Data open within ENTSO-E

Methodology for Identifying Regional Electricity Crisis Scenarios

in accordance with Article 5 of Regulation (EU) 2019/941 of the European Parliament and of the Council on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC

FOR PUBLIC CONSULTATION | 5 April 2023

From: Working Group Risk Preparedness

Table of Contents

[Data open within ENTSO-E 1](#_Toc132289023)

[Methodology for Identifying Regional Electricity Crisis Scenarios 1](#_Toc132289024)

[in accordance with Article 5 of Regulation (EU) 2019/941 of the European Parliament and of the Council on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC 1](#_Toc132289025)

[FOR PUBLIC CONSULTATION | 5 April 2023 1](#_Toc132289026)

[From: Working Group Risk Preparedness 1](#_Toc132289027)

[Table of Contents 2](#_Toc132289028)

[Whereas 4](#_Toc132289029)

[TITLE 1 7](#_Toc132289030)

[General provisions 7](#_Toc132289031)

[Article 1 Subject matter and scope 7](#_Toc132289032)

[Article 2 Definitions and interpretation 7](#_Toc132289033)

[Article 3 Cross-border dependencies 8](#_Toc132289034)

[Article 4 Initiating events 9](#_Toc132289035)

[Article 5 Requirements for an electricity crisis scenario 10](#_Toc132289036)

[Article 6 TSOs’ obligation to provide information to ENTSO-E and relevant RCC(s) to support scenario identification and evaluation 11](#_Toc132289037)

[TITLE 2 12](#_Toc132289038)

[Electricity crisis scenario evaluation methods 12](#_Toc132289039)

[Article 7 Evaluation of electricity crisis scenarios 12](#_Toc132289040)

[Article 8 Methods for the evaluation of the likelihood and impact of a crisis 13](#_Toc132289041)

[Article 9 Evaluation of cross-border dependencies 13](#_Toc132289042)

[TITLE 3 15](#_Toc132289043)

[Methodology outline 15](#_Toc132289044)

[Article 10 Revision of existing regional electricity crisis scenarios and identification of new scenario candidates 15](#_Toc132289045)

[Article 11 Steps for establishing the relevance of regional electricity crisis scenarios 17](#_Toc132289046)

[Article 12 Identification of regional electricity crisis scenarios 18](#_Toc132289047)

[Article 13 Evaluation of regional electricity crisis scenarios at a national level 19](#_Toc132289048)

[Article 14 Ranking of electricity crisis scenarios 21](#_Toc132289049)

[Article 15 Reporting of the most relevant regional electricity crisis scenarios 23](#_Toc132289050)

[Article 16 Review 24](#_Toc132289051)

[TITLE 4 25](#_Toc132289052)

[Final provisions 25](#_Toc132289053)

[Article 17 Handling of sensitive information 25](#_Toc132289054)

[Article 18 Publication of the methodology 26](#_Toc132289055)

[Article 19 Language 26](#_Toc132289056)

[Appendix I: Scenario rating scales 27](#_Toc132289057)

[I.1 Crisis likelihood scale 27](#_Toc132289058)

[I.2 Crisis impact scales 28](#_Toc132289059)

[I.3 Crisis scenario risk rating at the Member State level 28](#_Toc132289060)

[I.4 Cross-border dependency rating 30](#_Toc132289061)

[I.5 Example of regional scenario rating 31](#_Toc132289062)

[Appendix II: Hazards that could initiate an electricity crisis scenario (initiating events) 32](#_Toc132289063)

[Appendix III: Electricity crisis scenario description templates 34](#_Toc132289064)

[III.1 Description of electricity crisis scenario candidate 34](#_Toc132289065)

[Checklist to use for a comprehensive description of the electricity crisis scenario candidate 36](#_Toc132289066)

[III.2. Description of regional electricity crisis scenarios by ENTSO-E 38](#_Toc132289067)

[III.3. Evaluation of national impact of the regional electricity crisis scenarios 39](#_Toc132289068)

[Checklist to consider for a comprehensive impact evaluation of a regional electricity crisis scenario 40](#_Toc132289069)

Whereas

* + 1. This document is a methodology developed by the European Network of Transmission System Operators for Electricity (hereafter referred to as ’ENTSO-E’) for identifying regional electricity crisis scenarios in accordance with Article 5 of the REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC (‘RP Regulation’) establishing appropriate tools to prevent, prepare for and manage electricity crisis situations. It is hereafter referred to as the ‘methodology’.
    2. The methodology has been developed by ENTSO-E, in cooperation with the TSOs and the Regional Coordination Centres (RCCs). It takes into account the general principles and goals set in the RP Regulation as well as the relevant EU legal framework, in particular:
       - Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU, (OJ L 158, 14.6.2019, p. 125–199). (‘Electricity Directive’);
       - Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity, (OJ L 158, 14.6.2019, p. 54–124). (‘Electricity Regulation’) hereafter ‘Electricity Regulation’;
       - Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation, (OJ L 220, 25.8.2017, p. 1–120).[...] (‘SO GL’);
       - Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators, (OJ L 158, 14.6.2019, p. 22–53).(‘ACER Regulation’)
       - Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union, (OJ L 194, 19.07.2016, p. 1-30. (‘NIS Directive’);
       - Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration, (OJ L 312, 28.11.2017, p. 54–85). (‘Network code on emergency and restoration’);
       - Regulation (EU) 2017/1938 on measures to safeguard security of gas supply to ensure consistency with the gas disruption scenarios, (OJ L 280, 28.10.2017, p. 1–56);
       - Commission Recommendation (EU) 2017/1584 of 13 September 2017 on coordinated response to large-scale cybersecurity incidents and crises;
       - Commission Recommendation (EU) 2019/553 of 3 April 2019 on cybersecurity in the energy sector;
       - Commission Recommendation (EU) 2019/554 of 26 March 2019 Cybersecurity of 5G networks ;
       - Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection (OJ) L345, 23.12.2008, P.75-82) (‘European Critical Infrastructure Directive’); and
       - Decision No 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism (OJ L 347, 20.12.2013, p 924-947).
    3. The goal of the RP Regulation is to ensure the most effective and efficient risk preparedness within the Union. To this end, the RP Regulation aims at building trust between Member States by ensuring coherence of risk evaluations in a crisis situation. A common approach in identifying risk scenarios is needed at regional and national levels to achieve coherence. The first step toward common approach is the identification of scenarios at regional level which shall be achieved by applying this methodology prepared by ENTSO-E. The objective in the development of these regional electricity crisis scenarios is to provide adequate information that will allow the creation of effective risk preparedness plans.
    4. Once adopted, ENTSO-E shall use the methodology to identify the most relevant electricity crisis scenarios at regional level (including cross-border dependencies) and update the regional electricity crisis scenarios at least every four years as required by Article 6 of the RP Regulation. The national electricity crisis scenarios shall be identified on the basis of at least the risks referred to in Article 5(2) RP Regulation and shall be consistent with the regional electricity crisis scenarios identified in accordance with Article 6(1) RP Regulation, as required by Article 7 of the RP Regulation. Consequently, national competent authorities will use the regional crisis scenarios for establishing risk preparedness plans as required by Article 10 of the RP Regulation. For the sake of clarity, it is stated that ultimately Article 7 of the RP Regulation lays down the legal requirements for the national scenarios that the competent authorities shall adopt and that this methodology does not intend to go beyond or contradict those requirements.
    5. Mitigation of the electricity crises and their cross-border impact is outside the scope of this methodology. This mitigation falls into the scope of the risk preparedness plans to be established by competent authorities in accordance with Article 10 of the RP Regulation.
    6. The identification of electricity crisis scenarios at a regional level requires close cooperation between ENTSO-E and stakeholders as defined in Article 6 of the RP Regulation.
    7. Where applicable, model-based simulation of electricity crisis scenarios supports a consistent impact assessment at country level and of cross-border dependencies, which is particularly relevant in simultaneous regional crisis scenarios with cascading effects.
    8. In particular, the TSOs and RCCs play an important role to support ENTSO-E in the identification of crisis scenarios at a regional level. In this task, TSOs may seek support from the Member States’ competent authorities in the identification of all candidate risks to the electricity system at a national level, following the bottom-up approach of the methodology. TSOs, in accordance with this methodology, should be supported by RCCs, whose role is to ensure consistency among countries in the identification, assessment of cross-border dependencies and impact on the system operation region(s) (SORs) which they are designated to
    9. The Members States’ competent authorities should also establish effective cooperation with other relevant authorities in the Member State to ensure an integrated approach to the risks of the electricity system. With a view of obtaining all the relevant information for regional scenarios developed by ENTSO-E, the methodology assumes adequate information sharing at national level. This is understood to include among others, the competent authorities consulting with other authorities, at least, the national authorities implementing Council Directive 2008/114/EC (European Critical Infrastructure Directive), the national authorities in charge of the networks and information system security under the Directive (EU) 2022/2555 (‘NIS2 Directive’), and where appropriate, the national defence authorities.
    10. In accordance with Article 6 (1) of the RP Regulation, ENTSO-E may request RCCs for their support in the identification of regional electricity crisis, specifically in relation to assessment of cross-border dependencies and impact on the system operation region(s) in which they are performing their tasks.
    11. In accordance with Article 3 (3) of the RP Regulation, Member States may allow the competent authority to delegate the operational tasks regarding risk-preparedness planning and risk management to other bodies.

