis scenarios and the establishment of Risk-preparedness Plans so that no measures are taken that endanger the security of electricity supply of the Contracting Parties, the Member States, the Energy Community or the Union."*

…outline a basic legal environment for implementation of the regional component of the risk– preparedness planning process of Georgia, pursuant to this Regulation.

The above framework is applied here transposing the following principles:

- Due to lack of any direct interconnections of Georgia with a Contracting Party or EU Member State the identification of crisis scenarios, the risk-preparedness planning policies and regionalor bilateral measures, and the forms of cooperation and emergency assistance shall be definedin activity areas not dependent on common exchanges of power or electricity networkservices, to the applicable level, and
- due to the critical security relevance and the potential for exchanges of energy and network services with the power system of Georgia of the existing interconnections, the risks, crisis scenarios, regional and bilateral risk-preparedness and risk mitigation policies, and the measures relevant for RpP implementation are established with and amongst the neighbouring countries in the geographic region of Georgia[3].

Article 133 of the Law of Georgia on Energy and Water Supply [9] enforces the principle of regional and bilateral solidarity and mutual assistance in protection of security of energy supply based on cooperation with the competent authorities of other Contracting Parties in coordination of activities and measures for improving the security of electricity supply and the capacity and resilience of the power system (Article 143), and for managing a state of emergency in the electricity sector (Article 136).

Pursuant to Article 133(4):

> *"4. In order to ensure the achievement of the objectives provided for by this article, the Ministry shall also cooperate with the competent authorities of other neighbouring countries(which are not parties to the Energy Community), on the basis of relevant agreements."*

…the same kind of cooperation should be established with third parties (outside the Energy Community).

DEFINITION OF THE REGION – ENERGY SECURITY CONTEXT

Georgia is part of the Caucasus geographic region and borders with Russia to the north, Turkey and Armenia to the south, and Azerbaijan to the southeast.

Georgian power system is interconnected with Russia, Turkey, Azerbaijan and Armenia, and largest part of electricity trade relates to the first two. Energy exchanges between Georgia and Armenia are carried out in smaller volumes. Energy imports are used to satisfy increased demand in the winter period, while exports are related to the surplus of electricity generated during high water flows in thesummer. [10]

In addition to imports and exports of energy Georgian transmission network plays a strategic role in energy transit both in East – West and North – South direction. Main cross-border flows consist of power exchanges with Russia, exports to Turkey and significant transits from Russia and Azerbaijan toTurkey, as well as bidirectional exchanges with Azerbaijan and Armenia. Due to its geographical location, Georgian transmission network in principle may be used for energy transit between (1) Russiaand Armenia/Iran, (2) Azerbaijan and Turkey, (3) Russia and Turkey, and (4) Armenia/Iran and Turkey [11].

Overall cross-border transfer capacity for each border is illustrated in Figure 1.

Currently the power system of Georgia operates in synchronous mode with the power systems of Russia or Azerbaijan, within the wider IPS/UPS synchronous area which provides **frequency regulation**to the Georgian power system. Such a continuous dependence on cross-border FCR is a source of substantial system operation risks. The cross-border exchanges over unsynchronized borders are applied through temporary synchronization or "island" operation (Armenia), and Back-to-Back HVDC conversion (Turkey) [10].

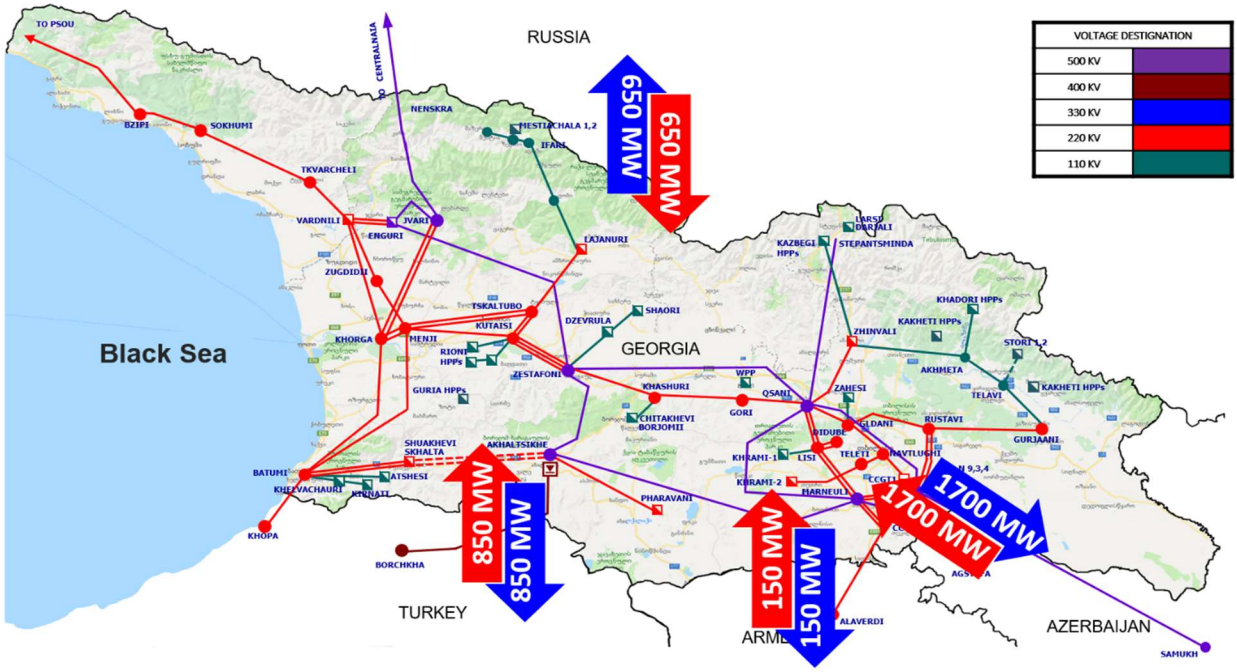
[3] Georgian power system is interconnected with non-EU or non-EnC countries which have completely different legislative framework and do not apply the same risk-preparedness regulation. If it is of Georgian interest, Georgia may initiate discussions with relevant subjects from neighbouring countries, about some bilateral or multilateral (involving several neighbouring countries) contracts defining the cooperation in a case of crisis management, prevention or mitigation. However, this is not legally obligatory for Georgia, until (and if) it gets connected with one EU/EnC country.

The structure, capacity and type of current cross-border connections are provided in Table 1.

The 500 kV OHL *Kavkasioni* is the main connector between Georgian and **Russian** power system. Its operation is exposed to increased risks due to its length (over 400 km total, near 100 km in Georgia) and its location (high mountains with difficult terrain and severe weather conditions). Operation of this line is critical for the stability of Georgian system and quality of supply – the frequency control is mainly implemented by the Russian system. [10]

The 400 kV OHL *Meskheti* is connecting Georgia to **Turkey** through a 700 MW Back-to-Back HVDC facility at *Akhaltsikhe* substation. The interconnector provides a potential for exchanges with Turkey –exports from Georgia and transits from Russia or Azerbaijan.

Figure 1. Current [2023] cross-border transfer capacities between the power systems of Georgia and neighbouring countries [11]



The 220 kV OHL *Alaverdi* connects Georgia to **Armenia** and is weak point by which is possible to implement only 150 MW of power exchange between these countries in synchronous mode and 100 MW in "Island" mode. [10]

In the period January-August 2021 **Azerbaijan** provided 500 GWh (indicatively 30%) of Georgia's electricity imports, and additional 164 GWh of transits to Turkey. The interconnections on this border(500 kV OHL *Mukhranis Veli* and the new 330 kV OHL *Gardabani*) may comfortably host higher flows. [10]

Major Georgian HPP generation sources are located in the western region (*Enguri* River basin), while significant loads are located in the central and eastern parts. This generates relatively large flows in the central, axial part of the transmission infrastructure (500 kV OHL *Imereti*), which also holds significant transits. This rendered the line as a critical component for the overall system resilience andperformance, (N-1) criterion and security of supply. [10] According to the development plan of GSE, criterion N-1 will be fulfilled from 2026 by constructing the new 500 kV OHL "Jvari-Tskaltubo– Akhaltsikhe".

At present, total installed capacity of electric power plants operated in Georgia amounts to 4586 MW.

From this, 2381 MW is generated by the so called "regulating HPPs (with water storage), 995 MW by"seasonal"

(run-of-river) HPPs, 110 MW by Gas Turbines, 21 MW Wind farms and 1079 MW by thermal power plants and combined-cycle gas turbines. Roughly 74% of the total in-country installed capacity is provided by HPPs, including 52% generated by regulating hydro power plants [11].

