

Review of current national rules and practices
relating to risk preparedness in the area
of security of electricity supply
(Contract ENER/B4/ADM/2015-623/SI2.717165)
Final report

Drafted by VVA Europe and Spark Legal Network

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1- LIST OF ABBREVIATIONS

Country abbreviations

AT – Austria
BE – Belgium
BG – Bulgaria
CY – Cyprus
CH - Switzerland
CZ – Czech Republic
DE – Germany
DK - Denmark
EE – Estonia
EL - Greece
ES – Spain
FI – Finland
FR – France
GB – Great Britain
HR – Croatia
HU – Hungary
IE – Ireland
IT – Italy
IS - Iceland
LT- Lithuania
LU – Luxembourg
LV - Latvia
MT – Malta
NO - Norway
NL - Netherlands
PL – Poland
PT - Portugal
SE – Sweden
SI – Slovenia
SK - Slovakia
UK – United Kingdom

Other abbreviations

AAC – Already Allocated Capacity
ACER – Agency for the Cooperation of Energy Regulators
ATC – Available Transmission Capacity
BEMIP - Baltic Energy Market Interconnection Plan
CENELEC - European Committee for Electrotechnical Standardisation
CCT - Crisis Communication Tool
CORESO - Coordination of Electricity System Operators
DSBR - Demand Side Balancing Reserve (DSBR)
DG ENER – Directorate General for Energy
CCT - Crisis Communication Tool
DNO – Distribution Network Operator
DSO – Distribution System Operator
EAC - Electricity Authority of Cyprus
EAS - ENTSO-E Awareness System
ECG - Electricity Coordination Group
EIS - Emergency Information System
ENTSO-E - European Network of Transmission System Operators
HEO – Hungarian Energy Office
MEA – Ministry of Economic Affairs
MEAS - Mutual Emergency Assistance Service
MIBEL - Iberian Electricity Market MIBEL

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NordAM - Nordic Asset Management Forum NordAM
NordBER – Nordic Contingency Planning and Crisis Management Forum
NordREG – Nordic Energy Regulators
NRA – National Regulatory Authority
NRR - National Risk Register of Civil Emergencies
OFGEM - Office of Gas and Electricity Markets (Ofgem)
PPC - Public Power Corporation S.A.
RAAS - Real-time Awareness and Alarm System
SBR - Supplemental Balancing Reserve
SCADA – Supervisory Control And Data Acquisition
SO – System Operator
SONPO - System operating instructions for electricity transmission network
TFUE - Treaty on the Functioning of the European Union
TO – Transmission Operator
TSO- Transmission System Operator

2- EXECUTIVE SUMMARY

This document is the final report of the fact-finding study "Review of current national rules and practices relating to risk preparedness in the area of security of electricity supply", launched by DG ENER. This study was conducted by a consortium composed of VVA Europe and Spark Legal Network, assisted by a network of national correspondents. It has taken stock of the different rules and practices currently in place in the twenty-eight EU Member States in relation to risk assessment, risk preparedness and emergency situations in the area of electricity of supply.

2.1 Legal and policy context of the study

The issue of risk preparedness in the area of security of electricity supply is a significant concern of the EU. Within this context, Directive 2005/89/EC aims to ensure the proper functioning of the European internal market for electricity, an adequate level of interconnection between Member States and of generation capacity and balance between supply and demand. While it requires the Member States to (inter alia) take into account the possibilities for cross-border cooperation, it does not provide detailed rules to organise such cooperation, which thus remains in practice limited to voluntary cases at regional level. Further, the Directive requires the Member States to ensure that TSOs set the minimum operational rules and obligations on network security and consult with the relevant actors in the countries with which interconnection exists, leaving it to Member States to set their own rules with regard to the content of these operational procedures and obligations. With regard to crisis situations, the Directive requires the Member States to ensure that the curtailment of electricity supply in an emergency situation is based on predefined criteria relating to the management of imbalances by the TSOs and that these measures are taken in close cooperation with other TSOs, whilst leaving room for the Member States to define these criteria.

The EU Third Energy Package aims to further improve the functioning of the internal energy market and resolve structural problems. In this context, Directive 2009/72/EC sets the general framework of the European energy market through a secure, competitive and sustainable supply of energy to the economy and to society. It encourages cross-border interconnections to secure the efficiency and continuity of electricity supply, and allows Member States to impose on undertakings in the electricity sector public service obligations, which may relate to security of supply. It further provides that the competent authority of each Member State shall publish every two years a report covering the balance of supply and demand on the national market, the level of expected future demand and envisaged additional capacity being planned or under construction, and the quality and level of maintenance of the networks, as well as measures to cover peak demand and to deal with shortfalls of one or more suppliers. The Directive does not set out detailed requirements on the information that these biennial reports need to provide. Thus, the latter generally include limited information on the assessment of risks and measures to prevent and respond to crisis. Moreover, there is no harmonised European methodology to measure generation adequacy. With regard to crisis situations, Directive 2009/72/EC grants Member States the right to take safeguard measures as long as they do not disturb the functioning of the internal market and are notified to the other Member States and the European Commission. Article 16(2) of Regulation 714/2009 provides amongst others that, except in cases of force majeure, market participants who have been allocated capacity shall be compensated for any curtailment.

At a technical level, the TSOs and DSOs play an important role in ensuring operational security, particularly in the short term. Work has already been done to harmonise TSOs' technical standards and emergency protocols within each synchronous area through the development of network codes and guidelines and the Entso-E Continental Europe Operation Handbook. Further convergence will be reached once the System Operation Guideline and Network Code on Emergency and Restoration are in place. However, the contents and practical implementation of the TSOs' plans are still to some extent determined by the national security of supply policies and regulations.

Considering that risk preparedness and risk mitigation measures remain fragmented in the EU, the European Commission launched two public consultations, which ended in October 2015. The Public Consultation on a new Energy Market Design sought stakeholder's views on the issues that may need to be addressed in a redesign of the European electricity market. This was complemented by an additional public consultation on risk preparedness in the area of security of electricity supply, which aimed to seek stakeholders' more specific views about how to improve the existing EU framework on security of electricity supply and how Member States should prepare themselves and cooperate with others.

2.2 Objectives of the study

This 'fact finding' study aims to provide an overview of the current legal framework and practices across the EU Member States with regard to security of electricity supply. More specifically, it focuses on how these countries identify, prevent, prepare and respond to security of supply risks and emergency situations. To this end, the study has reviewed the national rules and procedures in place at the various levels aimed at tackling short-term risks of scarcity and emergency situations. As a result, this report seeks to provide the European Commission with a complete overview of the various provisions and practices and of the gaps and inconsistencies between the national strategies for response to short-term risks of electricity scarcity. As such, the results of this study will allow the European Commission to identify good practices to tackle those inconsistencies. Going forward, together with the results from the above-mentioned two public consultations, the present study should help lay the ground for possible new EU legislation relating to security of electricity supply in Europe to be proposed by the European Commission in the near future, as part of a broader set of initiatives to reform the EU framework governing electricity markets.

2.3 Methodology applied

In order to collect a complete set of concise and high-quality data in each of the twenty-eight Member States, the research plan followed a two-tiered approach.

The first phase of the study consisted of a desk research exercise, performed by our team of national correspondents, in order to a) map the legal framework and practices that govern the security of supply of electricity at national level; b) verify the roles of the various stakeholders and clarify and map their responsibilities; c) identify publically available "risk preparedness plans" or parts of plans or (sets of) measures at national level, and provide a short description of them. We designed and tested a comprehensive desk research protocol comprising mainly a desk research questionnaire. The output was a set of twenty-eight completed desk research questionnaires, which contain a wealth of information on the legal framework and practices, so far as these were available on the basis of publically accessible information.