SUBMITS THE FOLLOWING METHODOLOGY TO THE AGENCY:

TITLE 1

General provisions

Article 1   
Subject matter and scope

1. This methodology has been developed in accordance with Article 5 of the RP Regulation. The Appendices constitute an integral part of this methodology and shall be read together with its provisions. This methodology shall establish the process for identification of the most relevant regional electricity crisis scenarios and provides guidance and defines roles and responsibilities of all concerned entities.

Article 2   
Definitions and interpretation

1. For the purpose of this document, the definitions in Article 2 of the RP Regulation shall apply.
2. The following additional definitions shall also apply:
   1. ‘likelihood’ means a chance of something happening;
   2. ‘impact’ means an evaluated consequence of a particular scenario;
   3. ‘risk rating’, or ‘risk’, means the combination of the likelihood and impact ratings of an electricity crisis scenario;
   4. ’expected energy not-served’ (EENS) in a given zone (Member State) and in a given time period (duration of load curtailment due to the electricity crisis scenario), energy which is expected not to be supplied due to insufficient resources to supply demand;
   5. ’expected energy not-served percentage’ (or EENS%) is calculated by dividing the expected energy not served by the estimated total annual energy consumption of a Member State;
   6. ’Energy consumption of a Member State’ is a sum of electricity consumption over control areas of all TSOs operating in that Member State;
   7. ’loss of load expectation’ (or LOLE) represents the expected number of hours, in a given zone (Member State), during which resources are insufficient to supply the demand due to the electricity crisis scenario. This indicator of the impact estimated for each specific crisis scenario should not be compared to “LOLE target”, which is the basis of the reliability standard definition used to indicate the necessary level of security of supply of a Member State;
   8. ‘electricity crisis scenario’ means a description of an initiating event or a chain of events that will (or is expected to) lead to a deterioration of security of supply of electricity affecting community or whole society. An electricity crisis scenario may include more than one region or subgroup defined by Member States or may include parts of two or more regions or subgroups;
   9. ‘regional electricity crisis’ means a present or imminent situation in which more than one Member State has declared an electricity crisis at the same time (simultaneous crisis in two or more Member States);
   10. ‘electricity crisis scenario candidate’ is an electricity crisis scenario identified by TSOs to have an impact on at least one other Member State and therefore have the potential to form a ‘regional electricity crisis scenario’;
   11. ‘critical grid situation’ is a potential emergency state, c.f. SOGL article 18(3), identified in the operational planning phase, when all the available regular countermeasures (Remedial Actions) are exhausted and therefore TSOs are required to take regionally coordinated extraordinary countermeasures.
   12. ‘initiating event’ is an event which has potential to initiate the electricity crisis; the initiating event can be momentary and can be significant enough to cause the electricity crisis by itself or can cause a critical grid situation or lead to an existing critical grid situation to become an electricity crisis.

Article 3   
Cross-border dependencies

1. Cross-border dependencies shall be identified both in regional electricity crisis scenarios and in electricity crisis scenario candidates.
2. In order to be identified as a cross-border dependency within the meaning of this article, the cross-border dependency shall be deemed likely to initiate a crisis or aggravate the situation in other Member States.
3. When identifying cross-border dependencies the following categories shall be assessed:
   1. Dependencies that result as a direct impact of a crisis on other Member States, for reasons such as unavailability of several (beyond N-1) interconnectors or internal lines in close electrical proximity, unavailability of generation or lack of adequacy;
   2. Dependencies that result as an indirect impact of a crisis on other Member States, either:
      1. Consequences in one Member State due to remedial actions and/or mitigating measures taken by another Member State in crisis; or
      2. Actions taken in one Member State following a request by a Member State in crisis with a significant negative impact on a third Member State, such as re-planning or cancellation of maintenance work or change of generation schedule in accordance with the relevant Articles of the SO GL, in particular Articles 20, 21, 22 and 23.
4. Cross-border dependencies shall be evaluated in accordance with Article 9.

Article 4   
Initiating events

In accordance with Article 5(2) of the RP Regulation, potential initiating events for electricity crisis scenarios shall be based on at least the following hazards:

1. rare and extreme natural hazards;
2. accidental hazards going beyond the N-1 security criterion, and exceptional contingencies;
3. consequential (cascading) hazards including consequences of malicious attacks and of fuel shortages.

As a basis to identify initiating events, the above list of hazards has been expanded in Appendix II. At least the hazards contained in Appendix II need to be considered as possible initiating events in developing regional electricity crisis scenarios.

Article 5   
Requirements for an electricity crisis scenario

1. Each electricity crisis scenario candidate and regional electricity crisis scenario shall fulfil the following quality criteria:
   1. it is specific enough for each TSO to individually, qualitatively or quantitatively describe the consequences in the TSO’s Control Area;
   2. Qualitatively or quantitatively describes the cross-border impact on the electricity grid, electricity market and fuel availability in neighbouring countries and system operation region(s) to which the TSO is assigned;
   3. it allows for the creation of a risk preparedness plan, including preventive and mitigating measures;
   4. its symptoms shall be observable, so that it is possible to execute risk preparedness plans.
2. The scenario description shall be precise and consistent. It shall consist of at least:
   1. a description of the initial condition of the electricity system relevant to the scenario;
   2. a list of initiating event(s) and a chain of event(s);
   3. List of vulnerabilities that make the electricity system prone to suffer the impact of the initiating event; The listed vulnerabilities should be on a general level, for example, fuel shortage or extreme weather, to support Member States in their creation of national risk preparedness plans;
   4. Potential measures that mitigate the relevant risk, including their national or regional dimension and its expected contribution to cope with the impact;
   5. season(s) of the year when the scenario is relevant and type of load;
   6. the evolution of the crisis scenario, including the analysis of root causes that lead to this evolution;
   7. the most likely impacts of the scenario, including, if applicable, past reference crises, and in terms of the electricity system and potential consequences, (including potential impact on critical infrastructure – this could be restricted to internal use), based on quantitative analysis;
   8. cross-border dependencies and / or regional impacts;
   9. if applicable, quantitative data expressed as ranges for all the items above; and
   10. other important information related to the scenario, relevant to managing it including the information related to historical events and results of the post-operation and post-disturbances analysis task performed by RCCs.