Table 1. Power exchange capabilities on the borders with the neighbouring countries [11]

Country	Cross-border line [conductor]	Nom. Voltage [kV]	Exchange directon	TTC summer [MW]	TTC winter [MW]	mode
Russia	Kavkasioni [AC – 3 x 300]	500	Export	570	650	S
			Import	570	650	S
	Salkhino [AC – 400]	220	Export	264	300	I
			Import	264	300	I
Azerbaijan	Mukhranis Veli[AC – 3 x 300]	500	Export	1300	1500	S
			Import	61300	1500	S
	Gardabani [AC – 480]	330	Export	616	700	S
			Import	616	700	S
Armenia	Alaverdi [AC – 300]	220	Export	150 / 100	150 /100	S / I
			Import	150 / 100	150 / 100	S / I
Turkey	Meskheti [AC – 3 x 500]	400	Export	700	700	B
			Import	700	700	B
	Adjara [AC – 400]	220	Export	150 / 150	150 / 150	I / R
			Import	150 / 150	150 / 150	I / R

[S – Synchronous mode, I – Isolated mode, B – operated Back-to-Back through HVDC station, R – in Reserve]

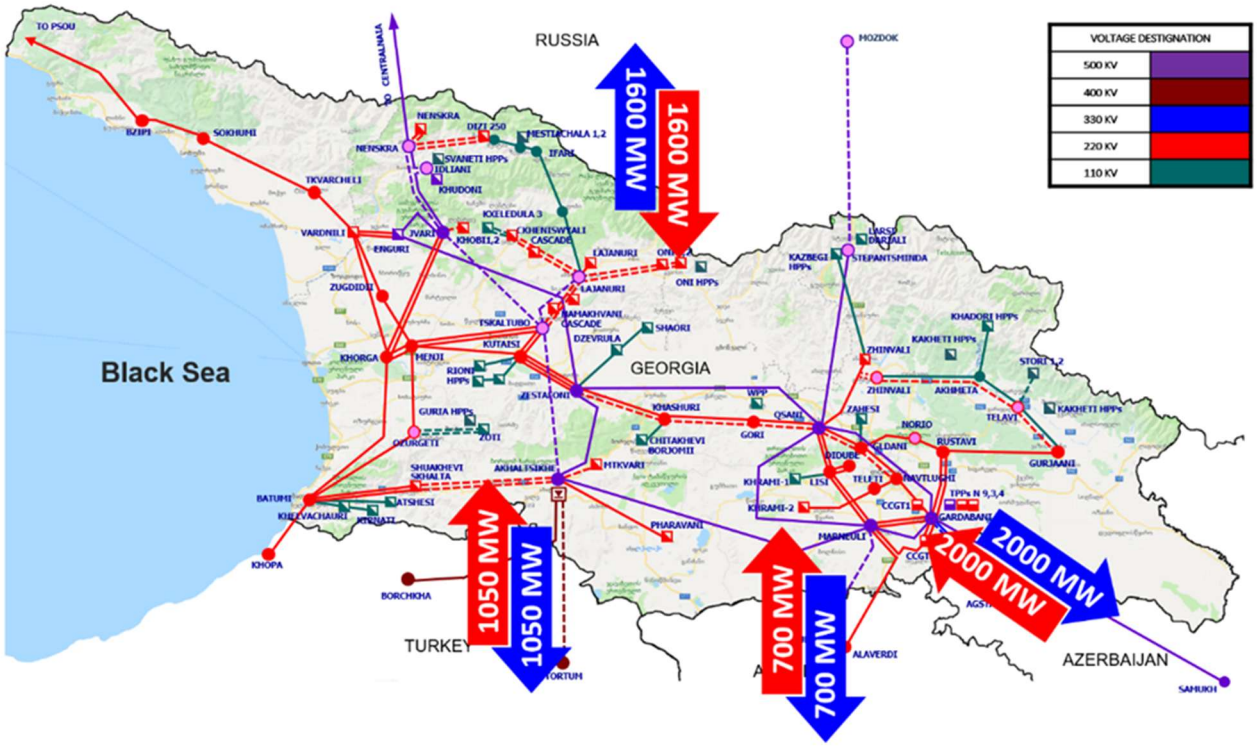
Georgian power profile is characterized by slightly lower demand (compared to winter) and high generation in summer and high demand and low generation in winter. The pattern enables potential exports during summer but significant dependence on thermal power generation during winter – the share increases to 28% (from less than 1% in summer). This expands power supply security considerations over the type, capacity and operational conditions of both hydro and gas-fired power generation fleet, and (seasonal) imports of gas (or electricity). [10]

Although synchronized, the power systems of Georgia, Russia and Azerbaijan are unable to operate ina “ring” configuration within the IPS/UPS network (one of the three borders needs to be switched off)
– one reason is appearance of loop flows. This condition increases the risk for Georgia to lose synchronization with IPS/UPS and reduces reliability of operation, access to frequency containment reserves and potential of power exchanges between the systems. [11]

The most powerful source of harmonics in Georgian system is the 700 MW *Akhaltsikhe* HVDC station.Having in mind the policy of development and application of new HVDC units -, new 350 MW at *Akhaltsikhe* (Turkey), 700 MW on the border with Armenia – the issue of associated increase in harmonic distortion and parasite flows is another source of risks in the quality of system operation tobe tackled. [11]

The planned prospects for increase of the cross-border transmission capacity by 2033 is illustrated inFigure 2. [11]

Figure 2. Planned future [2033] cross-border transfer capacities between the power systems ofGeorgia and neighbouring countries [11]



1. SUMMARY OF THE ELECTRICITY CRISIS SCENARIOS

Pursuant to Article 10 of the Risk-preparedness Regulation [3], the Risk-preparedness Plans are established by the national competent authority of each Contracting Party, based on both the *regional* and *national* electricity crisis scenarios identified pursuant to Articles 6 and 7.

Initiating events – definitions

The identification of relevant electricity crisis scenarios according to the applied Methodology ([4], [8])and Article 5 of the Risk-preparedness Regulation [1] is based on *initiating events* (threats, hazards) that could potentially initiate a crisis scenario. At least the following three classes of hazards has been defined as potential initial events:

- Rare and extreme **natural hazards**
- **Accidental hazards** going beyond N-1 security criterion, and exceptional contingencies
- **Consequential hazards** including consequences of malicious attacks and fuel shortages

Based on the *Overview of natural and man-made disaster risks the European Union may face* issued by the EU Commission in 2017, ENTSO-E has developed a referent (minimum) list of hazards that are considered as potential initiating events for crisis scenarios. The list is provided in ANNEX I – the scope and priority of hazards within the proposed categories is indicative and country-dependent, it may be expanded, sub-structured or aggregated. An initiating event can be defined as a single incident or a combination of multiple (correlated, consequential or overlapping) initiating events.

The specific pattern of exposure to threats, perception of risks, and resilience of incumbent energy systems of Georgia is not fully compatible with the proposed set of individual hazards (which is defined and assessed by ENTSO-E as of primary relevance for the EU environment). Consequently, the identification of relevant risk scenarios for Georgia is based on the modified list of threats.

Future risk assessment and planning scenarios will consider expanding the scope of regional or bilateral threat components on the common borders and the assessment of cross-border impact of a crisis in the observed Region if cooperation with neighbouring authorities is established related to these issues.

Furthermore, in the future threat analysis will be considered to include an assessment of relevant combinations (overlapping) of two or more threats in a single (imminent or consequential) initial security compromising event of a composite crisis scenario – in case the aggregated or conditional probability of such threats is not negligible.

The relevant initial events on the national level, and the identification and assessment of the most relevantelectricity safety risks and crisis scenarios, shall be carried out by the GSE using the methodology for the detection and assessment of electricity safety risks and crisis scenarios (Article 4 of the Rules for Security of Electricity Supply Security [7]).

Risk assessment and rating

The risk assessment is aimed to identify the level of priority in planning and addressing the response to specific threats and hazards. The ranking criteria and procedure are defined in the Methodology ([4], [8]) and summarized in Annex II.

The crisis scenarios derived from the relevant initiating events and ranked according to the criteria including *likelihood* (based on the expected frequency of occurrence of an initiating event) and *impact* considering the indicators expected energy not served (EENS) and loss-of-load expectation (LOLE). Forboth impact indicators, a classification with a five-step scale is used. The combination of the rating with respect to both parameters results in an overall rating of each scenario in a five-step bandwidth between “insignificant” and “disastrous”. A summary of the risk assessment grid defined by the Methodology ([4], [8]) is provided in ANNEX II.