The next step within this task was to assimilate the findings in a comparative table, which was designed to structure the results in an easily accessible, summarised way, with a separate sheet for each subject. This enabled the core team to effectively perform the comparative analysis of the findings and the identification of any data gaps at Member State level, to be addressed during the second layer of fact-finding.

After this first mapping exercise, we conducted a second layer of fact-finding to verify and gather further information on the regulatory framework, but also on practices, at national level. The relevant national authorities (relevant ministries, regulators, TSOs and DSOs) were actively involved. Using the results of the desk research phase, the study team drafted stakeholder questionnaires, which consisted of two parts: Part I *General Questions*, which included ten general questions addressed to stakeholders in all Member States; Part II *Specific Questions*, which included questions, specifically designed to address data gaps identified in the various Member States. Our team of national correspondents forwarded the stakeholder questionnaires to the relevant national authorities, requested documents which were not publicly accessible during the desk research and followed up with at least two of the approached stakeholders via telephone enquiries.

With a complete set of data in hand, the national correspondents completed their final Country Reports. Each country report provides complete, concise and clear information on the rules and practices in place to identify, prevent, prepare for and respond to security of supply risks and emergency situations, as well as the roles and division of responsibilities of the public authorities and other relevant stakeholders involved. Having collected the complete set of data, we proceeded to analyse the rules and practices across the twenty-eight EU Member States in order to identify similarities and differences between the different results and group the similar approaches into common categories. This final report presents our findings based on our fact-finding on the legal frameworks and practices existing in each of the EU Member States.

2.4 Results of the study

The analysis of current national rules and practices was primarily based on the twenty-eight national Country Reports, which were drafted by (legal) experts based on their in-depth desk research and on stakeholder responses received. Stakeholder engagement was achieved in all twenty-eight Member States, which is reflected in the completeness of the reports and the study. The availability to share relevant documents or information that the study team was not able to obtain through desk research, varied across the Member States; when these data could not be shared, this was mainly due to the confidentiality of the information.

Risk Assessment

All twenty-eight Member States have a general obligation to monitor the security of electricity supply from which implicitly follows the obligation to assess electricity supply risks, while nine countries have a direct legal obligation to carry out an assessment of these risks. The national entities responsible for risk assessment and the division of their roles vary across the Member States; in practice the TSOs are the main entity involved in the preparation of the risk assessment and monitoring reports.

Good practices can be found in a vast majority of the countries that describe the types of risks covered under the assessments, while the other countries do not define the types of risks or they do so in a (very) general manner. There exists a patchwork of types of risks covered under the assessments in the Member States, and they are

described in various levels of detail. While this could (partly) be explained by the existence of country or regional specific electricity supply risks and circumstances, disparate (definitions of) types of risks to be assessed can potentially cause difficulties in the cooperation between neighbouring Member States, when preventing and addressing such risks.

Risk Preparedness plans

Research shows a fragmented and diverse framework in relation to national risk preparedness plans, measures and obligations concerning security of electricity supply. In general, it can be said that all Member States take into account risk preparedness considerations. However, only ten Member States set clear obligations to draw up risk preparedness plans. Eighteen other countries do not have such an obligation, but take risk preparedness considerations into account in reports, plans or measures. There is no specific obligation to submit a risk preparedness plan in the Electricity Directive (2009/72/EC) and in the Security of Supply Directive (2005/89/EC), which partly explains the fragmented framework of preparedness plans and measures.

TSOs have a central role in the adoption of risk preparedness plans or measures in a significant number of Member States. Nonetheless, the responsible national entities and the specific role TSOs carry still varies significantly, revealing a significant diversity across the EU.

Moreover, a large majority of Member States' risk preparedness plans and / or measures include both preventive and emergency considerations, with the type of preventive measures envisaged varying significantly across Member States. The large majority of countries focuses on the adoption of market measures in their preventive framework (primarily measures directed at supply / demand, operational security and energy efficiency). In seven other countries, the information available does not allow for a categorisation of measures.

The time horizons covered by the different measures vary significantly across the Member States and no overall trend can be identified; they can vary from one year to fifteen years. Some Member States set no limits of validity for their measures, others have a system of continuous updates while at least eleven countries do not specify time horizons. It is noteworthy that some Member States take into account longer periods in their risk preparedness plans / measures.

Coordination between Member States with regard to risk preparedness takes place predominantly at the TSO level. This study did not identify any formal bilateral agreements at Ministerial level. Hence, although there are positive recent attempts to enhance regional cooperation (noteworthy examples are the Pentalateral Energy Forum, the so-called Baake declaration, NordBER and NordREG and a cooperation platform between PT and ES), it can be concluded that cooperation at the governmental level is still under development.

The concern with the protection of sensitive data is clearly seen in the fact that many Member States keep their risk preparedness measures or plans fully confidential. Nonetheless, some Member States reach a balance between the need to keep some plans and measures reserved from the public and the possibility of making some information publicly available. With regard to frequency of updates, the framework is extremely diverse (from annual, biennial or every five or ten years, for example) and no particular common pattern can be highlighted.

Emergency situations

A majority of the Member States provide a legal definition of emergency, but with varying levels of detail. This could potentially lead to disparate reactions of Member States in various emergency events. In a majority of countries, the TSO is responsible for implementing emergency measures; the NRA, DSOs and Ministry are also involved to a lesser extent. Although the situation differs between Member States, the most commonly used emergency measures include: restriction of electricity consumption, generation increase, use of contracted and strategic reserves and load shedding plans. Twenty Member States implement distinct levels of emergency. Good practice was found in almost half of the Member States, where measures are explicitly tailored to the different levels of emergency.

Market suspension measures are foreseen in all Member States by national legislation or operational plans but to different extents. This could potentially lead to dissimilar responses between Member States, which could potentially have consequences for neighbouring countries. In some countries, limitations to cross-border trading capacities are foreseen. Two Member States specifically include explicit legal provisions (law or regulation) on export bans.

Cooperation among Member States takes place mostly at TSO level via bilateral, multilateral agreements (e.g. CORESO in Centre West Europe, NordAm between Nordic countries, BRELL between Baltic countries) or via ENTSO-E. At governmental level, cooperation takes place via the Electricity Coordination Group (ECG) or in regional groups like the Pentalateral Forum, but no formal bilateral agreements were identified.

A majority of Member States prescribe that load shedding plans are to be implemented by the TSO, as well as the categories of consumers exempted from such measures. The categories vary across countries, however hospitals and public transport services seem to be most prevalent. This situation could potentially lead to an uneven level of protection of consumers between Member States as it concerns load-shedding plans.

In a majority of countries, the TSO and DSOs are responsible in case of brown out or black out but no financial compensation to consumers is foreseen in case of force majeure.

3-INTRODUCTION

This Chapter describes the legal and policy background (section 3.1), the objectives (section 3.2) and the methodology of the study (section 3.3). It finishes with a short overview of the further contents of this report (section 3.4).

3.1 Legal and policy context of the study

The issue of risk preparedness in the area of security of energy supply is a significant concern of the EU. Article 194 of the Treaty on the Functioning of the European Union (hereinafter: "TFEU") provides, amongst other things, that the aim of European Energy policy is to ensure the security of energy supply in the Union. Within this context, Directive 2005/89/EC of the European Parliament and of the Council of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment (hereinafter also referred to as: "Directive 2005/89/EC") aims to ensure the proper functioning of the European internal market for electricity, an adequate level of interconnection between Member States and an adequate level of generation capacity and balance between supply and demand. The Directive requires the Member States to ensure a high level of security of electricity supply by taking the necessary measures to facilitate a stable investment climate and by defining the roles and responsibilities of competent authorities, taking into account, amongst others, the internal market and the possibilities for cross-border cooperation in relation to security of electricity supply (article 3 (1) in conjunction with 3 (2)(c)). However, it does not provide detailed rules to organise such cross-border cooperation, which thus remains in practice limited to voluntary cases at regional level. Further, article 4 (1)(a) of the Directive sets out that Member States or the competent authorities shall ensure that TSOs set the minimum operational rules and obligations on network security and shall consult with the relevant actors in the countries with which interconnection exists. However, Member States remain free to set their own rules with regard to the content of these operational rules and obligations. With regard to crisis situations, Article 4 (4), provides that Member States shall ensure that the curtailment of electricity supply in emergency situations is based on predefined criteria relating to the management of imbalances by the TSOs and are taken in close cooperation with other TSOs, leaving room for the Member States in defining these criteria.