Article 6   
TSOs’ obligation to provide information to ENTSO-E and relevant RCC(s) to support scenario identification and evaluation

1. Each TSO shall share scenario information — including sensitive information — with ENTSO-E and RCC(s) of the system operation region(s) which they are assigned to in accordance with national and EU policies and legislation concerning handling of sensitive information.
2. Information provided to ENTSO-E and relevant RCC(s) shall be detailed enough to enable ENTSO-E and RCCs to identify the regional electricity crisis scenarios, as referred to in Article 12. ENTSO-E and RCCs are entitled to request more details where it deems that the information provided is insufficient to identify the regional electricity crisis scenarios.
3. TSOs shall take into account the checklists of information contained in Appendix III when evaluating scenarios.
4. Information which is already shared between TSOs, RCCs, ENTSO-E, regulatory authorities and other third parties to ensure operational or planning tasks in accordance with the requirements of the SO GL, NC ER and other regulations shall not be considered as sensitive information as described in Article 17.

TITLE 2

Electricity crisis scenario evaluation methods

Article 7   
Evaluation of electricity crisis scenarios

1. The evaluation of the electricity crisis scenario likelihood shall consider at least the following elements:
   1. the expected frequency of occurrence of an initiating event (or a combination of multiple initiating events); and
   2. the likelihood of each crisis scenario ranges from “extremely unlikely” to “very likely”, corresponding to a quantitative likelihood range, as shown in Appendix I.1 – Crisis likelihood scale.
   3. the derivation of the likelihood classification shall be documented allowing for retracing when the analysis is updated or verified.
2. The evaluation of the direct operational impact of a given electricity crisis scenario shall include at least the following elements:
   1. the impact estimated for each defined crisis scenario as a result of simulation based on models (where possible) in terms of the expected energy not served percentage (EENS%) and loss of load expectation (LOLE);
   2. the classification derived from previous impact assessment (ranging from “insignificant” to “disastrous”), as defined in Appendix I.2. EENS% and LOLE shall be classified independently; and
   3. the derivation of the impact classification shall be documented allowing for retracing when the analysis is updated or verified.
3. Electricity crisis scenarios are evaluated using the classification of likelihood and impact described in paragraphs 1 and 2. The overall crisis scenario risk rating is determined according to the table shown in Appendix I.3. The electricity crisis scenario risk rating, ranging from ‘low’ to ’extremely high’, is evaluated by combining the operational impact rating (resulting from EENS% and LOLE evaluation) and likelihood rating;
4. This crisis scenario risk rating, in combination with the cross-border dependency rating described in Article 9 and Appendix I.4, are used for the identification of regional electricity crisis scenarios, as described in Article 12.
5. ENTSO-E should provide guidance for a harmonized evaluation of the elements mentioned in Paragraph 1 of this article and Article 5.

Article 8   
Methods for the evaluation of the likelihood and impact of a crisis

1. During electricity crisis scenario evaluation, a quantitative or qualitative method of evaluating the likelihood and impact of a crisis shall be used. A quantitative method, based on available models and data, should be favoured over a qualitative approach that often relies on expert judgement techniques. ENTSO-E may propose the use of a scenario-specific method (or methods) for evaluating the likelihood and impact measures relevant to the particular scenario and the nature of its uncertainty when appropriate.
2. Until appropriate methods and tools become available, the TSOs shall evaluate the likelihood and impact of a crisis for their Member State using the best method available to them at the time of evaluation (favouring model-based simulations whenever possible).

Article 9   
Evaluation of cross-border dependencies

1. For each electricity crisis scenario described, the TSOs shall analyse the cross-border dependencies in coordination with other impacted TSOs and RCC(s) of the system operation region(s) they have been designated to with taking into account:
   1. Direct impact of a crisis on other TSO’s control area for events such as loss of multiple interconnectors or internal lines of cross-border importance, loss of significant generating units and/or critical loads, lack of adequacy.
   2. Indirect impact of a crisis by applying remedial actions and/or mitigating measures with the cross-border significance whether acting on generation, load, net transfer capacity and/or grid topology.
2. The evaluation shall be done through two perspectives:
   1. as an aggravating input for the scenario, for example, if the crisis prevents other TSOs from offering necessary support, either in active or reactive power, through countertrading or redispatching;
   2. as a national output of the regional electricity crisis scenario, for example, if the crisis prevents the TSO from offering support to other TSOs, either in active or reactive power, through counter trading or redispatching.
3. The two aspects described in paragraph 1 shall be included in the description of scenarios following Appendix III.3. Cross-border dependencies shall be considered as aggravating factors and thus shall be included in the relevance rating of the regional electricity crisis scenarios, as defined in Appendix I.4. A general overall rating of the strength of the cross-border dependencies is to be evaluated in accordance with Appendix I.4.
4. RCC(s) of the TSOs’ system operation region(s) shall provide them with assistance in simulation and analysis of cross-border dependencies, which will, depending on the scenario, be based on the data provided by the TSOs.
5. RCC(s) may use or adapt already existing tools, datasets and methods that are used in provision of other RCC tasks, such as but not limited to common grid model, coordinated security analysis, short-term and seasonal adequacy and operational planning coordination.

TITLE 3

Methodology outline

Article 10   
Revision of existing regional electricity crisis scenarios and identification of new scenario candidates