Cross-border dependencies

As a part of the scenario rating grid, the Methodology ([4], [8]) defines the criteria for assessment of the cross-border impact of a crisis scenario in a country on the security of electricity supply in anothercountry. It is estimated on a three-level scale including the potential to "initiate" a cross-border crisis or to "aggravate" one (regardless of whether it is a direct neighbor or only a member of the considered region). The dependency may result in a direct (imminent) impact – based on the availability of transmission infrastructure or generation capacity, or indirect – either consequential orinvolving third-party commitments or decisions.

The cross-border dependency factor is used in the final estimation of the national (priority) rank of a crisis scenario. The regional rank of a crisis scenario is estimated as the sum of all national ranking values of that scenario as estimated in each of the countries in the region. A summary of the cross– border impact assessment and overall ranking criteria is provided in ANNEX II.

1.1. REGIONAL CRISIS SCENARIOS (EU RELEVANCE)

Based on the examples of initiating events proposed by the EU transmission system operators, pursuant to Articles 5 and 6 of the Risk-preparedness Regulation [1] ENTSO-E was tasked to identify the most relevant regional electricity crisis scenarios for the EU. Ultimately, ENTSO-E developed and communicated a priority list of 31 regional crisis scenarios. The scenarios were submitted to the EU Member States to be used as a reference list of initial events for ranking and identification of priority national crisis scenarios of the Member States.

The proposed scenarios can be tentatively aggregated in the following Classes:

C1 Cyberattack [1, 2]
C2 Physical attack [3, 4, 5, 6]
C3 Extreme weather conditions [7, 9, 10, 11, 12, 16, 28, 29]
C4 Natural disaster [8, 27, 30, 31]
C5 Fuel delivery [13, 14]
C6 Behavior of employees [20, 23]
C7 Market Rules [21, 25]
C8 Technical Error [15, 17, 18, 22]
C9 Other [19, 24, 26]

The proposed scenarios are provided in Table 1 along with references to their Class and to their reference in the List of initial events (ANNEX I).

Table 2 – regional crisis scenarios relevant for EU (defined by ENTSO-E)

No	Scenarios	Class	Hazard
1.	Cyber-attack on entities physically connected to the grid	C1	3a
2.	Cyber-attack on market participants not physically linked	C1	3a
3.	Physical attack against critical assets	C2	3a
4.	Physical attack against control centers	C2	3a
5.	Threatening / blackmailing/ hostage-taking of key employees	C2	3a
6.	Insider attack	C2	3a
7.	Solar storm	C3	1g
8.	Volcanic eruption	C4	1e
9.	Storm	C3	1c
10.	Cold spell	C3	1c
11.	Heavy precipitation and flooding	C3	1c

No	Scenarios	Class	Hazard
12.	Winter incident	C3	1c
13.	Fossil fuel shortage (including natural gas)	C5	3b
14.	Nuclear fuel shortage	C5	3b
15.	Local technical failure with regional importance	C8	2b
16.	Multiple failures caused by extreme weather	C3	1c
17.	Loss of ICT for power system operation	C8	3d
18.	Simultaneous failure of power system primary elements	C8	2a
19.	Complexity of power system control mechanism	C9	2b
20.	Unintended violation of N-1 criterion due to human error	C6	2b
21.	Physical power flows don't follow market flows	C7	3e
22.	Serial equipment failure due to a systematic defect	C8	2b
23.	Strike, riots, industrial action in power supply chain	C6	3a
24.	Large impact industrial or nuclear accident	C9	3f
25.	Unexpected interaction of energy market rules	C7	3e
26.	Unusually big forecast errors for renewables	C9	3e
27.	Pandemic	C4	1f
28.	Heatwave	C3	1c
29.	Dry period	C3	1b
30.	Earthquake	C4	1e
31.	Forest fire	C4	1d

2. ROLES AND RESPONSIBILITIES OF THE COMPETENT AUTHORITY

2.1. NATIONAL COMPETENT AUTHORITY

Articles 132(2) about competences regarding security of supply and 138 regarding monitoring thesecurity of supply of the *Law on energy and water supply* [9] define the tasks of the Ministry of Economy and Sustainable Development (MoESD) to:

- adopt a strategy of action during extreme situations in the electricity sector;
- ensure the development and improvement of the legislative and normative frameworks;
- specify the energy potential of Georgia;
- approve rules for security of electricity supply which regulate the tasks and responsibilities ofenergy undertakings, market participants, system users and customers in the process of achieving minimum level and quality of electricity supply;
- monitor the security of supply of electricity in Georgia and publish bi-annual reports [*SoS statements*].

The policy targets and types of measures are indicated by Article 134 of the Law.

The *Rules for Security of Electricity Supply* [7] provide the MoESD specific powers and competences related to implementation of RpP, including:

- assessment of all relevant risks related to electricity security according to the established conditions;
- authorization to **establish and manage** an electronic information exchange system, the purpose of which is to collect the information and data needed to assess risks, prevent and manage electricity crises on a regular basis from the electricity market participants, or to entrust the provision to the GSE [7];
- **to define the reporting obligations** of electricity market participants, including the reporting period, and the quality and volume of information;
- to monitor and support the development and adjustment of risk assessment methodology and the methodologies for adequacy assessment, and to approve crisis scenarios;
- to consult with neighbouring countries' to coordinate the work done at the regional level to ensure the security of electricity supply;
- to **define** the structure, adopt rules for operation and initiate meetings of IGES[4];
- to **approve** and update every four years the Emergency Risk Management Plan [*this Plan*] and notify the EnCS;
- to develop, if necessary, supplementary risk-preparedness plans for specific security threats and crisis scenarios, including those related to cybersecurity;
- to apply sanctions in case of incompliance with the Plan(s)[5];
- **upon notification by GSE**, to alert and provide information to the Government, GNERC, energy stakeholders and CA of the directly concerned countries as well as EnCS;
- to convene the IGES in order to evaluate an event and provide its opinion;
- to issue early warning or declare electricity crisis upon recommendation by IGES, and to inform all involved parties to activate the measures of the Risk Preparedness Plan;
- **to lift the early warning or announce the end of a crisis** and inform CA of the directly concerned countries as well as EnCS;
- **upon announcement by GSE**, to notify EnCS on electricity market resumption of its operation;
- to submit to the EnC the assessment report prepared by GSE after the termination of an event;
- to promote and apply supportive measures to achieve international and regional cooperation [pursuant to this Plan].

According to the adopted version of the Regulation (EU) 2019/941, Articles 14(1) and 14(2), about Earlywarning and declaration of an electricity crisis, define that Competent Authority shall inform the Energy Community Secretariat about the possibility that energy crisis may occur, as well about declarationof an energy crisis if it occurs. That information shall include the causes of the deterioration of the electricity supply situation, the reasons for declaring an electricity crisis, the measures planned or taken to mitigate it and the need for any assistance from other Contracting Parties.

Appointment of the Risk Management Officer (RMO)

The MoESD appoints a **Risk Management Officer (RMO)**, responsible for the secretarial, clerical, and administrative affairs of the IGES with an objective to coordinate the functions of the IGES. The RMO is an employee of the MoESD. The Role of the RMO includes:

- Coordinate the operation of the IGES, maintain the list of persons, including direct contact details, representing Participating entities;
- Coordinate and communicate with stakeholders to initiate the process of updating the list of threats and hazards;
- Prepare and communicate the Calendar of Meetings of the IGES with participants;
- Briefing the Head of the IGES;

[4] Article 5(2) of the Rules for Security of Electricity Supply: The EUU (Interagency Energy Security Group) is composed of representatives of the Ministry, the Commission, the GSE, distribution system operators, producers and other relevant stakeholders in the field of electricity supply security that the Ministry deems relevant. The EUU acts as an interagency coordinating body for energy security and convenes its meetings as needed by the Ministry. The rules for the establishment and operation of the EU are approved by the Ministry.

[5] Article 7(1) of the Rules for Security of Electricity Supply: For non-compliance with the requirements of the plan, the Ministry is authorized to apply the sanctions provided by the legislation of Georgia within its competence.

- Preparation of a report on the operation and the management of the electronic information system;
- Responsibility for appropriate documentation and sourcing of information.