The EU Third Energy Package, which consists of three Regulations and two Directives and came into force on 3 September 2009, aimed to further improve the functioning of the internal energy market and resolve structural problems, setting out as main objectives, amongst others, the strengthening of the competitiveness of the market and improvement of consumers' rights. In short, it covers a) the unbundling energy suppliers and producers from network operators; b) strengthening of the independence of regulators; c) establishment of the Agency for the Cooperation of Energy Regulators (ACER); d) cross-border cooperation between transmission system operators; e) the creation of European Networks for Transmission System Operators and f) increased transparency in retail markets to benefit consumers. The third package contains *inter alia* Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC (hereinafter also referred to as: "Directive 2009/72/EC"). This Directive sets the general framework of the European energy market in view of reaching the goals of the Europe 2020 strategy through a secure, competitive and sustainable supply of energy to the economy and the society. It encourages cross-border interconnections to secure the efficiency and continuity of

electricity supply, while pursuant to article 3(2), Member States may impose on undertakings operating in the electricity sector, in the general economic interest, public service obligations which may (amongst others) relate to security, including security of supply. Furthermore, article 4 stipulates that the competent authority of each Member State shall publish every two years a report covering the balance of supply and demand on the national market, the level of expected future demand and envisaged additional capacity being planned or under construction, and the quality and level of maintenance of the networks, as well as measures to cover peak demand and to deal with shortfalls of one or more suppliers. Member States are responsible for identifying, assessing and managing risks relating to security of electricity supply; the Directive does not set out detailed requirements on the information that these biennial reports need to provide, which thus generally include limited information on the assessment of risks and measures to prevent and respond to crisis. Moreover, there is no harmonised European methodology to assess system adequacy.

With regard to crisis situations, article 42 of Directive 2009/72/EC grants Member States the right in case of extreme crisis, to take safeguard measures as long as these do not disturb the functioning of the internal market and are notified to the other Member States and the European Commission, which may decide to amend or abolish such actions if they distort competition and affect common interest. Relevant in this regard is Article 16(2) of Regulation 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003 (hereinafter also referred to as: "Regulation 714/2009") which provides, amongst others, that except in cases of force majeure, market participants who have been allocated capacity shall be compensated for any curtailment.

At a technical level, the transmission system operators (TSOs), in charge of balancing activities, and distribution system operators (DSOs) have an important role to play in ensuring operational security, particularly in the short term. Work has already been done to harmonise TSOs' technical standards and emergency protocols within each synchronous area through the development of network codes and guidelines¹. The European Network of Transmission System Operators (hereinafter: "Entso-E") Continental Europe Operation Handbook should also be noted in this regard.² Further convergence will be reached once the System Operation Guideline³ and Network Code on Emergency and Restoration⁴ are in place. However, the contents and practical implementation of the TSOs' plans are still to some extent determined by the national security of supply policies and regulations.

¹ The most relevant Network Codes / Guideline in this context are those related to the operation of the electricity system: the System Operation Guideline which merges the former network codes on Operational Planning and Scheduling (NC OPS), Operational Security (NC OS), and Load Frequency Control and Reserve (NC LFCR) in one guideline document and the Network Code on Emergency and Restoration.

² <https://www.entsoe.eu/publications/system-operations-reports/operation-handbook/Pages/default.aspx>.

³ <https://www.entsoe.eu/major-projects/network-code-development/system-operation/Pages/default.aspx>

⁴ <https://docs.entsoe.eu/dataset/entso-e-final-network-code-on-emergency-and-restoration>.

Considering that risk preparedness and risk mitigation measures remain fragmented in the European Union despite the regulatory framework provided by the relevant above mentioned Directives and strategies launched by the EU⁵, the European Commission launched two Public Consultations running from 15th July 2015 until 8th October 2015. The Public Consultation on a new Energy Market Design sought stakeholder's views on the issues that may need to be addressed in a redesign of the European electricity market (in order to achieve the framework strategy 'Resilient Energy Union with a Forward-Looking Climate Change Policy'), including: (i) improvements to market functioning and investment signals; (ii) market integration of renewables; (iii) linking retail and wholesale markets (iv); reinforcing regional coordination of policy making, between system operators and of infrastructure investments; (v) the governance of the internal electricity market; and, (vi) an European dimension to security of supply. This was complemented by an additional public consultation on risk preparedness in the area of security of electricity supply. The latter sought stakeholders' more specific views on how to improve the existing EU framework on security of electricity supply, how Member States should prepare themselves and cooperate with others.

3.2 Objectives of the study

The study "Review of current national rules and practices relating to risk preparedness in the area security of electricity supply" (hereinafter also referred to as: "Risk preparedness fact finding study") was launched by DG ENER, under the Multiple framework service contract with re-opened competition for Legal assistance in the field of energy (SRD MOVE/ENER/SRD.1/2012-409 lot 1). It was subsequently awarded to VVA Europe ("VVA") and Spark Legal Network ("Spark") in September 2015. The project aims to provide an overview of the current legal framework and practices in the twenty-eight Member States with regard to security of electricity supply. More specifically, it focuses on how the twenty-eight Member States identify, prevent, prepare and respond to security of supply risks and emergency situations. To this end the study has reviewed the national rules and procedures in place at the various levels aimed at tackling short-term risks of scarcity and emergency situations.

As a result, this report seeks to provide the European Commission with a complete overview of the various provisions and practices and of the gaps and inconsistencies between the national strategies to respond to short-term risks of electricity scarcity. In addition, the results of this study will allow the European Commission to identify good practices to tackle the inconsistencies. Together with the results from the above-mentioned two public consultations, the present study aims to help lay the ground for new EU legislation relating to security of electricity supply in Europe to be proposed by the European Commission in the near future, as part of a broader set of initiatives to reform the EU framework governing electricity markets.

3.3 Methodological approach

In order to collect a complete set of concise and high-quality data in each of the twenty-eight Member States, the research plan consisted of a two-tiered approach. This enabled us to cover every relevant aspect of both the national legal frameworks and practices, providing both comprehension and attention to detail in a manner that ensured that the resources of the Study were optimally focused.

⁵ Such as the 2014 'European Energy Security Strategy'⁵ which called for, *inter alia*, strengthened emergency/solidarity mechanisms including coordination of risk assessments and contingency plans.

First phase: desk research

The first phase of the study consisted of a desk research exercise, performed by our team of national correspondents, in order to:

- Map the legal framework and practices that govern the security of supply of electricity at national level, in particular with regard to risk identification and preventive actions, emergency preparedness and crisis management;
- Verify the roles of the various stakeholders (the governments, regulators, TSOs and DSOs) and clarify and map their responsibilities with regard to risk preparedness planning (including emergency planning);
- Identify publically available "risk preparedness plans" or parts of plans or (sets of) measures at national level, and provide a short description of these plans and / or measures.

Before starting the research at national level, we designed and tested a comprehensive desk research protocol. This comprised of a questionnaire, holding the questions to the research, and an elaborate introductory document, instructing the national correspondents on the aim, the output sought, the methodology to be applied, the breadth and width and limitations and the planning foreseen. This was sent out to the national correspondents, to assist and guide them in their research and reporting. The output was a set of twenty-eight completed desk research questionnaires, which contained a wealth of information on the legal framework and practices, so far as these were available on the basis of publically accessible information.