1. To initiate or update regional electricity crisis scenarios in accordance with Article 16, ENTSO-E shall send a request to TSOs and RCCs for the identification of electricity crisis scenario candidates. In its request, ENTSO-E shall:
   1. list the existing regional electricity crisis scenarios;
   2. propose amendments to the existing regional electricity crisis scenarios, requesting that these are revised to address:
      * 1. what might be unclear or ambiguous in their description; and
        2. what additions or changes are required.
        3. additional requirements identified in Article 5
   3. request the identification of new electricity crisis scenario candidates, where these are not addressed by the existing regional scenarios.
2. Electricity crisis scenario candidates shall be determined by the TSO(s) in close cooperation with the national competent authority and RCC(s) of their respective system operation region(s) The identification shall follow a three-step-process consisting of:
   1. the identification of scenarios and their cross-border dependencies with relevant RCC(s),
   2. the description of electricity crisis scenario candidates; and
   3. the submission of electricity crisis scenario candidates to ENTSO-E as laid down in this Article.
3. TSOs who belong to the same Member State shall coordinate and submit a common list of electricity crisis scenario candidates.
4. The TSO(s) shall identify credible electricity crisis scenario candidates based upon, but not limited to, consideration of:
   1. historical electricity crises and incidents that may occur again (both experienced nationally and by other Member States) and results of the post-operation and post-disturbances analysis task performed by RCCs;
   2. available operational expertise and experience on credible future incidents and situations related to lack of system adequacy, degraded system security and/or fuel shortage (see Appendix II. for a list of possible initiating events); and
   3. electricity crisis scenario candidates identified by Member States forming a regional subgroup, if relevant.
5. For each Member State, the TSO(s) shall define electricity crisis scenario candidates and evaluate their cross-border dependencies in close coordination with RCC(s) of their respective system operation region(s) in terms of available capacity for providing, in accordance with Article 3:
   1. energy support;
   2. active power (through redispatching, countertrading, demand-side response, and cross-border exchange of ancillary services);
   3. reactive power (to support system stability).
6. RCC(s) shall assist TSO(s) in assessment of cross-border dependencies in certain scenarios, through a simulations based on the data provided by the TSOs.
7. For each Member State, the TSO(s) shall complete a detailed description of electricity crisis scenario candidates (using the template in Appendix III.1), in close cooperation with the national competent authority. This description shall fulfil the requirements outlined in Article 5.2.
8. For each Member State, the TSO(s) shall submit descriptions of relevant electricity crisis scenario candidates to ENTSO-E within six weeks of receipt of the request. TSO contact information of the authors shall be included in this description.
9. ENTSO-E shall consult with RCCs on the electricity crisis scenario candidates, specifically in relation with cross-border dependencies and regional impacts.
10. ENTSO-E may contact the relevant TSO(s) to clarify the descriptions of electricity crisis scenario candidates. The clarification shall be provided to ENTSO-E without undue delay, and no later than ten working days from the receipt of the request for clarification.

Article 11   
Steps for establishing the relevance of regional electricity crisis scenarios

1. Following the identification of electricity crisis scenario candidates in accordance with Article 10, ENTSO-E shall establish the relevance of regional electricity crisis scenarios through the following steps:
2. carrying out quality and compliance checks to ensure that the minimum required data is completed according to Article 5.2 (Article 12 (1)) and if submissions are considered deficient, asking the relevant TSOs to address the deficiency (Article 12 (2));
3. aggregating the relevant electricity crisis scenario candidates into regional crisis scenarios (Article 12 (4));
4. carrying out a gap analysis performed against the initiating events list (Article 12 (5)) and if necessary, adding any regional electricity crisis scenarios that have been overlooked (Article 12 (6));
5. identifying groups of electricity crisis scenario candidates which can be reasonably expected to coincide in more than one Member State and thus form a simultaneous regional electricity crisis (in accordance with Article 12 (7) a)).
6. preparing a description of the final set of regional electricity crisis scenarios identified (Article 12 (8));
7. submitting the regional electricity crisis scenario template to TSOs (Article 12 (9));
8. collecting the evaluations of the national impact to the regional electricity crisis scenarios (Article 14 (2));
9. ranking the regional electricity crisis scenarios evaluated at national level in accordance with Article 13, following the process described in Article 14 (1);
10. reporting the most relevant regional crisis scenarios according to their ranking, as specified in Article 15.

Article 12   
Identification of regional electricity crisis scenarios

1. Upon collecting the electricity crisis scenario candidates, ENTSO-E shall carry out quality and compliance checks to ensure that the minimum required data is completed according to Article 5(2)
2. In the event national submissions are considered deficient, ENTSO-E shall ask the relevant TSOs to address the deficiency in line with Article 10(8). In the case clarification is not forthcoming, missing information will be resolved by ENTSO-E during the gap analysis as set out in paragraph 6.
3. TSOs who belong to the same Member State shall coordinate and submit a common clarification of electricity crisis scenario candidates.
4. ENTSO-E shall aggregate the relevant electricity crisis scenario candidates into regional crisis scenarios compliant with Article 5. In particular, electricity crisis scenario candidates shall be considered relevant if at least one of the following conditions is fulfilled:
   1. the scenarios are likely to develop simultaneously or consequently by the same initiating event (e.g. a widespread disaster), or by the same combination of initiating events as defined in Article 4; and
   2. the electricity crisis scenario candidates are likely to coincide in time in Member States and have a cross-border relevance as defined in Article 3.
5. Following the aggregation of the relevant electricity crisis scenario candidates into regional electricity crisis scenarios, ENTSO-E shall carry out a gap analysis performed against the initiating events listed in Appendix II in order to determine whether any hazard capable of causing a regional scenario has been overlooked in the electricity crisis scenario candidates.
6. If a relevant regional electricity crisis scenario has been overlooked by the TSOs, it shall be added by ENTSO-E in cooperation with the relevant TSOs, RCCs and stakeholders as defined in Article 6 of the RP Regulation, if necessary. The list of initiating events in Appendix II includes infrastructure and fuel supply disruption scenarios. At least, scenarios related to the natural gas supply disruption shall be considered, as developed by ENTSO-G pursuant to Article 7 of the Regulation (EU) 2017/1938 of the European Parliament and of the Council. Additional scenarios related to interdependent or interconnected infrastructure (e.g. distribution grids, gas, telecommunication, water) may be considered and included where appropriate, by ENTSO-E in cooperation with the relevant Agencies of the European Union, TSOs, the EU DSO Entity and stakeholders as defined in Article 6 of the RP Regulation.
7. ENTSO-E shall identify groups of electricity crisis scenario candidates which can be reasonably expected to coincide in more than one Member State and thus form a simultaneous regional electricity crisis. RCCs may be requested to support in the identification process. Simulations of simultaneous electricity crisis scenarios shall be carried out by:
   1. identifying groups of electricity crisis scenario candidates which can be reasonably expected to coincide and thus form a simultaneous regional electricity crisis;
   2. combining the relevant electricity crisis scenario candidates into regional electricity crisis scenarios; and
   3. evaluating such regional electricity crisis scenarios according to Articles 13 and 14, via model-based simulations when available.
8. Upon concluding on the results of the gap analysis and creation of simultaneous electricity crisis scenarios, ENTSO-E shall prepare a description of the final set of regional electricity crisis scenarios identified in compliance with the template in Appendix III.2.
9. ENTSO‑E shall submit the regional electricity crisis scenario template in Appendix III.2 to TSOs four weeks after the receipt of the completed electricity crisis scenario candidate descriptions to enable assessment in accordance with Article 13.

Article 13   
Evaluation of regional electricity crisis scenarios at a national level

1. Each relevant regional electricity crisis scenario identified in accordance with Article 12, shall be assessed and simulated (to the extent relevant simulation tools are available) at a national level by TSOs, in consultation with the relevant RCCs and close cooperation with the national competent authority. This assessment shall be based on, ENTSO-E guidance for the use of common and comparable data.
2. For each Member State, regarding each relevant regional electricity crisis scenario, the TSO(s) shall assess their risk rating and cross-border dependencies in accordance with Articles 7, 8 and 9.
3. For each Member State, the TSO(s) shall specify the likelihood and the impact on the electricity system of each regional scenario consistent with the rating scales provided (Appendix I), in accordance with paragraphs (1) and (2) of Article 7. TSOs shall collaborate with their competent authority and provide a single evaluation for each electricity crisis scenario. TSOs who belong to the same Member State shall coordinate with other TSOs within the Member State, including use of common and comparable data and information,.
4. The model-based simulations may be introduced gradually, starting with a limited number of scenarios for the first evaluation of regional scenarios following the adoption of this methodology to take account of the difficulties and time required to model certain types of scenarios. RCCs shall support TSOs in assessing cross-border dependencies, ensuring consistency of both data and results.
5. Within six weeks from receiving the regional scenarios for a national impact evaluation, for each Member State, the TSO(s) shall provide to ENTSO-E the completed national impact evaluation template in accordance with Appendix III.3 on the evaluation of national impact to the regional electricity crisis scenarios.