2.2. OTHER BODIES RESPONSIBLE FOR RISK-PREPAREDNESS PLANNING AND CRISIS MANAGEMENT

Transmission System Operator (GSE)

The *Rules for Security of Electricity Supply* [7] define the main tasks and powers of GSE in this domain.The TSO is authorized to:

- on behalf of the MoESD, collect and compile information from the market participants required in the process of risk management;
- develop and update the risk assessment methodology and the methodologies for adequacy assessment, including consultations with relevant stakeholders and publication;
- carry out seasonal and short-term, as well as medium and long-term adequacy assessment pursuant to corresponding methodologies;
- identify and evaluate the most relevant electricity security risks and crisis scenarios;
- **develop or update the Emergency Risk Management Plan** and submit to the MoESD for approval;
- notify the MoESD on the possibility or occasion of a crisis scenario;
- provide **early warning** and information to the MoESD that an electricity crisis (risk scenario) may arise;
- take decisions on import electricity from neighbouring countries in case of crisis or **state of emergency** in the electricity system of Georgia and to export electricity to neighbouring countries in case of crisis or state of emergency in their electricity system based on the emergency contracts signed by ESCO and the relevant party[6];
- take all necessary measures **to eliminate any crisis or emergency** in the system (with all stakeholders involved);
- prepare and submit a report on an actual crisis event after the threat has been eliminated;
- upon agreement with the MoESD, **enter into contracts for the purchase of guaranteed capacity**.

The Crisis Management Process

The GSE prepares a Crisis Management Process for the scheduling and activation of the risk control measures, contingency actions and emergency response. The Crisis Management Process is coordinated within the internal structure of the GSE.

Among the actions included in the Crisis Management Process are:

- Continuous collection of information from electricity market participants concerning an event, evaluation of information/ indications, monitoring, and assessment of conditions.
- Close cooperation of the GSE with electricity market participants, IGES and the MoESD in case of an early warning or crisis, including the following tasks:
    - performs short-term adequacy study for the next three (3) days on daily basis and submits to MoESD and IGES, along with information on non-availability of power generation units (causes, recovery time, etc.), availability of reserves and the possibility of emergency imports.
    - Informs the MoESD and IGES on a daily basis regarding the development of an event, measures taken, the need for additional measures.
- Detecting events and based on reliable information that a crisis may or has already occurred, the GSE informs the MoESD and recommends to the MoESD the convocation of IGES (in the capacity of IGES as Crisis Coordinator) so that IGES can in turn recommend to the MoESD the issuance of an early warning

[6] After the new market model is put in operation. In the meantime, TSO is authorized to import electricity from neighbouring countries in case of crisis or state of emergency in the electricity system of Georgia and to export electricity to neighbouring countries in case of crisis or state of emergency in the electricity system of such country. For these purposes, TSO is authorized to enter into emergency and / or mutual assistance agreements with the relevant authorities / neighbouring enterprises and / or local markets in neighbouring countries.

or the declaration of an electricity crisis.

- Based on information collected and overall monitoring of the situation, GSE recommends to IGES the lifting of an early warning or the declaration of a crisis termination.
- In case of **cyber-security events**, the GSE also informs other designated/ responsible authorities such as
    - the Personal Data Protection Service of Georgia, which is the independent authority responsible for monitoring the legality of personal data processing and for informing the public about the state of data protection in Georgia and events related to it;
    - the Digital Governance Agency (DGA) of the of the Ministry of Justice, responsible inter alia for promoting cyber and information security in public administration;
    - the National Security Council;
    - the Ministry of Internal Affairs.
- After the termination of an event that led to the issuance of an early warning or the declaration of an electricity crisis, but not later than 6 months after the early warning has been issued or the crisis has been declared, prepares **a report** and submits to the MoESD (and to the RMO).

The Georgian National Energy and Water Supply Regulatory Commission (GNERC)

The *Rules for Security of Electricity Supply* [7] define the responsibilities of GNERC in the domain ofsecurity risk management.

The Commission has active role and participates in:

- assessment of relevant risks and crisis scenarios;
- assessment of the impact of draft methodologies on the market and submission of opinion to GSE[7];
- all activities and decisions of IGES;
- development and modification of the methodologies;
- consultations for development of the Emergency Risk Management Plan [*this Plan*].

Electricity System Commercial Operator (ESCO)

According to the existing Market Rules ESCO is responsible for signing emergency contracts with neighbors, before the new market model is implemented in Georgia.

The Inter-Institutional Group For Energy Security (IGES)

Pursuant to Article 5(2) of the *Rules for Security of Electricity Supply* [7] the Inter-institutional Group for Energy Security is composed of representatives of the MoESD, GNERC, GSE, distribution system operators, electric power producers and other relevant stakeholders in the electricity sector, **which the** MoESD **considers relevant**. The IGES is convened by the MoESD and the rules for establishmentand operation are approved by the MoESD. It acts as a body for inter-institutional coordination of energy security matter.

The more detailed information in sub-chapter 2.3.

2.3. THE INTER-INSTITUTUIONAL GROUP FOR ENERGY SECURITY (IGES)

The *Rules for Security of Electricity Supply* [7] define the establishment, competences, and powers of IGES in the domain of security risk management. The Group is authorized to:

[7] Article 4. Methodology for Detection and Assessment of Electricity Safety Risks and Crisis Scenarios [7]: 7. The GSE, the Ministry, as well as any interested person, who submits a relevant request for updating the methodology and a full justification of the need to implement the proposed changes to the Ministry, has the authority to request a renewal of the methodology or amendments to it (Annex 1 to these Rules). Prior to the change in the methodology, GSE shall consult with all interested parties on the instructions of the Ministry. During the consultation process, the Commission assesses the impact of the presented methodology on the market and submits the opinions to GSE, which prepares the relevant draft amendment and, after agreement with the stakeholders, submits it to the Ministry for a final decision.

- approve the risk scenarios before their adoption by the MoESD;
- participate in adoption and update of the risk assessment methodology and the methodologies for adequacy assessment;
- participate in consultations for development of the Emergency Risk Management Plan;
- upon appointment, perform the function of a Crisis Coordinator in the inter-institutional cooperation or consultations with other relevant stakeholders, as required;
- participate in consultation for the announcement of the end of a crisis.

Objectives of IGES

The IGES is designated as the competent body and is appointed as the permanent mechanism to ensure and promote the cooperation, consultation and communication between the entities parties involved in security risk management, including:

- The coordination of actions for the implementation of the risk management policies;
- The consultation on the allocation of responsibilities of the Emergency Risk Management Plan;
- Regularly review conditions that can affect safety electricity supply to the country;
- Cooperation in the preparation of the study identifying national scenarios of electricity crisis;
- Proposal of measures that can reduce the risk of electricity supply to the country;
- Enhance cooperation for the elaboration of the Emergency Risk Management Plan.

Composition of IGES

The Core Members of the IGES are the MoESD (Coordinating Body – Head of the IGES), the GNERC and the GSE.

Other members are the representatives from the Distributions System Operators (Energo-Pro, Telasi), the National Natural Gas System Operator (Georgian Gas Transportation Company Ltd (GGTC), the Electricity Market Operator (ESCO), the Georgian Energy Exchange (GENEX), the power producers, the Natural Gas Distribution Network Operators, etc., who participate in the IGES and the regular meetings according to the Calendar of Meetings, and in any of the extraordinary meetings, as appropriate, following a decision and invitation by the MoESD, communicated by the RMO.

Representatives from other organizations and authorities may participate in the IGES, including the Personal Data Protection Service and the Digital Governance Agency (DGA).

Calendar of Meetings

Regular meetings, after invitation from the MoESD.

Groups within the IGES

There are two working groups within IGES:

- Working Group for Risk Assessment
- Working Group for Risk Management

The **Working Group for Risk Assessment** is established by decision of the MoESD and is activated every time there are reasons to update the list of threats and hazards or the risk analysis and scenarios.

The **Working Group for Risk Management** includes the core members of the IGES. The Working Group is coordinated by the Risk Management Officer (RMO), for the following actions:

- Identifying threats and hazards and updating a list;
- Identification of the crisis scenarios considered;
- Demand estimation;

- Assessment of the probability of scenarios;
- Simulations and impact assessment;

The **Working Group for Crisis Management** is established and activated by decision of the MoESD for the effective management of electricity crisis situations that endanger security of supply, after the MoESD receives an early indication by the GSE. The Working Group is coordinated by a head appointed by the IGES, receives information and suggestions from GSE regarding the incident and after evaluation of the criticality of the incident gives an opinion on the issuance of a timely warning or declaring an electricity crisis to the MoESD. The head of the Crisis Working Group has the role of the Crisis Coordinator.