Comparative analysis

The next step within this task was to assimilate the findings in a comparative table, which was designed to structure the results in an easily accessible, summarised way, with a separate sheet for each subject (risk assessment, risk preparedness and emergency situations) which in turn were divided in sub headings, based on the key questions contained in the desk research questionnaire. This enabled the core team to effectively perform the comparative analysis of the findings across the member states and, importantly, the identification of any data gaps at Member State level, to be addressed during the second layer of fact-finding.

Second phase: stakeholder consultation

Consequently, after this first mapping exercise, we conducted a second layer of fact-finding focused on verifying and gathering further information on the regulatory framework, but also on practices, at national level. This was done by actively involving the relevant national authorities: relevant ministries, regulators, TSOs and DSOs. Using the results of the desk research phase, the study team drafted stakeholder questionnaires, which consisted of two parts:

- Part I *General Questions*, included ten general questions addressed to stakeholders in all Member States, and
- Part II *Specific Questions*, included questions, specifically designed for the Member States, which related to data gaps identified in the respective countries during the desk research exercise.

Part II thus differed per Member State, and for the majority of Member States such specific questions were drafted, with the exception of Austria, France, Latvia,

Luxemburg, Spain, Sweden and the UK. We instructed our team of national correspondents to forward the stakeholder questionnaires by email to the relevant national authorities, i.e. the Ministry responsible for energy affairs, the relevant regulator and the TSOs (and/or DSOs) and to request documents, which were not publicly accessible during the desk research, such as risk-preparedness plans, emergency plans, etc.. We provided each of our national experts with a database containing the names and details of the relevant stakeholders in their country and a standard email in order to contact the stakeholders. To increase the response rate and the completeness of the questionnaires, our national correspondents followed up with at least two of the approached stakeholders via telephone enquiries, upon sending the questionnaires. These calls were used in order to agree on a timing to receive written answers or receive answers over the phone.

A complete overview of the received stakeholder responses can be found, in table 2, under section 4.1 below.

Compiling the Country Reports

With a complete set of data in hand (completed desk research questionnaires, any publically available risk preparedness plans, completed stakeholder questionnaires), the national correspondents completed their final Country Reports. Each country report provides complete, concise and clear information on the rules and practices in place to identify, prevent, prepare and respond to security of supply risks and emergency situations as well as the roles and division of responsibilities of the public authorities and other relevant stakeholders involved. The full Country Reports can be found in ANNEX 1.

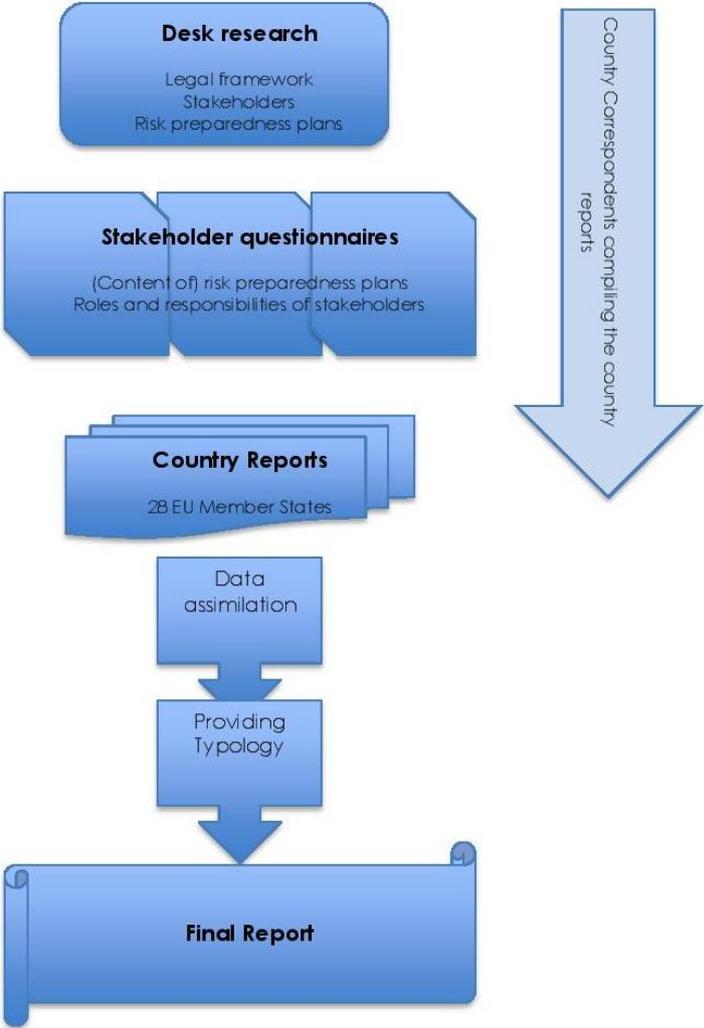
Providing typology and final reporting

Having collected the complete set of data, we proceeded to analyse the rules and practices across the twenty-eight EU Member States, in order to identify the similarities and differences between the different results and group the similar approaches into common categories addressing for example, the types of risks assessed, the obligation to have a risk preparedness plan in place and the time period of the emergency plans, their targets, stakeholders, types of measures, etc.

Having finalised our fact-finding on the legal frameworks and practices existing in each of the EU Member States, and having examined the outcomes, we will now proceed to present our findings in our final report.

See below, in figure one a schematic overview of our overall project approach.

Figure 1 Overall project approach



3.4 Outline of the main content of the final report

This report will further set out an overview and analysis of our findings with regard to the current legal framework and practices concerning security of electricity supply in the twenty-eight Member States (section 4). As such, this section provides details on how these countries identify, prevent, prepare and respond to security of supply risks and emergency situations. In order to maintain clarity, the overview and analysis is divided into the three main subheadings '*risk assessment*' (4.2), '*risk preparedness*' (4.3) and '*emergency situations*' (4.4). It includes a typology, which categorises the various findings across the EU Member States, including commonalities as well as differences between the legal frameworks, practices and approaches in the twenty-eight Member States. It also includes examples illustrating these findings on the national rules practices regarding the mitigation of risks and emergency situations related to electricity security of supply, which are accompanied by tables, charts and diagrams. Section 5 follows with a summary of our findings, conclusions and identified good practices. The final section 6 encompasses the annexes, which include a complete list of Country Reports, a list of risk assessment, risk preparedness and emergency plans and measures and the completed stakeholder questionnaires.

4-ANALYSIS OF THE CURRENT RULES AND PRACTICES RELATING TO RISK PREPAREDNESS IN THE AREA OF SECURITY OF ELECTRICITY SUPPLY IN THE EU28 (TYPOLOGY)

4.1 Introduction

In the context of the Study on the Review of current national rules and practices relating to risk preparedness in the area security of electricity supply, desk research and stakeholder consultation was carried out to provide an overview of the current legal framework and practices in the twenty-eight EU Member States. The present analysis of current national rules and practices was primarily based on country reports (See Annex 1). These country reports were drafted by national correspondents in all Member States, based on their previous in depth desk research and on stakeholder questionnaires received. Stakeholder engagement was achieved in all twenty-eight Member States, which is reflected in the completeness of the reports and study. In one country (HR), each of the relevant stakeholders provided a response. Three stakeholder responses were received in seven countries. In a majority of fourteen Member States two stakeholder responses were received, while one stakeholder response was received in seven Member States. Coordinated or joint responses from two or more stakeholders were provided in eleven countries. The availability to share relevant documents or information that the study team was not able to obtain through desk research, varied across the Member States; when these data could not be shared, it was due to the confidentiality of the information. The table below shows a complete overview of the responses received across the twenty-eight Member States.