Article 14   
Ranking of electricity crisis scenarios

1. ENTSO-E shall rank the regional electricity crisis scenarios evaluated at national level in accordance with the following process:
   1. gathering the national impact evaluations per Member State (paragraph 2);
   2. checking the consistency of cross-border dependencies (paragraph 2) and addressing any deficiencies (paragraph 3);
   3. evaluating regional impacts (paragraphs 4 and 5); and
   4. final ranking of regional electricity crisis scenarios according to their relevance (paragraph 6).
2. ENTSO-E shall first collect the evaluations of national impact to the regional electricity crisis scenarios according to Article 13, completed by the TSOs. ENTSO-E shall check the evaluations for completeness and consistency with the impacted power systems. ENTSO-E shall consult on the evaluations with the RCC(s). In cases of detected inconsistencies or missing submissions, ENTSO-E shall notify the concerned TSOs. Missing or non-compliant submissions:
3. may be treated as rating a particular crisis scenario as irrelevant to the Member State (national impact rating “insignificant”); or
4. may be treated as not having a cross-border dependency (cross border dependency rating “none”); or
5. may be brought to compliance by ENTSO-E in cooperation with the relevant TSOs, RCCs at ENTSO-E’s discretion.
6. In case of any doubts regarding any content of the submitted national evaluations, ENTSO-E shall ask the concerned TSOs to address the deficiency in line with Articles 7 and 9. TSOs who belong to the same Member State shall provide a single clarification. The clarification shall be provided to ENTSO-E without undue delay, but not later than ten working days from receipt of request for clarification.
7. ENTSO-E shall then apply the following steps to evaluate the regional impact of each regional crisis scenario:
8. the national impact rating and national rating of the cross-border dependencies shall be collected (cf. Appendix III.3);
9. a rating of a regional crisis scenario is calculated as a sum over all Member States of national impact ratings weighted by the national ratings of the cross-border dependencies.
10. Those electricity crisis scenarios, that are evaluated as not having a regional significance (only one Member State rated the scenario higher than “insignificant”) are captured for future reference. As these scenarios are not considered regional, they shall not be included in the evaluation and ranking.
11. ENTSO-E shall rank the regional crisis scenarios according to their relevance: as a result of the calculation in accordance with paragraph 3, a single number is assigned to each scenario. The higher the number, the more relevant the regional scenario is.

Article 15   
Reporting of the most relevant regional electricity crisis scenarios

1. The reporting of the most relevant regional electricity crisis scenarios shall be done in accordance with Article 6 of the RP Regulation.
2. The reporting mentioned in paragraph 1 shall consist of a single report comprising the regional electricity crisis scenarios which shall be prepared by ENTSO-E and RCCs, both for the pan European and regional scale, depending on the significance of the impact of the scenario. Its characterisation should be specific and targeted to each region (or subregion), to allow a proper assessment of each regional electricity crisis scenario, and the identification of the scope for cross-border cooperation. The relevance of each regional electricity crisis scenario shall be indicated by the score according to Appendix I. The most relevant scenarios shall be the highest scoring scenarios. Each scenario shall be reported in terms of the following minimal information collected:
   1. initiating event(s) and chain of events;
   2. Description of Initial Condition of the power system relevant to the scenario;(including area of geographical relevance, duration, magnitude of the event, and characterisation of the power system);
   3. season(s) of the year when the scenario is relevant and type of load;
   4. RCCs and Member States affected by the crisis scenario;
   5. Existing measures that mitigate the relevant risk, including their national or regional dimension and its expected contribution to cope with the impact (including assessment of potential dependencies to other MSs);
   6. the most likely impacts of the scenario in terms of the electricity system and consequences (including potential impact on critical infrastructure – that could be restricted to internal use) based on quantitative analysis;
   7. national impact and likelihood (separately);
   8. ranking;
   9. Evolution of the crisis scenario, including the analysis of root causes that lead to this evolution
   10. presence and importance of cross sector and cross-border dependencies.
3. Additional information, including any visualisation, may be included in the report. The report should reflect how the input from the ECG, RCCs, competent authorities (including that related to critical power system infrastructure), and regulatory authorities during the scenario identification and assessment process influenced the report findings.

Article 16   
Review

1. ENTSO-E shall update the regional electricity crisis scenarios every four years unless circumstances warrant more frequent updates according to Article 6.3 of the RP Regulation. Such updates could be triggered by ENTSO-E as a result of events such as a significant change in national or regional risk evaluations, or the detection of a major risk previously not integrated in the regional electricity crisis scenarios (for instance, new studies on climate change highlighting a significant increase in the frequency or severity of various hydro-meteorological hazards could trigger an update). For this purpose, following a request by ENTSO-E, the process described in the methodology shall be applied.
2. ENTSO-E shall update and improve this methodology when significant new information becomes available according to Article 5(7) of the RP Regulation.

TITLE 4

Final provisions

Article 17   
Handling of sensitive information

1. TSOs and national competent authorities are expected to communicate the open national risk information in sufficient detail to allow ENTSO-E to assess if a regional risk may exist as described in Article 12.
2. Directive 2008/114/EC is applied to the energy sector and certain parts of the electricity transmission system can be identified as sensitive critical infrastructure.

Accordingly, the following principles are established:

* 1. Confidentiality
     1. Any confidential or sensitive information received, exchanged or transmitted pursuant to this methodology shall be subject to the conditions of professional secrecy laid down in ii, iii, and iv;
     2. The obligation of professional secrecy shall apply to any natural or legal person subject to the provisions of this methodology;
     3. Confidential information received by the natural or legal person in the course of their duties may not be divulged to any other person or authority, without prejudice to cases covered by national law, the other provisions of this methodology or other relevant EU legislation;
     4. Without prejudice to cases covered by national law, regulatory authorities, bodies or persons which receive confidential information pursuant to this methodology may use it only for the purpose of the performance of their functions under this methodology.
  2. Publication
     1. For clarity, the owner of the disclosed information has the right to decide which, if any, disclosed information may be communicated outside of ENTSO-E and to whom and in what format.

Article 18   
Publication of the methodology

1. ENTSO-E shall publish the methodology without undue delay after the Agency has approved it.

Article 19   
Language

1. The reference language for the methodology for identifying electricity crisis scenarios at a regional level shall be English.

Appendix I: Scenario rating scales

I.1 Crisis likelihood scale

The likelihood should be assessed based on the most appropriate information. For example, historical data where future changes are not expected should be used if available. If not available, estimates should be based on qualitative assessments, like expert judgments.