The following entities participate in the **Working Group for Crisis Management**:

- Head of Working Group
- Representative appointed by the IGES
- Representative of the Electricity Transmission System Operator
- Representative of Electricity Distribution Network Operators
- Representative of the National Gas Transmission System Operator

In addition, on a case-by-case basis and depending on the nature of the incident that may cause or is responsible for the electricity crisis, the Head of the Working Group for Crisis Management invites representatives of other stakeholders to participate in the Group. For the management of risk related to cybersecurity, the MoESD may invite representatives from the Personal Data Protection Service of Georgia, the Digital Governance Agency (DGA), the National Security Council's Office (Department of Information and Cybersecurity) or the MoESD of Internal Affairs – Emergency Management Agency.

The Working Group meets at the invitation of the head and:

- evaluates the incident and gives an opinion to the head on the issuing an early warning or declaring an electricity crisis;
- evaluates and approves the crisis response plan including all measures necessary to deal with it;
- evaluates the need for additional measures (beyond those foreseen in the Risk Preparedness Plan);
- takes actions in accordance with the Risk Preparedness Plan;
- monitors situation based on information from its members;
- evaluates the situation and gives its opinion on the lifting of an early warning or the declaration of a crisis termination.

The Coordination Group for Crisis management

The Coordination Group for Crisis Management is called by the Minister of Economy and Sustainable Development upon the request by the Working Group for Crisis Management or by the GSE **to manage the impact** of an electricity crisis.

The mission of the Coordination Group is the coordination of State Services to deal with the effects of an electricity crisis.

In the Coordination Group, the participating entities are:

- The Working Group for Crisis Management
- The Emergency Management Agency of the Ministry of Internal Affairs of Georgia, which is responsible for managing and coordinating the prevention, mitigation and elimination of the impact of nationwide emergencies.

3. PROCEDURES AND MEASURES IN ELECTRICITY CRISIS

The Risk-preparedness Plan for electricity crisis management includes procedures and measurescovering the following categories:

- Preventive and preparatory measures.
- Mitigation measures

The market-based measures may be complemented by separate set of non-market measures, asrequired.

3.1. NATIONAL PROCEDURES AND MEASURES

3.1.1. Measures in electricity crisis

The measures in place to address an electricity crisis relate to two different types of measures, namely:

- Mitigation and preparatory measures: Measures that are in place, or that are planned, to mitigate the consequences of an electricity crisis.
- Preventive measures: Measures that are in place, or that are planned, to prevent the occurrence of the identified electricity crisis scenarios;

The preventive and preparatory measures for electricity crisis management are based on National legislation (laws and by-laws) and acts approved by the TSO, containing dedicated and coordinated measures. The general principles are reflected in a common regulatory / legal act defining the responsibilities of the critical categories of stakeholders (large generators, market participants, energy and security service providers, others), and a monitoring / reporting agent.

3.1.2. General principles (policies) and regulatory legislation

The general principles in the national procedures are:

- Preventive development and maintenance of infrastructures (including the necessarycontingencies and financing);
- Preventive policy for access to sources (reserves) of energy and fuel in case of marketdisruption;
- Preventive policy for (emergency) supply of energy to consumers in case of marketdisruption;
- Ensuring adequate and sufficient human capacity (qualified personnel) including training andmentoring;
- Financing policy and resources (reserves) to be available in case of energy crisis;

The national security domain (including cybersecurity domain) in Georgia includes the following legislation:

- **Law on Energy and Water Supply.** Sets general regulations and principles for energy sector (both electric energy and gas supply) and water supply.
- **Transmission Grid Code (Network Rules).** Sets the principle technical and procedural regulation in the sphere of electrical energy. It includes the adapted and transposed versions of three EU Codes for network connections (RfG, DCC and HVDC Codes).
- **Distribution Grid Code.** Regulates the procedures regarding connection to the distribution network, as well as relation between DSOs and network user.
- **Electricity (Power) Market Rules.** Regulates the procedures an of operating the current electricity market.
- **Electricity Market Rules (draft).** Regulates the operation of new electricity market.
- **Technical Exploitation Rules for Electric Facilities.** Regulates the technical rules for exploitation transmission lines, power plants and relevant equipments. Sets the rules for dispatching and operative control for the electricity system.
- **Operational plans.** Based on the General principles, the electricity network operators (GSE, responsible DSOs) define their *Crisis Management Operational Plans*, including criteria, internal procedures and measures on

- **Various protocols and plans adopted by the TSO:**
  - **System restoration plan.** A document adopted by the TSO that lists number of technical varieties and scenarios of restoration of the system after a total or partial blackout state.
  - **Action Plan for Emergency Situations.** The measures are defined by the responsible operators in their internal risk management (emergency operation) plans and corresponding rules and procedures. GSE has internally approved a decree on the "Action Plan for Emergency Situations" that determines the operation of the automatics in the system, as well as the actions of all parties involved in the management of the system.
  - **Business Continuity Plan.** The document defines the number of technical measures to avoid the termination of the company's business activities and technological processes.

3.1.3. Anticipation of electricity crisis

The operator keeps a consolidated record of historic data (relevant events, applied measures / remedies, consequences, etc.) and technical data (own system, interconnected systems, generation / large consumption units, other connected stakeholders, service providers, market participants). If necessary, additional / alternative historic data sources are engaged (statistical office, government, administrations for weather and water economy, transport and telecommunications, environment, etc.). The data documents the risk events and exposure to specific threats. It is used for modelling andforecasting the potential exceptional events or conditions for occurrence of a specific threat scenario.

The availability and treatment of information obeys the criteria for confidentiality as well as transparency rules. These conditions must not obstruct the efficiency of the applied mechanisms.

Other corresponding authorities and mechanisms for risk prevention and crisis management (state or local government) are continuously consulted / coordinated through established secure means of cooperation. For the purpose of the electricity operators, the process of cooperation is governed by the Competent Authority. On State level, such cooperation employs other crisis management authorities (e.g. for cybersecurity, state security, etc.) and requires government action. On regional level, the crisis management cooperation mechanisms are established through (1) administrative instruments (treaties, bilateral agreements and offices), and (2) on operational level, through established mechanisms for exchange of data and early warnings.

In addition to the identification of crisis events, the crisis anticipation structures are used for establishment or supplementing international (regional) crisis mitigation structures, development of standards and improved rules for construction / maintenance of energy infrastructures, for operationof systems and energy markets and provision of energy supply services. They can also support rules and criteria for civil constructions, land use and spatial planning, water economy, environment and climate management, etc.

Based on the crisis anticipation structures, together with the Competent Authority and the Government, the operators set the criteria for the required contingencies in critical infrastructures, protection of legacy equipment and advances in the applied technology, timely maintenance planningand overall resilience of the system. It is essential for the determination of the energy reserves, as well asbudgetary control and identification of required financial reserves.

3.1.4. Evolution of electricity networks and systems

The TSO and DSOs of Georgia take into consideration the requirements for network development planning pursuant to[11] Articles 32 and 51 of the Electricity Directive (EU) 2019/944 and the Law on Energy and Water Supply.

Standard network development plans for the electricity networks are based on the annual electricity balance forecasts, [and any long-term electricity demand forecast programmes applied in their domains of operation]. It also refers to the criteria applied by ENTSO-E in the context of its revolving Ten-Year Network Development Plans and corresponding requirements, to the applicable level. The network planning of Georgia responds to the

specific cross-border requirements, to be met in cooperation with the neighbouring TSOs.

The planning also responds to the requirements for resilience of the electricity system, based on the criteria developed through processing of the historic data related to past crisis events, and the corresponding threat analysis and crisis forecast conclusions. Additionally, the operators apply mechanisms for modelling of network parameters through simulation of various projected operationalconditions (weather conditions and events, demand patterns, systems or components failure, variousperformance and security criteria, other types of events – including those indicated in the crisis scenarios, as applicable).

The criteria on dimensioning of the electricity networks comply, to applicable level, with the relevant EU acquis mandatory in the Energy Community including the *Network Codes and Guidelines*[12] appliedby ENTSO-E, and relevant technical standards.

A special part of the planning is the cybersecurity chapter, developed in cooperation with thecybersecurity authorities and aimed to address both common cyber resilience aspects and the specificcrisis scenarios provided here and those indicated as relevant in the threat forecast exercises. The plan reflects the measures indicated in the cybersecurity legislation of Georgia and, as much as applicable,the EU acquis on cybersecurity.