Figure 2 Overview stakeholder responses

Country	Ministry	NRA	TSO	DSO(s)	Other	Comments
Austria		X				
Belgium	X		X			Coordinated answer from the Ministry and the TSO
Bulgaria				X		Two DSO responses were received.
Croatia	X	X	X	X		Joint response from the Ministry, NRA, TSO and DSO
Cyprus		X				
Czech Republic	X	X	X			Joint response from the Ministry and TSO.
Denmark	X		X			Joint response from Ministry and TSO.
Estonia	X	X	X			
Finland	X	X			X	Ministry made comments to desk research questionnaire; National Emergency Supply Agency also participated.
France	X	X	X			Coordinated answer from Ministry, TSO and NRA.
Germany	X	X	X			Joint answer from the 4 TSOs
Greece			X			
Hungary	X		X			
Ireland		X	X			
Italy	X	X				The NRA sent an email with tips to improve but did not answer to the questionnaire.
Latvia	X	X				
Lithuania	X	X	X			Joint answer from Ministry and TSO.
Luxembourg	X	X	X			Joint answer from Ministry and TSO.
Malta		X		X		Joint answer
Netherlands	X	X	X			The NRA and TSO provided an integrated answer. The Ministry provided answers to an IEA questionnaire and via email.
Poland		X	X			The TSO provided comments to the desk research report; the Ministry approved the desk research report.
Portugal	X		X			NRA and Ministry agreed to have the Ministry responding
Romania		X	X			
Slovakia	X		X			
Slovenia			X	X		
Spain	X					
Sweden	X					
United Kingdom⁶	X	X	X			Ministry and NRA prepared a joint answer to the stakeholder questionnaire.

⁶ The department for enterprise, trade and investment of Northern Ireland provided a separate answer.

4.2 Risk assessment

Conclusions

All twenty-eight Member States have a general obligation to monitor the security of electricity supply from which implicitly follows the obligation to assess electricity supply risks, while nine countries have a direct legal obligation to carry out an assessment of these risks.

The national entities responsible for risk assessment and the division of their roles vary across the Member States; in practice the TSO is the main entity involved in the preparation of the risk assessment and monitoring reports.

Good practice can be found in a vast majority of the countries, which describe the types of risks covered under the assessments, while the other countries do not define the types of risks or they do so in a (very) general manner. There exists a patchwork of types of risks covered under the assessments in the Member States, and they are described in various levels of detail. While this could (partly) be explained by the existence of country or regional specific electricity supply risks and circumstances, disparate (definitions of) types of risks to be assessed can potentially cause difficulties in the cooperation between neighbouring Member States, when preventing and addressing such risks.⁷

4.2.1 Introduction

This section provides an overview and a comparative analysis of risk assessment obligations and practices in the area of security of electricity supply in the EU Member States. This is focused on the three following main aspects: the existence of a legal obligation to carry out a risk assessment of electricity security of supply risks at national level; the national entities responsible for the risk assessment(s) and the types of risks which need to be addressed in the assessment reports / plans. The first part of the analysis (section 4.2.1) provides an overview of the legal framework with regard to risk assessment, while the second part (section 4.2.2) consists of a description of the national entities and their responsibilities related to risk assessment. Finally, the third part (section 4.2.3) identifies the types of risks covered under the assessment including the level of detail in which they are described.

4.2.2 Obligation to carry out a risk assessment

All Member States have a general obligation to monitor and report on the security of electricity supply (pursuant to article 4 of Directive 2009/72/EC and article 7 of Directive 2005/89/EC)⁸. In nine of those countries there is a direct legal obligation to carry out an assessment of electricity security of supply risks (BE, BG, EE, ES, FR, HU, MT, SE, UK). Within this group, SE and MT have unique provisions in relation to the other countries. SE law sets a clear legal obligation for central authorities, municipalities and country administrative boards to carry out a risk and vulnerability

⁷ This issue was not raised in our stakeholder questionnaires, so further research may be necessary to ascertain this assumption.

⁸ All 28 Member States are responsible for assessing risks relating to security of electricity supply, however their monitoring reports seem to provide limited information about the different risk assessments, types of risks assessed and measures to prevent and respond to crisis.

analysis in their own areas, to strengthen their own and Sweden's overall emergency management capacity⁹. MT law sets a clear obligation upon the NRA and the DSO to carry out a risk assessment; additionally, a legal notice¹⁰ obliges all designated Critical Infrastructures to carry out risk assessments and draw up and maintain operator security plans¹¹.

4.2.3 National entities responsible for the assessment of security of supply risks

Generally, the national entities that are responsible for carrying out risk assessments at national level are the TSOs, the National Regulatory Authorities (NRAs), the competent Ministries and the DSOs. However, the division of roles and level of responsibilities varies across the Member States, as described below.

In three Member States (DK, IT, LV), the TSO is the sole entity responsible for carrying out the risk assessment. This competence is provided by law (DK, LV) or dictated by a guidance document (the Grid Code in IT).

In five other countries national laws provide that both the competent Ministries and the TSOs have responsibility for monitoring security of supply, (DE, FR, NL, SK, PT) and thus for assessing the relevant risks. More specifically, in PT, the TSO, the Directorate General of Geology and Energy (which currently falls under the Ministry of Economy) is responsible (with the TSO's support) for monitoring the security of supply and thus assessing the relevant risks. In NL the law provides that the entities responsible for the risks assessment are the Minister of Economic Affairs (MEA) and the TSO. In particular, the MEA is obliged to monitor and report on the security of supply of electricity, compiling the report in close cooperation with the national TSO. The latter collects data regarding the adequacy of the security of supply, and when necessary, consults the TSOs of neighbouring countries. The Dutch NRA has a supervisory role.

In the UK, the National Grid (TSO) and the Secretary of State for Energy and Climate Change are both obliged to assess risks with regard to electricity security of supply as part of their responsibility to monitor and issue their reports.

In HR and RO, the laws state that TSOs, competent Ministries and NRAs are the entities responsible for the assessment and monitoring of electricity security of supply risks.

In five other countries (BG, EE, EL, HU, IE) both the NRAs and TSOs have the responsibility in the risk assessment. In BG, the NRA is obliged to adopt rules for conducting an assessment on the compliance and security of the electricity system operation mode, which in practice is to be carried out by the TSO. In EE, the TSO has the principal role to ensure the electricity security of supply of the system at all times, preparing the annual action plan with regard to electricity security of supply (TSO Security of Supply Report), while the NRA has a subsidiary role being responsible for

⁹ Stakeholder response on behalf of Ministry of the Environment and Energy.

¹⁰ L.N. 434 of 2011 Critical Infrastructure and European Critical Infrastructure – Identification, Designation and Protection.

¹¹ Stakeholder response on behalf of the NRA (MRA) and DSO (Enemalta).

stating its opinion with regard to the TSO report. EL law establishes that the NRA is the responsible entity to conduct a report of its findings resulting of monitoring the security of supply of electricity in Greece; in practice, the NRA monitors the balance of supply and demand and the generation adequacy in the interconnected and non-interconnected systems based on the data submitted by the TSO. In HU, the law and NRA regulations¹² state that the risk assessment is responsibility of the NRA and TSO. In IE, the NRA has the crucial role to carry out risk assessments and to monitor the security of supply on the basis of a set of reports received from the TSO (e.g. generation capacity statements & network development plans). Such documents are typically produced on an annual basis, and involve approval by the NRA following a public consultation (e.g. network development plans). By having a public consultation, the NRA and the TSO ensure a transparent approach to security of supply monitoring, while also providing an opportunity for stakeholders to outline any potential risks they envisage from a security of supply perspective

In MT, the law sets an obligation for the NRA to assess and monitor the electricity supply and draft a report in cooperation with the DSO, which assists the NRA transmitting estimates on energy supply.

In SI, there is not an explicit obligation to carry out a risk assessment but the law sets an obligation for the TSO and the DSO to draw up 'development plans'¹³. Furthermore, in SE, the TSO is in charge of the national vulnerability analysis, based on the risk analysis made by the DSOs and other entities which manage production, trade or transfer of electricity.