For classification of likelihood of crisis, a five-step scale is used:

|  |  |  |  |
| --- | --- | --- | --- |
| **Classification** | **Events per year** | **1 x in …**  **years** | **Description/example of initiating event** |
| **Very likely** | ≥ 0.5 | 2 or less | event expected practically every year, e.g. winds/storms causing multiple failures of overhead lines may be expected nearly  every year in some areas |
| **Likely** | 0.2-0.5 | 2-5 | event expected once in a couple of years,  e.g. heat wave causing limits on output of open-loop water-cooled power plants, low  water levels at hydro plants, higher load, etc. |
| **Possible** | 0.1-0.2 | 5-10 | event expected or taken into consideration as a potential threat, e.g. cyber or malicious  attack |
| **Unlikely** | 0.01-0.1 | 10-100 | rare event, e.g. simultaneous floods causing unavailability of generation,  distribution and transmission infrastructure |
| **Very unlikely** | 0.001-0.01 | 100 - 1000 | very rare event, e.g. earthquake causing a huge destruction of transmission, distribution and generation  infrastructure |
| **Extremely unlikely** | ≤ 0.001 | 1000 or more | extremely rare event, expected beyond 1 in 1000 years. |

I.2 Crisis impact scales

The consequences should be simulated based on the present knowledge of the system over at least the next four years.

For the classification of operational impact of crisis, a five-step scale is used. Two different dimensions of impact (EENS% and LOLE) are used. These are treated independently as shown in Appendix I.3.

|  |  |  |
| --- | --- | --- |
| **Classification** | **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 |

I.3 Crisis scenario risk rating at the Member State level

Crisis scenario risk rating is performed by combining the operational impact rating (resulting from EENS% and LOLE evaluation) and likelihood rating, as illustrated in the Likelihood – Impact Matrix below. This Likelihood-Impact matrix reflects risk of a particular scenario and the proposed qualitative scale is from very low to very high with low, medium and high being intermediate classes.

For example, if a certain crisis is Likely and has Critical EENS% impact and Minor LOLE impact, the scenario would be evaluated as having Medium risk.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Likelihood  Impact | | Extremely Unlikely | Very Unlikely | Unlikely | Possible | Likely | Very likely |
|  |
| EENS% | LOLE |  |
| Disastrous | Disastrous | Medium | Medium | High | Very high | Extremely high | Extremely high |  |
| Disastrous | Critical | Medium | Medium | High | Very high | Very high | Extremely high |  |
| Critical | Disastrous | Medium | Medium | High | Very high | Very high | Extremely high |  |
| Disastrous | Major | Medium | Medium | High | High | Very high | Extremely high |  |
| Major | Disastrous | Medium | Medium | High | High | Very high | Extremely high |  |
| Disastrous | Minor | Medium | Medium | High | High | Very high | Extremely high |  |
| Minor | Disastrous | Medium | Medium | High | High | Very high | Extremely high |  |
| Disastrous | Insignificant | Medium | Medium | High | High | Very high | Extremely high |  |
| Insignificant | Disastrous | Medium | Medium | High | High | Very high | Extremely high |  |
| Critical | Critical | Low | Medium | Medium | High | Very high | Extremely high |  |
| Critical | Major | Low | Medium | Medium | High | Very high | Very high |  |
| Major | Critical | Low | Medium | Medium | High | Very high | Very high |  |
| Critical | Minor | Low | Medium | Medium | High | High | Very high |  |
| Minor | Critical | Low | Medium | Medium | High | High | Very high |  |
| Critical | Insignificant | Low | Medium | Medium | High | High | Very high |  |
| Insignificant | Critical | Low | Medium | Medium | High | High | Very high |  |
| Major | Major | Low | Low | Medium | High | High | Very high |  |
| Major | Minor | Low | Low | Medium | Medium | High | High |  |
| Minor | Major | Low | Low | Medium | Medium | High | High |  |
| Major | Insignificant | Low | Low | Medium | Medium | High | High |  |
| Insignificant | Major | Low | Low | Medium | Medium | High | High |  |
| Minor | Minor | Low | Low | Low | Medium | Medium | High |  |
| Minor | Insignificant | Low | Low | Low | Medium | Medium | High |  |
| Insignificant | Minor | Low | Low | Low | Medium | Medium | High |  |
| Insignificant | Insignificant | Low | Low | Low | Low | Medium | Medium |  |

For the purpose of combining and computing consequences across multiple Member States, the above crisis scenario risk ratings are assigned values, shown in the table below:

|  |  |
| --- | --- |
| **Crisis scenario risk rating** | **Value**  *(used for regional scenario rating)* |
| Extremely high | **10** |
| Very high | **5** |
| High | **2** |
| Medium | **1** |
| Low[[1]](#footnote-1) | **0** |

I.4 Cross-border dependency rating

The cross-border dependencies that must be considered are described in Article 3. For each scenario, the level of cross-border dependency must be evaluated using the following scale:

|  |  |  |
| --- | --- | --- |
| **Cross-border**  **dependency rating** | **Value** | **Description** |
| None | 1 | The crisis has no impact on other countries, even if they are facing simultaneous crisis. |
| Minor | 1.2 | The crisis is susceptible to aggravate a simultaneous crisis in at least one other  country, either through direct or indirect causes (cf. Article 3). |
| Major | 2 | The crisis is susceptible to generate a cross-border crisis in at least one other  country, either through direct or indirect causes (cf. Article 3). |

It is accepted that the impact of local events on other TSOs will be estimated using the TSOs’ expertise on its own network and in coordination with RCC(s) of their respective system operation region(s) through simulations based on data provided by the TSOs.

It should be noted, however, that qualitative and subjective values assigned to specific crisis scenario risk ratings and cross-border dependency ratings (shown in tables above) would produce very subjective output that is difficult to interpret and provide adequate risk preparedness measures. Therefore, an attempt should be done to use quantitative models and their results for as many scenarios as possible and convert the whole analysis into quantitative study also at regional level. This would enable development of more precise risk preparedness measures against high risk scenarios.

I.5 Example of regional scenario rating

The values of crisis scenario risk ratings (Appendix I.3) and cross-border dependency ratings (Appendix I.4) are used to compute a national risk rating for the scenario using the following equation:

𝑁𝑎𝑡𝑖𝑜𝑛𝑎𝑙 Risk 𝑅𝑎𝑡𝑖𝑛𝑔 = 𝐶𝑟𝑖𝑠𝑖𝑠 𝑆𝑐𝑒𝑛𝑎𝑟𝑖𝑜 Risk 𝑅𝑎𝑡𝑖𝑛𝑔 × 𝐶𝑟𝑜𝑠𝑠 𝐵𝑜𝑟𝑑𝑒𝑟 𝐷𝑒𝑝𝑒𝑛𝑑𝑒𝑛𝑐𝑦 𝑅𝑎𝑡𝑖𝑛𝑔

A regional crisis scenario risk is then evaluated as the sum of all national risk ratings. The resulting numbers are used only for the relative ranking of scenarios risks. An example computation of regional crisis scenario ratings, based on three national scenario ratings, is provided below (using values from Appendices I.3 and I.4). Note that in the table below, CBD is an abbreviation of Cross-Border Dependency. The values in this table represent the expected output from the national scenario evaluations in Article 13. The computation of regional risk ratings, as in the example below, shall take place in line with Article 14.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Member State 1** | | | | **Member State 2** | | | **Member State 3** | | | **Regional Risk Rating** |
| **Scenario Name** | **Scenario Risk Rating** | **CBD Value** | **National Risk rating** | **Scenario Risk Rating** | **CBD Value** | **National Risk rating** | **Scenario Risk Rating** | **CBD Value** | **National Risk rating** |
| *Fuel Shortage* | 1 | 1 | 1 | 5 | 1.2 | 6 | 10 | 2 | 20 | 27 |
| *Cyberattack* | 2 | 1.2 | 2.4 | 2 | 1 | 2 | 5 | 2 | 10 | 14.4 |
| *Heat wave* | 1 | 1.2 | 1.2 | 5 | 1.2 | 6 | 0 | 2 | 0 | 7.2 |
| *Cold spell* | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |

Appendix II: Hazards that could initiate an electricity crisis scenario (initiating events)

At least the following hazards[[2]](#footnote-2) need to be considered as possible initiating events affecting electricity system adequacy, system security and/or fuel security in developing both national and regional electricity crisis scenarios:

1. rare and extreme natural hazards:
   1. flooding;
   2. drought and associated water shortage
   3. extreme weather (incl. storms, extreme winds, ice storms, snowfall, heavy precipitation, hurricanes, cold spells, heat waves);
   4. forest fire;
   5. seismic and volcanic activities;
   6. infectious threats, incl. pandemic;
   7. space weather hazards;
2. accidental hazards going beyond the N-1 security criterion, and exceptional contingencies:
   1. simultaneous failure of multiple grid elements;
   2. accidental (unintended) violation of N-1 criterion due to human error:
      1. error during operation;
      2. failure or omission during the maintenance;
      3. substandard quality of a series of manufactured grid elements.
3. consequential hazards including consequences of malicious attacks and of fuel shortages:
   1. malicious attacks:
      1. terrorism / sabotage;
      2. cyberattack;
      3. manipulation of the market.
   2. disruption of fuel supply for electricity generation;
   3. not electricity-related industrial accident (e.g. chemical spill, collapse, explosion, gas leak, radiation, transport disruption);
   4. not electricity-related critical infrastructure disruption (incl. water & food supply, garbage & sewage collection, fuel supply excl. fuels for electricity generation, telecommunications, ensuring compliance with the scenarios related to the natural gas supply disruption, as developed by ENTSO-G pursuant to Article 7 of the Regulation (EU) 2017/1938;
   5. electricity market failure with significant impact in security of supply (e.g. speculation or failure of one or more stakeholders to meet its/their obligations);
   6. nuclear / radiological accident.
   7. New emerging threats (such as hybrid threats or those coming from technological evolution) to add a forward looking vision in future threats scenarios

**Note:** It is expected, that for many Member States and TSOs, some of the above hazards will not be relevant, while, for some others, they will be relevant, but not regarding an electricity crisis scenario. The list given above is meant to help Member States and TSOs only as a checklist against which the electricity crisis scenario candidates and regional electricity crisis scenarios should be checked for completeness of coverage. It is not required (nor expected) for any TSO to produce a list of electricity crisis scenario candidates that would cover all of the above, but it should be consistent with National Risk Evaluations.

Appendix III: Electricity crisis scenario description templates

**Note: Appendix III will be reviewed and updated to ensure alignment with any changes made based on the consultation results.**

The electricity crisis scenario description templates below shall be used during the electricity crisis scenario identification and evaluation. Columns are to be interpreted as follows:

1. “Item” contains a definition of information needed;
2. “Information to provide” must be filled by the relevant data provider.

All the template fields below are required and must be completed by the provider. For each item an understandable general description is needed, without indicating exact locations, equipment, measurements etc., and a range of values is preferable to an exact number.

Check lists are provided in paragraphs III.2 and III.3 as a tool for building a comprehensive description of each scenario. They must be followed to ensure that an important aspect of the scenario is not omitted. Some of the questions may lead to sensitive information that will not be shared by the provider, but may be useful for the provider to do a self-evaluation of a given crisis scenario impact.

III.1 Description of electricity crisis scenario candidate

For each electricity crisis scenario candidate as mentioned in Articles 6 and 10, the description must follow the following template and, where available, quantifiable information to be provided:

|  |  |  |
| --- | --- | --- |
| **Item** | **Information to provide** | |
| **Name of entity and date of submission of the scenario** |  | |
| **Contact information if more information is required on the scenario in the following weeks.** |  | |
| **Description of initial condition of the power system relevant to the scenario** | Describe potential initial conditions for the scenario, using a range for these conditions. They do not have to be very specific (load generation, weather conditions, internal and cross border congestions, cross sector dependencies, redispatching, regional and internal transmission limitations). Include the range of years when scenario is relevant. **Ex**: on the national perimeter, temperatures between 30°C and 35°C for 2 to 5 weeks, associated with low water levels in reservoir, internal transmission limitations expected, etc. | |
| **Initiating event(s) and chain of event(s)** | Brief description of the initiating event (or combination of events) generating the crisis. including the area of geographical relevance, frequency, magnitude and duration of the event | |
| **List of vulnerabilities** that make the electricity system prone to suffer the impact of the initiating event | Identification of vulnerabilities associated to the initiating event that could provoke further impacts |
| **Existing measures that mitigate the relevant risk** including their national or regional dimension and its expected contribution to cope with the impact (including assessment of potential dependencies to other MSs) | List of existing preventive and mitigating measures that could be adopted per identified risk (including their national / regional dimension, and expected contribution to cope with the impact) |
| **Season(s) of the year and day when the scenario is relevant and type of load** | Winter/Spring/Summer/Autumn/All  Week, weekend, holiday, day before holidays  Peak/Base load/Minimum load/Any | |
| **Evolution of the crisis scenario,** including the analysis of rootcauses that lead to this evolution | Description of sequence of events leading from initiating events to electricity crisis | |
| **Description of the most likely impacts of the scenario in terms of electricity system and consequences, based on quantitative analysis** | Description of potential impacts of the crisis of the scenario, focusing on range/general areas instead of details, in terms of the electricity system (ie power stations offline, line overload), and consequences (black out, power quality issues), as well as likely impact on critical infrastructure (restricted to internal use), based on quantitative analysis  **Ex**: describe potential impacts in the south of the country/in maritime areas; instead of naming a district or a city | |

|  |  |
| --- | --- |
| **Item** | **Information to provide** |
| **Does the event cause a cross-border dependency? (or regional impact)** | Yes/No |
| **Description of cross-border dependency** | All categories described in Article 3 and 9 must be considered here for relevance |
| **Broad geographical area** | Description of the likely geographic location or part of the system affected by the event |
| **If applicable, reference crisis in the past** |  |
| **Other important information related to the scenario (historical events, results of the post operation and post disturbances analysis)** |  |

Checklist to use for a comprehensive description of the electricity crisis scenario candidate

|  |  |  |  |
| --- | --- | --- | --- |
| **Section** | **Item** | **Considered** | **Not relevant** |
| Description of initial condition of the power system relevant to the scenario | load, generation, frequency, available reserves, import capabilities, stability, level of system control |  |  |
| weather conditions (temperature, wind speed, rain, hail, snow, etc.) |  |  |
| internal and cross-border congestions |  |  |
| cross sector dependencies |  |  |
| re-dispatching performed before the start of the initiating event |  |  |
| internal and regional generation and transmission limitations |  |  |
| Initiating event(s) and chain of event(s) | details of the initiating events (their parameters and related circumstances, if relevant) |  |  |
| the course of events (event chain) |  |  |
| Season(s) of the year when the scenario is relevant and type of load | season of the year |  |  |
| type of day (week, weekend, holiday, day before holidays) |  |  |
| peak or base load |  |  |
| Evolution of the crisis scenario | system parameters (frequency, voltage drop at critical points, etc.) at every stage of scenario |  |  |
| expected system response (automatic or manual) to the trigger and to every event in the chain |  |  |
| spontaneous propagation of the scenario vs the need for human action in the following stages of the crisis |  |  |
| potential for human error/omission/wrong decision |  |  |
|  | required availability of the power system elements or fuel supply |  |  |
| possible mitigation and/or corrective actions to be taken before the crisis occurs and their availability and expected contribution to cope with the impact |  |  |
| time required for mitigation and/or corrective actions, including time before overloading of successive grid elements |  |  |
| Broad geographical area | the likely geographic location or part of the system affected by the event (type of line, substation, PST, interconnector, dispatching centre, etc.) |  |  |
| Cross Border Dependencies and regional impact | Results of the assessment and simulation of the cross border and regional impact based on data provided by TSOs |  |  |