Cybersecurity includes mechanisms for cyber protection at corporate and national level (such as adequate cybersecurity legislation, rules and data protection standards, mechanisms for exchange of sensitive information and education, qualified incident response teams, and mechanisms for monitoring). Cybersecurity costs are defined and included in the planning of the financial aspects.

The planning includes micro-management of the development process pursuant to the safety precautions derived from the historic data, simulations or other resilience requirements (including spatial and environmental criteria, exposure to intense weather or adverse human behavior, networktopology, applied materials, technologies and system parameters, redundancy systems beyond N-1 criterion, capacity margins, etc.). Corresponding qualified human capacity, educated instructions to employed personnel and the public domain is also included.

The plans include the scope and dynamics of implementation, which is based on the assessment of the real-time availability of required material, logistics and other resources including financial sources.

3.1.5. Resource adequacy planning

The resource adequacy plan is developed by the TSO, approved by the Competent Authority and adopted on national level. The Resource Adequacy Plan is developed according to the relevant national laws and regulations.

The resource adequacy planning in Georgia is based on revolving process of resource (generation) adequacy assessment. The process is implemented by the Methodology for Seasonal and Short-term Adequacy Assessment and the Methodology for Medium and Long-term Adequacy Assessment provided as Annex 2 and Annex 3 of the Rules on Security of Electricity Supply [7].

Furthermore, the assessment process complies with the methodologies and rules for resource adequacy applied in the EU – pursuant to Regulation (EU) 2019/943 and including the methodology applied under the European Resource Adequacy Assessment applied by ENTSO-E, to the applicable level. National reliability standards of Georgia are based on the "*Methodology for calculating the value of lost load, the cost of new entry and the reliability standard*" approved by ACER. Furthermore, the short-term and seasonal adequacy assessment is implemented pursuant to Articles 8 and 9 of Regulation (EU) 2019/941 [1].

The system adequacy assessment is based on the simulation of the operational conditions throughapplication of identified operational scenarios – pursuant to the relevant EU and national legislation.

3.1.6. Security monitoring

Basic requirements for evaluation and monitoring of electricity crisis in Georgia are provided in Article12 of the Rules for Security of Electricity Supply [7].

In principle, subjects of monitoring are:

- operational system security (in compliance with the relevant EU regulations), and
- implementation of the crisis management planning and mitigation processThe monitoring is implemented on State and on corporate levels.

The State-level monitoring is provided by the nominated monitoring agent (GSE). The corresponding rules and responsibilities, including reporting obligations, are defined in the *Rules for Security of Electricity Supply [7]*. The process of monitoring and enforcement on the State level is supervised by the Competent Authority (*Ministry*), in coordination with the other relevant authorities involved in the activities including the national security and cybersecurity authorities.

Article 7(7) of the Rules for Security of Electricity Supply [7] authorizes the Ministry to apply the sanctions for non-compliance with the Plan[8]. It is necessary to correlate the enforcement mechanisms, including penalties, to the monitoring activity and define the corresponding regulation that provides the required legal enforcement.

The Monitoring on corporate level is performed by each energy enterprise, including TSO, pursuant to the Law on Civil Security. Large energy companies (power generators, TSOs etc.) have the obligations to elaborate and keep in update the Emergency Management Plan, that should be agreed with the Emergency Management Service of Georgia.

The monitoring reports can be used in:

- implementation of security planning measures, and
- improvement of the security monitoring process and environment.

3.1.7. Planning of crisis management

Crisis management planning mechanism is defined in Articles 7 and Article 8 of the Rules for Security of Electricity Supply [7].

Crisis management planning activities are defined by the transmission and distribution system operators. The activities are:

- aggregated in a crisis management plan on state-level defining the tasks and responsibilities of all responsible stakeholders (public or private), and
- defined on the corporate level, stipulated in internal crisis management plans and implemented by each operator in cooperation with the responsible stakeholders. These measures are defined by the responsible operators in their internal risk management (emergency operation) plans and corresponding rules and procedures. GSE has internally approved a decree on the “Action Plan for Emergency Situations” that determines the operation of the automatics in the system, as well as the actions of all parties involved in the management of the system

The responsible stakeholders list includes at least electricity network operators, gas network operators, electricity producers and suppliers, large consumers of electricity (responsible for demand response), national security and cybersecurity authorities, and designated sectoral operators, service providers or authorities in the domains of transport and telecommunication, water economy and environment protection.

The crisis management plans consist of market-based and non-market contingency measures, demand response measures, load shading, as well as system operation security, critical infrastructure security and cybersecurity measures. The plans include detailed or aggregated procedures for specific crisis scenarios (as required), training

[8] According to literature [7], Article 7(7) says: "For non-compliance with the requirements of the plan, the Ministry is authorized to apply the sanctions provided by the legislation of Georgia within its competence."

exercises, post-crisis system and market recovery measures, as well as monitoring, reporting and enforcement provisions.

"Action Plan for Emergency Situations" that is internally approved in GSE foresees the measuresthat would be taken for almost all assessed categories of the events.

3.1.8. Measures to mitigate the electricity crisis

Crisis management processes and responsibilities are defined in Articles 9, 10 and 11 of the Rules forSecurity of Electricity Supply [7].

The measures are defined at the State and the corporate level.

The related measures, both those managed at the State level (as a policy) and those directly managed bythe energy operators are of two complementary categories, as

- Market-based measures
- Non-market measures

It should be noted, that the categorization of measures by market-based and non-market, is based on the future electricity market approach, that is regulated by the number of legislative acts, that are either adopted and not in force, or are still in the process of drafting.

Future electricity market, based on the principle of self-dispatch allows such categorization, while the central dispatch model that is still in force, makes such kind of categorization not applicable.

3.1.9. Market-based measures activated by the System Operators

Measures (market-based and non-market based) activated by the TSO (GSE) for mitigation of the electricity crisis are defined in the Transmission Network Code [12].

In case of emergency the TSO uses Market-based measures for mitigation of electricity crisis where GSE, with predefined procedures and with the help of in advanced reserved capacity volumes mitigatesthe system deficit. In general, these operational measures include:

- activation of standard balancing products (FCR, aFRR and mFRR);
- activation of specific products (Emergency Reserve fast), EmergencySupport from neighbouring TSOs.

3.1.10. Non-market measures activated by the System Operators

The use of non-market measures by the TSO (GSE) is outlined in Article 10 of the Rules for Security of Electricity Supply [7]. Measures (market-based and non-market based) activated by the TSO (GSE) for mitigation of electricity crisis are defined in the draft Transmission Network Code.

Non-market measures shall be activated as a last resort if all market-based measures have been exhausted or where it is evident that market-based measures alone are not sufficient to prevent a further deterioration of the electricity supply situation.

When there is a need for non-market measures for mitigation of the electricity crisis, the TSO with predefined procedures mitigates the system deficit.

The TSO is granted the right to stop the relevant market segment, for system security and mitigation of emergency. In these cases, the TSO has ability to move from self-dispatch mode to central dispatch mode and regulate the system parameters manually or with the help of system automation.

Non-market measures include:

- **Deviation from the merit order list.** Activation or de-activation of the reserves by the balancing service providers in the merit order list, without following the sequence of the list.
- **Re-dispatching.** Simultaneous and equal activation of counter (reduction and increase) balancing products from two different balancing service providers.
- **Limitation of physical transmission right (PTR).** Physical Transmission Right (PTR) is limited through proportional limiting physical transmission right (PTR) on relevant cross-border line for all traders within day, month or year basis.
- **Countertrading.** Implies activation of electricity transmission to relevant electricity system with symmetric volume and in opposite direction, on the basis of an agreement between TSO and neighbor country electricity system operator.
- **Last-resort instruction**
    - increase of generated capacity of the power plant which is not included in relevant merit order list or whose sold balancing product relevant to increase is exhausted;
    - restriction of power plant generation or consumers load not included in the merit order list, or whose sold balancing product relevant to reduction is exhausted.

Last-resort instruction can be carried out, i.a. via load-shedding. Forms of load-shedding are:

- Automatic load-shedding by frequency relays. Automatic under-frequency load shedding relays are installed at designated substations with the capability of disconnecting 2 ÷ 5 % of system demand on each step (minimum numbers of steps are 21in Winter and 23 in Summer), triggered at an initial frequency of 49.2 Hz in Summer and 49 Hz in Winter.
- Manual load-shedding applied by the dispatch centers (separate chapter).