Finally, in the remaining nine countries (AT, BE, CY, CZ, ES, FI, LT, LU, PL) the responsibility for risk assessment is spread among various entities. In AT, the risk assessment involves the NRA, the control area managers, the TSO and the DSO. In particular, the law establishes that the NRA is in charge of monitoring the security of supply, while the control area managers (which also include the TSO) have the obligations to identify bottle necks in transmission grids as well as implementing of measures to avoid, remove and overcome bottle necks, maintaining the security of supply and then evaluating and elaborating prognosis; the TSO is required to submit to the regulatory authority a yearly 'network development plan' which covers a time horizon of ten years, as well to observe the security of supply. Finally, the DSO and the TSO are required to operate a secure, reliable and well performing powerful grid. In BE, the Ministry of Energy (which is part of the Ministry of Economy, Middle Class, SMEs and Energy) establishes a prospective study on electricity supply which covers a scope of minimum ten years, in collaboration with the TSO and the Federal Planning Bureau, after consulting with the NRA. Representative market stakeholders are consulted, as well as the National Bank of Belgium, the Interdepartmental Commission for Sustainable Development and the Central Council for Economy. CY law provides that the NRA is the entity responsible to monitor the national energy market which must, in cases of possible shortfalls, inform the Minister of Commerce, Industry and Tourism. In CZ, the TSO, the OTE (the Czech market operator), the NRA and the Ministry are responsible for carrying out risks assessments. In ES, the law provides that the national Government is responsible for carrying out the electricity planning, which includes the assessment of risks with regard to electricity security of supply.

¹² The Emergency Decree and the Internal Rules of the Regulatory Authority (Internal Regulation no. 1/2015, of the Hungarian Energy and Public Utility Regulatory Authority).

¹³ See section 4.3 Risk Preparedness Plans.

The electricity planning is conducted by the General State Administration (specifically, by the Minister of Industry, Energy and Tourism), with the participation of the Autonomous Communities and Cities of Ceuta and Melilla. Additionally, it requires a report of the National Commission on Competition and Markets and Hearing Process, to be submitted to the Congress of Deputies, prior to their approval by the Government, and covering a period of six years. Furthermore, the TSO provides and controls the level of electricity security of supply in the short and medium term, in the peninsular and non-peninsular systems. In FI, the risk assessment involves the Council of State, the National Emergency Supply Agency, the Energy Authority, the TSO and the DSOs. Various Finnish laws impose obligations upon the above-mentioned entities, in particular: the Council of State sets forth the general objectives of security of supply that determine the overall level of preparedness in view of the minimum needs of the population, the necessary functions of the economy, and military defence (the level of preparedness required depends on the threat scenarios and potential risks envisioned); the National Emergency Supply Agency adopts general security of supply measures and measures to respond to serious emergencies; the TSO ensures the reliability of the main grid and power balance responsibility and the DSOs ensure the reliability of the distribution grid and end-customer supply. In LT, the national entities responsible for carrying out the assessments of risks with regard to electricity security of supply are: the Ministry of Energy, the State Energy Inspectorate, the TSO and the DSO. In particular, the State Energy Inspectorate supervises the usage efficiency and reliability of energy and energy resources production, transmission, distribution and supply; this entity and the Energy Ministry are in charge of assessing risks of dangers and emergency situations for activities of the institutions, whilst the TSO is responsible to ensure the national electric energy balance. TSO and DSO are required to carry out risk assessments of possible danger and emergency situations. In LU, the Government Commissioner for Energy draws up the risk assessment report based on the information provided by Electricity companies, while the TSO has to establish an operational code to preserve the security, reliability and efficiency of the electrical system in case of exceptional situations. Finally, the NRA has the obligation to monitor the past performance of the network security and reliability and to set or approve standards and requirements for the quality of service and supply or contributing thereto, as well as establishing an annual report in the context of its duties in the electricity sector. Lastly, in PL, the TSO and DSO are responsible for monitoring the security of electricity supply together with the Ministry of Energy, which draws up and publishes every two years a report on the results of monitoring of security of electricity supply¹⁴.

¹⁴ Stakeholder response on behalf of the competent Ministry, TSO and NRA.

Figure 3 - Entities responsible for assessment of security of supply risks

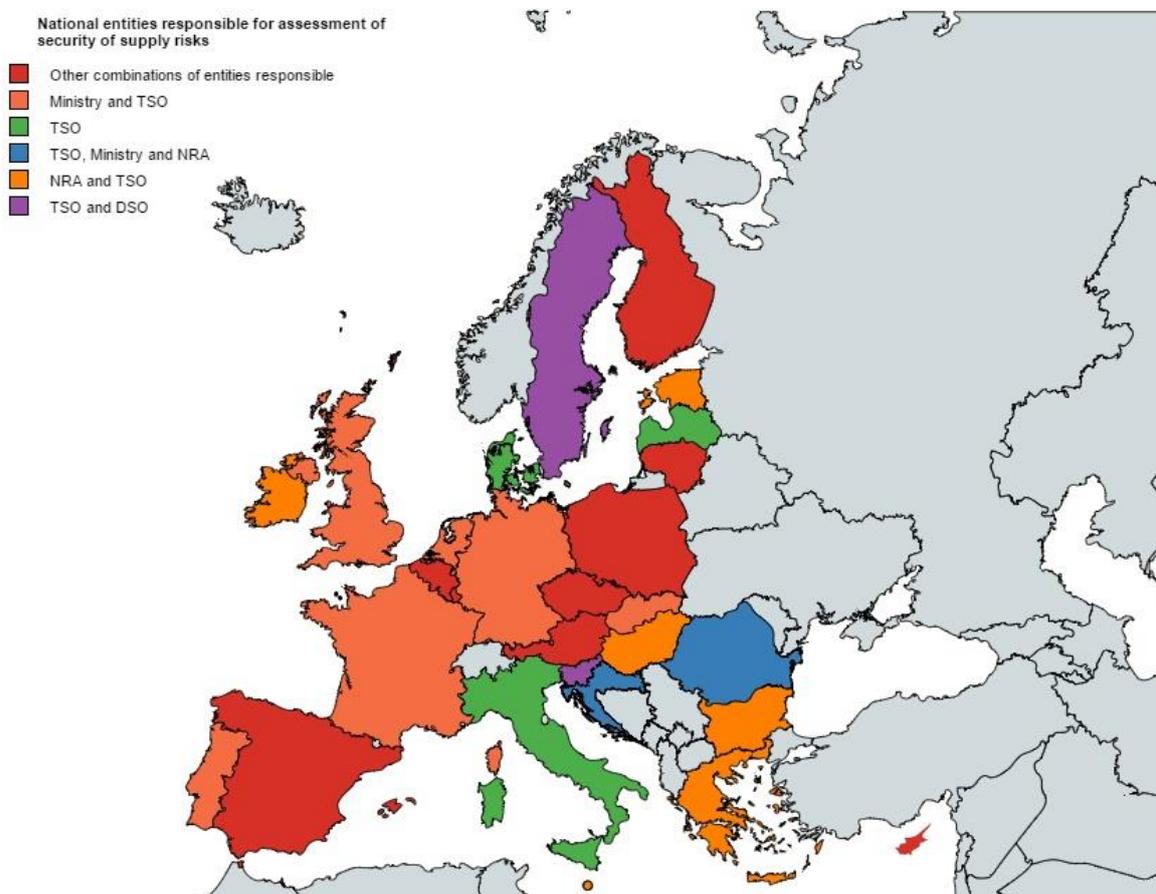
National entities responsible for assessment of security of supply risks	Member States
TSO	DK, IT, LV
Ministry and TSO	DE, FR, NL, PT, SK, UK ¹⁵
TSO, Ministry and NRA	HR, RO
NRA and TSO	BG, EE, EL, HU, IE, MT ¹⁶
TSO and DSO	SI, SE
Other combinations of entities responsible	AT, BE, CZ, CY, ES, FI, LT, LU, PL ¹⁷

¹⁵ The NRA has a supervisory role.