III.2. Description of regional electricity crisis scenarios by ENTSO-E

The description of regional electricity crisis scenarios as mentioned in Article 12 and Article 9 must follow the following template. The scenario must be sufficiently detailed and specific for each TSO to individually evaluate the relevance.

|  |  |
| --- | --- |
| **Item** | **Information to provide** |
| **Name of the scenario** |  |
| **Regional Ranking and National Ranking (Impact and likelihood separately)** |  |
| **RCCs and Member States affected by the crisis scenario** |  |
| **Description of Initial Condition of the power system relevant to the scenario** |  |
| **Initiating event(s) and chain of event(s)** |  |
| **Time horizon for evaluation (years)** |  |
| **Season(s) of the year when the scenario is relevant and type of load** |  |
| **Evolution of the crisis scenario** |  |
| **Broad geographical area** |  |
| **Description of possible impacts in terms of the power system (**ie power stations offline, line overload), a**nd consequences** (black out, power quality issues), based on quantitative assessment |  |
| **Potential for cross-border and cross-regional dependencies** |  |
| **Other important information related to the scenario** |  |

III.3. Evaluation of national impact of the regional electricity crisis scenarios

The national impact evaluation of the regional electricity crisis scenarios by TSOs (as mentioned in Article 13) must follow the following template. The checklist below is to be used to ensure that the evaluation is comprehensive.

|  |  |
| --- | --- |
| **Item** | **Information provided** |
| **Name of entity and date of submission of the scenario** |  |
| **Contact information if more information is required on the scenario in the following weeks.** |  |
| **Name of the scenario (as described by ENTSO-E)** |  |
| **Crisis scenario EENS% impact at the Member State level (as described in Appendix I.3)** | Disastrous/Critical/Major/Minor/Insignificant |
| **Crisis scenario LOLE impact at the Member State level (as described in Appendix I.3)** | Disastrous/Critical/Major/Minor/Insignificant |
| **Crisis scenario likelihood at the Member State level (as described in Appendix I.3)** | Very likely/Likely/Possible/Unlikely/Very unlikely/Extremely unlikely |
| **Crisis scenario risk rating at the Member State level (as described in Appendix I.3)** | Low/Medium/High/Very high/Extremely high |
| **Cross-border dependency rating (as described in Appendix I.4)** | Major/Minor/None |
| **Method used for evaluation of likelihood** | qualitative assessment /quantitative assessment (statistical data, number of sub-scenarios taken into account) |
| **Method used for evaluation of impact** | qualitative assessment /quantitative assessment (number of sub-scenarios taken into account) |
| **Description of identified cross-border dependencies** |  |
| **Explanation of the severity of the scenario – national specificities to ENTSO-E description** | National specificities relevant for the scenario: duration, length of direct impact, consequential hazards, incl. potential impact on fuel and energy markets (gas, electricity), etc. |
| **Other important information related to the scenario** |  |

Checklist to consider for a comprehensive impact evaluation of a regional electricity crisis scenario

**Crisis scenario rating at the Member State level:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Section** | **Item** | **Considered** | **Not relevant** |
| Severity of the scenario | duration of the scenario |  |  |
| evaluation of likelihood of scenario materialisation |  |  |
| evaluation of direct impact on security of supply (EENS%) – the most likely and the worst case |  |  |
| overall risk evaluation (taking into account EENS%, LOLE likelihood) |  |  |
| impact & likelihood evaluation – one of: qualitative assessment or quantitative assessment |  |  |
| sufficient number of sub-scenarios considered for likelihood & impact evaluation (in case of a  probabilistic approach). |  |  |
| the length of the direct impact |  |  |
| consequential hazards, incl. potential impact on fuel and energy markets (gas, electricity) |  |  |
| subjects of protection negatively affected by the event (persons, environment, infrastructure, etc.) |  |  |
| time required to restore the system to a normal state |  |  |
| need for remedial actions or other coordinated actions beyond TSO (national/regional) |  |  |
| Reference crises of the past | list of comparable events that have occurred in the past (regardless of whether the crisis developed to the full  extent, or not) |  |  |
| post crisis review (lessons learnt): main similarities and differences between the scenario and past crises, including the improvements/deterioration of the system condition/robustness, operational standards, maintenance practices, etc. |  |  |
| Readiness of operators and authorities to handle the crisis | ability of TSOs and DSOs to prepare and/or react:   * availability of backup/support/spare components; * established activation protocol; * availability of clear and precise crisis procedures. |  |  |
| readiness of the local and national authorities/TSOs:   * existence and verification (tests, exercises) of relevant national crisis plans; * existence of a clear/unambiguous chain of command; * legal basis for handling crisis situations. |  |  |
| national crisis plans drafted/implemented/verified; |  |  |
| readiness/limitations of the relevant rescue/relief services; |  |  |
| ability to provide for a cross-border coordination; |  |  |
| availability of communication channels; |  |  |
| findings concerning the damage susceptibility and/or robustness of the affected persons/elements, incl.:   * robustness of the transmission system; * match/adequacy of the system response to events; * flexibility of reaction to the scenario; * simulation exercises. |  |  |
| Other important information related to the scenario relevant to managing it. | |  |  |

**Cross-border** dependency rating:

|  |  |  |  |
| --- | --- | --- | --- |
| **Section** | **Item** | **Considered** | **Not relevant** |
| Strength and type of cross-border dependencies | Description of cross-border dependencies as a possible aggravating input for the scenario (reliance on assistance from other TSOs); |  |  |
| Description of cross-border dependencies as a possible output of the national crisis (decreased ability to assist other TSOs). |  |  |
| Interdependencies  In the described scenario, will your  situation worsen if other TSOs are unable to offer the following support? | Availability of redispatch/counter trading/cross-border exchange of ancillary services to make it possible to  inject or to withdraw power from power plants in a certain neighbouring power system; |  |  |
| Availability of reactive power (to support system stability); |  |  |
| Availability of energy support. |  |  |
| Interdependencies  During the described scenario, would you be able to assist other TSOs in the following fields if they face simultaneous crisis? | Availability of redispatch/counter trading/cross-border exchange of ancillary services to make it possible to inject or to withdraw power from power plants in a certain neighbouring power system; |  |  |
| Availability of reactive power (to support system stability); |  |  |
| Availability of energy support |  |  |

1. Low also includes zero or close to zero risk rating. [↑](#footnote-ref-1)
2. The list of hazards is adapted from Commission Staff Working Document: Overview of Natural and Man-made Disaster Risks the European Union may face, Brussels, 23.5.2017, SWD(2017) 176 final. [↑](#footnote-ref-2)