3.1.11. Framework for manual load shedding

The National Control Centre (NCC) of GSE receives the list of all customers from the Distribution System Operators that are subject to manual load shedding in a state of emergency.

The provided list also indicates the portion of the demand to be disconnected categorized according to the regions of Georgia (in case such categorization is applicable). NCC has the authority and possibility to give instructions to DSOs to perform manual load shedding with or without considering the geographic areas.

3.1.12. Mechanisms used to inform the public

The Ministry, in consultation with the GSE, is committed to ensuring that the public is well-informed and prepared during an electricity crisis. By utilizing a multi-channel communication approach and engaging with community stakeholders, the Ministry aims to foster cooperation, enhance public safety, and minimize the impact of the crisis. The Ministry informs the public about electricity crises in accordance with its internal regulations governing the procedure for the dissemination of information in crisis situations. Communication with the media is coordinated by the Public Relations Department, with all communications being handled by the designated official responsible for media relations.

3.2 REGIONAL AND BILATERAL PROCEDURES AND MEASURES

According to Article 12 of the *Risk-preparedness Regulation* [3], the bilateral or regional measures shallbe agreed within the Energy Community Region.

Additional options are brought up from the assumption that the relevant region should be synchronized and/or, in a broader sense, a country in the region should have the technical ability to provide or exchange (regionally, or bilaterally with Georgia) mutual assistance in case of electricity crisis. This provides an opportunity to exploit the cross-border cooperation with a country in the regionon certain threats and scenarios that would allow such an exchange.

4. CRISIS COORDINATOR

Pursuant to Article 8(4)(D) of the Rules for Security of Electricity Supply [7], the role of Crisis Coordinator in Georgia is dedicated to the Inter-institutional Group for Energy Security (IGES).

The objectives, roles, responsibilities and composition of the IGES is provided by the sub-chapter 2.3 of this Plan.

5. STAKEHOLDER CONSULTATIONS

Establishment and implementation of the Risk-preparedness Plan is a responsibility of the CompetentAuthority, which is Ministry of Economy and Sustainable Development of Georgia (MoESD). In this process necessary consultations have been also conducted with DSOs (TELASI, ENERGOPRO), TSO (GSE), relevant producers, suppliers or trade bodies, significant electricity network users, electricity and natural gas undertakings, the relevant organizations that represent the interests of industrial and non– industrial electricity customers, and the energy and water supply regulatory authority of Georgia (GNERC).

6. EMERGENCY TESTS

The defined measures, procedures and activities of the Risk-preparedness Plan are subject to testing,in order to confirm their applicability, effectiveness and efficiency. The testing is performed at nationallevel and, as much as applicable, on bilateral / regional level.

The testing as activity and measure belongs to the planning measures and has substantial riskmitigation impact.

The tests are performed following the relevant EU legislation and applied procedures for emergency testing enforced in the EU Network Codes and Guidelines[9].

6.1. NATIONAL EMERGENCY TESTS

According to the Georgian Grid Code, system emergency trainings for operational staff of TSO and DSOs are performed in simulation exercises to check the level of training of dispatchers and to study the methods of restoration of the power system in case of emergency situations. In particular, **Article 47** of the Grid Code [12] defines the rules for emergency training and testing to be applied by TSO.

To develop skills for optimum management of emergency modes, avoidance of disconnection of electricity system, rapid restoration of disconnected electricity system and rapid, safe elimination of emergency mode with minimum losses, TSO conducts emergency training, which covers:

- system emergency exercise;
- dispatchers testing.

System emergency training is conducted with such regularity, that ensures at least once-a-year participation of each member of the operational staff, who may face, under actual conditions, the challenge of eliminating emergency mode. Emergency training programs is approved by TSO. Emergency training program reflects pre-accidentmode, accident creation and development. System emergency exercise considers system restoration from a blackout state – the “worst” operational state.

Testing of dispatchers is carried out once in a quarter. By such testing, knowledge of various dispatching matters by TSO operational dispatchers is examined.

6.2. REGIONAL AND BILATERAL EMERGENCY TESTS

Regional emergency tests haven't been performed and planned for the near future.

[9] Not all ENTSO-E Network Codes and Guidelines are obligatory for Georgia at the moment. Only Connection Codes are mandatory in the Energy Community (to be applied with specific parameters), the remaining Codes and Guidelines are in process of adoption. Additionally, Georgia is exempted from certain regulations or provisions until its direct synchronization with the Continental Europe synchronous area.

ANNEX I – INITIATING EVENTS (Hazards that could initiate a crisis scenario)

The following hazards are identified as potential initial events pursuant to Article 4 and Appendix II ofthe Methodology [4] and Article 5(2) of the Risk-preparedness Regulation [1]. They are relevant for thedeveloping of both national and regional crisis scenarios. The list is neither mandatory nor exhaustive,but applied as a minimum source of references.

Table I-1 – Network hazards

1. Rare and extreme natural hazards	
a)	Flooding
b)	Drought and associated water shortage
c)	Extreme weather (storms, extreme winds, ice storms, snowfall, heavy precipitation,hurricanes, cold spells, heat waves)
d)	Forest fire
e)	Seismic and volcanic activities
f)	Infectious threats, pandemics
g)	Space weather hazards
2. Accidental hazards going beyond the N-1 criterion, and exceptional contingencies	
a)	Simultaneous failure of multiple grid elements
b)	Accidental (unintended) violation of N-1 criterion due to human error: i) Error during operation ii) Failure or omission during maintenance Substandard quality of a series of manufactured grid elements
3. Consequential hazards including consequences of malicious attacks and fuel shortages	
a)	Malicious attacks i) Terrorism / sabotage ii) Cyberattack Manipulation of the market
b)	Disruption of fuel supply for electricity generation
c)	Non electricity-related industrial accident (chemical spill, collapse, explosion, gas leak, radiation, transport disruption)
d)	Non electricity– related critical infrastructure disruption (water / food supply, garbage / sewage collection, fuel supply – excluding fuels for electricity production,telecommunications)
e)	Electricity market failure with significant impact in security of supply (speculation orfailure of one or more stakeholders to meet its/their obligations)
f)	Nuclear / radiological accident

ANNEX II – RISK ASSESSMENT CRITERIA (Scenario rating scales)

The Methodology for Identification of Regional Electricity Crisis Scenarios [4] in its Annex I provides the generic metrics for rating and comparison of the crisis scenarios. The same metrics is embedded in the Risk Assessment Methodology of Georgia [8] and applied in the assessment and classification of the national crisis scenarios provided in the GSE Report on electricity safety risks and crisis scenarios [5], and the Description of the crisis scenarios [6].

Each scenario is rated according to the categorization of the risk as a combination of two scales – for its *likelihood* and *impact*. The applied [numeric] five-step criteria and [descriptive] category values foreach scale are provided in Table II-1 and Table II-2 respectively.

The two scales for likelihood assessment in Table II-1 (number of "Events per year" and period of "Incidence") are equivalent and represent *de facto* a single scale. Provided descriptions provided in Table II-1 are only indicative.

Table II-1 – crisis scenario assessment scale of likelihood

Category	Events per year	Incidence (years)	Description
Very likely	≥ 0,5	≤ 2	expected every second year or less (winds, storms, snow, forest fire)
Likely	0,2 – 0,5	2 – 5	expected once in several years (heat wave, droughts, low water level, cold spell, equipment failures)
Possible	0,1 – 0,2	5 – 10	expected quite rarely or considered as potential threat(cyber-attack, natural disaster, torrents) – causing disturbance in
Unlikely	0,01 – 0,1	10 – 100	very rare event (large flood, mudslide, simultaneous incidents) – causing unavailability of infrastructure
Very unlikely	≤ 0,01	≥ 100	Event considered extremely rare or irrelevant (earthquake, nuclear disaster, explosions) – causing huge destruction of the infrastructure

The two scales for impact assessment applied in Table II-2 are mutually complementary, use different criteria and work independently – both criteria are needed in order to complete the assessment. Theyinclude:

- **EENS** [%] – **Expected** [percentage of] **Energy Not Served** is calculated as the expected energy (electricity) not served [due to the crisis scenario] divided by the estimated total annual amount of energy consumed
- **LOLE** [hours] **– Loss Of Load Expectation** is the number of hours in which, in the given zone [MSor Georgia] resources are insufficient to supply the (electricity) demand [due to the crisis scenario

Table II-2 – regional crisis scale of impact

Category	EENS (% of annual demand)	LOLE (hours)
Disastrous	≥ 0,25%	≥ 168
Critical	≥ 0,05% and < 0,25%	≥ 48 and < 168
Major	≥ 0,01% and < 0,05%	≥ 12 and < 48
Minor	≥ 0,002% and < 0,01%	≥ 3 and < 12
Insignificant	< 0,002%	< 3

The Category value in Table II-2 refers to either one of the two parameters (EENS or LOLE). By their combination, the two parameters define a **combined scale** of 25 [5 x 5] levels of the crisis scenarios impact rating.