¹⁶ In Malta, in the absence of a TSO, the DSO takes on this role.

¹⁷ In the following countries the combinations of national entities involved in the risk assessment and their roles vary: AT (NRA, control area managers, TSO and DSO); BE (Ministry of Energy, TSO, Federal Planning Bureau, NRA, Representative market stakeholders, National Bank of Belgium, the Interdepartmental Commission for Sustainable Development and the Central Council for Economy); CZ (TSO, OTE, NRA, Ministry); CY (NRA, the Ministry takes the measures required as a result from the assessment), ES (national Government, Minister of Industry, Energy and Tourism, Autonomous Communities and Cities of Ceuta and Melilla, National Commission on Competition and Markets and Hearing Process and TSO); FI (Council of State, National Emergency Supply Agency, Energy Authority, TSO and DSOs); LT (Ministry of Energy, State Energy Inspectorate, TSO and DSO); LU (Government Commissioner for Energy, Electricity companies, TSO and NRA); PL (TSO, DSO, Ministry of Energy).

Figure 4 - Entities responsible for assessment of security of supply risks



4.2.4 Types of risks covered under the assessment(s)

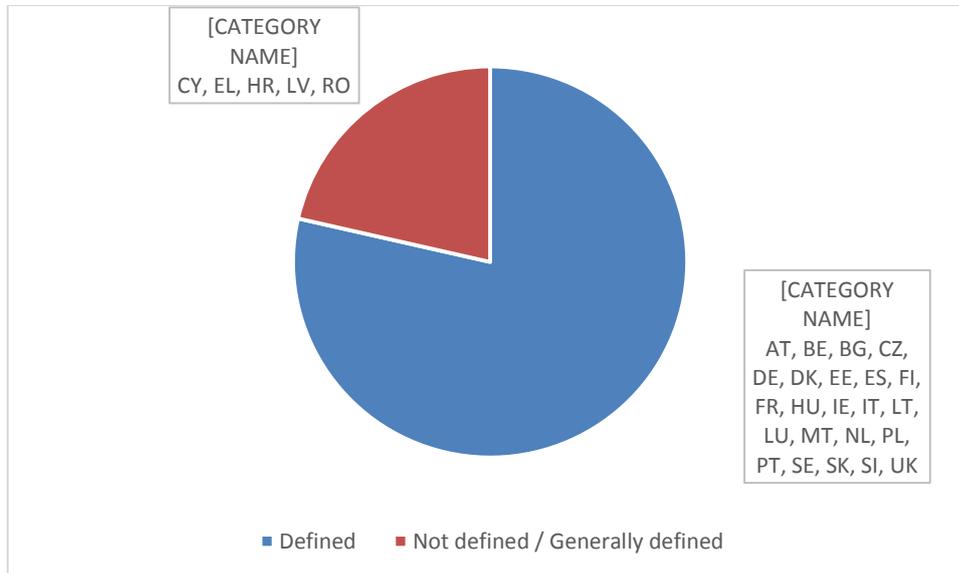
For the purpose of the analysis, the countries can be divided into two main groups: the first composed of countries which give information on the types of risks to be covered by the risk assessments (information that in some cases is detailed and in others less so), and the second group composed of countries that do not describe the risks or that do so only very generally.

Good practice can be found in the first group, which consists of twenty-three Member States, which clearly define the risks to be covered in the risk assessment: AT, BE, BG, CZ, DE, DK, EE, ES, FI, FR, HU, IE, IT, LT, LU, MT, NL, PL, PT, SE, SK, SI, UK.

Example – Types of risks defined

In AT risk assessment covers comprehensive types of risks, namely, technical (e.g. bad conditions due to lack of investment), market (imbalance in generation and demand), political (terror attacks) and environmental factors (natural disasters). The types of risks are provided for both by law and by a non-legislative document (a factsheet published by the NRA).

Figure 5 - Types of risks covered under the risk assessment



In CZ, the types of risks can be derived from the definition of emergency included in the Energy Act. As a consequence, the assessment of risks includes the following circumstances: *natural disasters (torrential rain, landslides, storms, rime); measures of State Authorities during a state of emergency, state of threat to the State or state of war; accidents or accumulation of faults on the electricity generation, transmission and distribution facilities; a smog situation¹⁸; a terrorist act; outstanding balance of the electricity system or its part (a situation, when the consumption of electricity exceeds the capacity of the power plants in the Czech Republic); transmission of the fault from the foreign electricity system; the physical security or protection of persons being endangered*. Furthermore, monitoring and assessment of risks also includes provisions concerning cyber security risks¹⁹.

In DE, the TSOs assess the critical infrastructure related risks as well as the supply interruptions which are caused by atmospheric conditions, third party influence, competence of network operator, retroactive perturbation and force majeure. The NRA, in consultation with the Federal Ministry for Security in Information Technologies, has elaborated upon and published a catalogue of IT-related security requirements to the telecommunication and electronic data processing systems of the TSOs²⁰. These requirements also cover rules on regular compliance checks of security requirements. Notably, in DK, the NRA indicates a number of scenarios to be assessed by the companies and the TSO. These scenarios represent the minimum requirements for risk assessment²¹.

¹⁸ This is detailed under the specific legal regulations (a state of an extraordinary polluted air according to Section 10 (1) of the Act No. 201/2012 on the Protection of the Air)

¹⁹ Stakeholder response on behalf of the NRA.

²⁰ Stakeholder response on behalf of the four TSOs, the NRA and the competent Ministry.

²¹ Stakeholder response on behalf of the NRA and TSO.

Within this group, four countries (BE, FR, IE, UK) explicitly cover meteorological risks. In BE²² and FR²³, the risk assessment takes into account cold spells, while in IE, the main day-to-day risks are weather-related²⁴. Similarly, in the UK, severe weather events are considered in the risks assessment.

Additionally, in the UK the types of risks which are monitored and assessed are mostly around impacts as a result of primary fuel shortages, generation plant breakdown and severe weather events as mentioned above.

Example – General risk assessment at national level

The UK represents an example of a country where risks such as terror attacks and cyber threats are covered by a more general national risk assessment: the National Risk Assessment (NRA). This is a governmental and classified assessment of the risks of civil emergencies facing people in the UK over the next five years. The National Risk Register of Civil Emergencies (NRR) is the unclassified version of the NRA. The NRR is a public resource for individuals and organisations wishing to be better prepared for emergencies. When identifying risks for the NRA and NRR, a 'reasonable worst case' is chosen which represents a challenging manifestation of the scenario after highly implausible scenarios are excluded. The key risks are captured in risk matrices, bearing the two headings: Risks of terrorist and other malicious attacks' (which are categorised into subheadings such as 'Catastrophic terrorist attacks', 'Cyber-attacks: infrastructure' etc.) and 'Other risks' (such as 'Pandemic influenza', 'severe space weather', 'Coastal flooding' and 'Widespread electricity failure').

In SE the type of risks to be assessed by central government authorities, municipalities and country administrative boards²⁵, are not specified. Instead, the legislation often sets out so called functional demands. Directions can however be found in the Civil Contingencies Agency's guidelines for assessment, which includes risk categories that can be used when conducting risk assessments. Such categories are: natural disasters, other accidents, technical infrastructure and supply systems, antagonistic threats and societal instability and infectious diseases. The Electricity Act establishes that the NRA has the role of providing guidelines and general advice on the types of risks possibly covered in the risk assessment, namely risks with an exceptional character (war, terrorism) and with no exceptional character (flood, storm, lightning strike). Furthermore, in SE, there is a specific risk concerning long-term energy shortages, continuously monitored by the Swedish Energy Agency, by way of analysing the electricity market and production capacities, the levels of the water reservoirs, etc²⁶.

²² Stakeholder response on behalf of the Ministry and TSO.

²³ Stakeholders responses on behalf of the Ministry and TSO.