The aggregated crisis scenario **rating grid** to be applied at national level, as provided by the Methodologies ([4], [8]), is obtained from the *combined impact scale* (25 levels) cross-referenced by the *likelihood assessment scale* (5 levels), with the assessment domain applying the same 5-level metrics of the impact category pattern. The rating grid is common for each country and national scenario. It is provided in Table II-3.

Table II-3 – Crisis scenario rating grid

Impact		Likelihood				
EENS	**LOLE**	**Very likely**	**Likely**	**Possible**	**Unlikely**	**Very unlikely**
Disastrous	Disastrous	Disastrous	Disastrous	Critical	Major	Minor
Disastrous	Critical	Disastrous	Critical	Critical	Major	Minor
Critical	Disastrous	Disastrous	Critical	Critical	Major	Minor
Disastrous	Major	Disastrous	Critical	Major	Major	Minor
Major	Disastrous	Disastrous	Critical	Major	Major	Minor
Disastrous	Minor	Disastrous	Critical	Major	Major	Minor
Minor	Disastrous	Disastrous	Critical	Major	Major	Minor
Disastrous	Insignificant	Disastrous	Critical	Major	Major	Minor
Insignificant	Disastrous	Disastrous	Critical	Major	Major	Minor
Critical	Critical	Disastrous	Critical	Major	Minor	Minor
Critical	Major	Critical	Critical	Major	Minor	Minor
Major	Critical	Critical	Critical	Major	Minor	Minor
Critical	Minor	Critical	Major	Major	Minor	Minor
Minor	Critical	Critical	Major	Major	Minor	Minor
Critical	Insignificant	Critical	Major	Major	Minor	Minor
Insignificant	Critical	Critical	Major	Major	Minor	Minor
Major	Major	Critical	Major	Major	Minor	Insignificant
Major	Minor	Major	Major	Minor	Minor	Insignificant
Minor	Major	Major	Major	Minor	Minor	Insignificant
Major	Insignificant	Major	Major	Minor	Minor	Insignificant
Insignificant	Major	Major	Major	Minor	Minor	Insignificant
Minor	Minor	Major	Minor	Minor	Insignificant	Insignificant
Minor	Insignificant	Major	Minor	Minor	Insignificant	Insignificant
Insignificant	Minor	Major	Minor	Minor	Insignificant	Insignificant
Insignificant	Insignificant	Minor	Minor	Insignificant	Insignificant	Insignificant

In order to enable extension to *cross-border* impact assessment of a crisis scenario the descriptive rating categories of the rating grid are assigned numerical values indicated in Table 4.

Table II-4 – numerical values of the crisis scenario rating grid categories

Category	Value
Disastrous	10
Critical	5
Major	2
Minor	1
Insignificant	0

Furthermore, the Methodologies define the metrics for *cross-border dependency* – impact of the crisisscenario in the incumbent country on one or more other countries (neighbouring or not), applicable to specific national crisis scenarios. The three-level scale (descriptive category and numeric value of the impact factor) is provided in Table II-5.

Table II-5 – cross-border dependency rating of national crisis

Category	Value (N)	Description
None	1	No impact on other countries even in case of simultaneous crisis
Major	1,2	The crisis can potentially aggravate a simultaneous crisis in at least oneother country (through directly or indirect causes)
Minor	2	The crisis can potentially generate a cross-border crisis in at least oneother country (through directly or indirect causes)

Cross-border dependency rating value (factor) of a crisis scenario assessed by a country is the same and the impact is equal applicable on all countries in the region (neighbouring or not). Different countries may have different rating values for the same crisis scenario.

The overall **national rating** of a crisis scenario (numerical value) is estimated as product of the numerical value of the national crisis scenario rating (Table II-4) and the cross-border crisis dependencyrating (Table II-5) for the same scenario.

The **regional** [bilateral] **rating** of a crisis scenario (numerical value) is estimated as the sum of the overall national rating values of all [both] countries in the designated region.

ANNEX III – REFERENCE DOCUMENTS AND LEGISLATION

[1] **Regulation (EU) 2019/941** of 5 June 2019 on risk-preparedness in the electricity sector andrepealing Directive 2005/89/EC – [https://eur-lex.europa.eu/legal- content/EN/TXT/PDF/?uri=CELEX:32019R0941&rid=9];

[2] **Decision No 2021/13/MC-EnC** of 30 November 2021 of the Ministerial Council of the Energy Community amending Annex I to the Treaty Establishing the Energy Community and incorporating Directive (EU) 2019/944 and Regulation (EU) 2019/941 in the Energy CommunityAcquis Communautaire – [https://www.energy-community.org/dam/jcr:3304cadf-c63b-433f– 9636-79d9ec63b186/Decision%202021-13-MC-EnC.pdf];

[3] **Risk-preparedness Regulation**, (**RpR**) – Regulation (EU) 2019/941 as adapted and adopted bythe Ministerial Council Decision 2021/13/MC-EnC [2], and incorporated in the Energy Community acquis communautaire since 30 November 2021 – [https://www.energy– community.org/dam/jcr:fafd34a1-3e1f-48a7-a8fb-074c8c1fd81a/RegulationEU2019_941.pdf];

[4] **Methodology for Identifying Regional Electricity Crisis Scenarios** – developed by ENTSO-E in accordance with Article 5 of Regulation (EU) 2019/941 [1], and adopted by the Decision of ACER No 07/2020 of 6 March 2020 – [https://extranet.acer.europa.eu/Official_documents/Acts_of_the_Agency/Individual%20decisions%20Annexes/ACER%20Decision%20No%2007-2020_Annexes/ACER%20Decision%2007-2020%20on%20RPR%20ART%205%20-%20Annex%20I.aspx];

[5] **Report on electricity safety risks and crisis scenarios** [of Georgia]– developed by the GeorgianState Electrosystem (GSE) pursuant to Article 4 of the Rules on Security of Electricity Supply [7], and published in 2021 – [restricted access];

[6] **Description of the crisis scenarios** [of Georgia] – developed by the Georgian State Electrosystem (GSE) as a complementary document to the Report on electricity crisis scenariosof Georgia [5] – [restricted access]

[7] **Rules for Security of Electricity Supply** – developed by the Ministry of Economy and Sustainable Development of Georgia pursuant to Articles 132(2)(d) and 167(3) of the Law of Georgia on Energy and Water Supply [8], and approved by the Order of the Ministry No 1/520of 2 December 2020 – [https://www.matsne.gov.ge/ka/document/view/5043284?publication=0];

[8] **Risk Assessment Methodology of Georgia** – Methodology for identifying and assessing electricity security risks and emergency scenario – developed pursuant to Article 4 and published as ANNEX 1 of the Rules on Security of Electricity Supply [7], and approved by theMinistry of Economy and Sustainable Development in November 2019 – [https://www.matsne.gov.ge/ka/document/view/5043284?publication=0];

[9] **Law of Georgia on Energy and Water Supply** – adopted in December 2019, amended [consolidated 22.12.2021: https://matsne.gov.ge/ka/document/view/4747785?publication=6]

[10] **Security of Supply Statement of Georgia** – adopted and published in 2021 by the Ministry of Economy and Sustainable Development of Georgia [http://www.economy.ge/uploads/files/2017/energy/security_of_supply_statement_electricity/security_of_supply_statement_electricity_2021_eng.pdf];

[11] **Ten-Year Network Development Plan of Georgia 2023-2033** – endorsed by the Government and approved by the Minister of Economy and Sustainable Development of Georgia in March 2023 [https://www.gse.com.ge/sw/static/file/TYNDP_GE-2023-2033_ENG_corr.PDF];

[12] **Transmission Grid Code** – published by GSE [https://www.gse.com.ge/sw/static/file/2._qselis-tsesebi-12.01.22.pdf];

[13] **Rules for Preparation of an Emergency Management Plan** – adopted by Resolution No. 452 ofthe Government of Georgia of October 6, 2017 [https://matsne.gov.ge/ka/document/view/3824628?publication=0]