²⁴ Stakeholder response on behalf of the TSO (EirGrid).

²⁵ In accordance with the Emergency Management and Heightened Alert Ordinance of 2006:942.

²⁶ Stakeholder response on behalf of the competent Ministry (Ministry of the Environment and Energy).

The second group consists of five countries where the law or regulation does not clearly specify the types of risks covered under the assessment or do so in a very general manner (CY, EL, HR, LV, RO). Notably, in CY, LV, RO the law does not make any reference to the types of risks to be covered by the assessment. However, in RO, in practice the TSO assesses and monitors risks related to all activities: operational risks, financial risks, strategic risks and hazard/natural risks, other than sudden phenomena (e.g. natural disasters, terrorist and cyber-attacks). Similarly, in the other two countries (EL, HR) the national law does not describe the types of risks to be assessed. Nonetheless, in EL, the law provides definitions of hazards and associated risks including electricity supply and sudden phenomena other than natural disasters, while in HR, the only type of risks envisaged by the law being "*vis major*". Notably, "*vis major*" are considered to be "*extraordinary situations*" which are defined as "*natural disasters or a catastrophe, as determined by the act regulating protection and rescue and natural disasters*"²⁷.

4.2.5 Conclusions

Our analysis of the legal frameworks and practices with regard to the assessment of electricity security of supply risks shows both similarities and diversities among the twenty-eight EU Member States. The similarity exists in the fact that all Member States have a general obligation to ensure the monitoring of electricity security of supply, by complying with the requirement set out in Article 4 of Directive 2009/72/EC, from which implicitly follows the obligation to assess electricity supply risks. In nine Member States an explicit obligation prevails (by law) to carry out an assessment of risks.

The (combination of) national entities (TSOs, the competent Ministries, the NRAs and the DSOs) responsible for risk assessment and the division of their roles, which are often defined by law, vary across the Member States. TSOs play a major role in the assessment of risks in a majority of the countries. In line with Article 7 of Directive 2005/89/EC, the TSOs are in practice the main entity involved in the preparation of the risk assessment and monitoring reports and in charge of ensuring the security of electricity supply in practice.

With regard to the types of risks to be assessed, good practice was found in a vast majority of the countries (AT, BE, BG, CZ, DE, DK, EE, ES, FI, FR, HU, IE, IT, LT, LU, MT, NL, PL, PT, SE, SK, SI, UK), which describe the types of risks covered under the assessments. The level of detail in which the types of risks are described varies and a high level of detail was found in AT, IE, UK. In five countries the types of risks to be assessed are not or very generally described (CY, EL, HR, LV, RO).

There exists a patchwork of types of risks covered under the assessments in the Member States. Diversities in types of risks and their definitions will be (partly) due to the existence of varying electricity risks at national level and different national circumstances (e.g. weather, electricity resources and location). Nevertheless, disparate (definitions of) types of risks to be assessed can potentially cause difficulties

²⁷ Stakeholder response on behalf of the competent Ministry (Ministry of Economy), the NRA (HERA), the TSO (HOPS) and the DSOs (HEP and ODS).

in the cooperation between neighbouring Member States, when preventing and addressing such risks.²⁸

4.3 Risk preparedness plans

4.3.1 Introduction

This section provides an overview and comparative analysis of risk preparedness obligations in the area of security of electricity supply in the EU Member States. Risk preparedness plans can be described as 'plans whereby national authorities set out various types of risks, draw conclusions from various types of risk assessments and list measures taken or envisaged to remove or mitigate the risks identified, as well as measures to prepare and prevent emergency situations'. The analysis covers the seven main questions included in the desk research and stakeholder consultation phases in relation to risk preparedness. Hence, the first part (section 4.2.1) will provide an overview of the existing national obligations to draw up risk preparedness plans. The analysis will then look into which national entities are responsible and how their roles are divided (section 4.3.2) and, subsequently, identify whether measures are of a preventive or emergency nature. It will be seen that the distinction between risk preparedness and emergency measures although useful from an analytical perspective, is not always reflected in the laws and practices of Member States (section 4.3.3). The analysis will continue by looking at the types of preventive measures envisaged at national level (section 4.3.4). It will then proceed with the identification of the time horizons covered (section 4.3.5). In turn, the sixth part of the analysis will focus on the coordination between neighbouring Member States (section 4.3.6). Subsequently, it will be seen whether the information in this domain is publicly available and the frequency according to which risk preparedness plans need to be updated (section 4.3.7). The results of the study show a fragmented and diverse framework in relation to national risk preparedness plans/ measures, with Member States taking different approaches to risk preparedness obligations.

4.3.2 Existence of a national obligation to draw up 'risk-preparedness plans' (legal obligation or other)

Conclusions

Research shows a fragmented and diverse framework in relation to national risk preparedness plans, measures and obligations concerning security of electricity supply.

In general, it can be said that all MSs take into account risk preparedness considerations. However, only ten MSs set clear obligations to draw up risk preparedness plans, whilst eighteen other Member States do not have such an obligation, but take risk preparedness considerations into account in reports, plans or measures.

There is no specific obligation to submit a risk preparedness plan in the Electricity Directive (2009/72/EC) and in the Security of Supply Directive (2005/89/EC), which partly explains the fragmented framework of preparedness plans and measures.

²⁸ This issue was not raised in our stakeholder questionnaires, so further research may be necessary to ascertain this assumption.

The diversity of approaches at national level may create some difficulties in cross border cooperation. Furthermore, the fact that several MSs do not compile preventive measures in a single plan may create an unclear framework at national level.

A good practice can thus be identified in at least ten MSs which set specific obligations to draw up 'risk preparedness plans' (BG, CY, CZ, DK, HR, HU, LT, PT, RO and SE).

All Member States take into account risk preparedness considerations with regard to the security of electricity supply. Ten Member States set clear obligations to draw up 'risk preparedness plans' (BG, CY, CZ, DK, HR, HU, LT, PT, RO and SE). In eight of these countries this obligation is set by law, whilst in BG and PT this obligation is provided by a guidance document.²⁹ Furthermore, in eighteen other Member States, although there is no direct obligation to draw up 'risk preparedness plans' *per se*, risk preparedness considerations are taken into account in other plans/ reports or measures (AT, BE, DE, EE, EL, ES, FI, FR, IE, IT, LV, LU, MT, NL, PL, SK, SI and UK).

4.3.3 Responsible national entities and their roles

Conclusions

Although TSOs appear to have a central role in the adoption of risk preparedness plans or measures, the responsible national entities and the specific role they carry still varies significantly revealing a significant diversity amongst Member States.

With regard to the national entities that are responsible for risk preparedness plans, measures or considerations, the framework across the EU is very diverse. Hence, TSOs are the sole entity responsible for drawing up risk preparedness plans/ 'risk preparedness related measures' in three Member States (BG, DE, and HU); TSO and government in five Member States (ES, LV, PL, RO and SK); TSO in collaboration with the government and DSO in further three countries (IT, NL and PT); TSO, DSO and NRA in two Member States (SE and FR); TSO and DSO in three countries (IT, HR and SI); TSO and NRA in AT and IE; TSO and 'regulated companies' (TSO, DSO and producers of electricity with a capacity above 25 MW) or 'network providers' (providers of electricity supply) in DK and EE respectively. Three other Member States have arrangements which do not involve their TSOs (CZ, MT and CY). Finally, in FI, the National Emergency Supply Agency is responsible for risk preparedness measures; and in the UK, the network operators, the Secretary of State and the Energy Emergencies Executive Committee share risk preparedness competences (the Energy Emergencies Executive Committee advises the Secretary of State on the continual review and testing of the Electricity Supply Emergency Code, whilst the NRA (OFGEM) reports contain risk assessment considerations for the following years).

²⁹ The fact that there is a clear obligation to elaborate risk preparedness plans does not exclude the taking into account of risk preparedness considerations or measures in other laws, reports or plans.

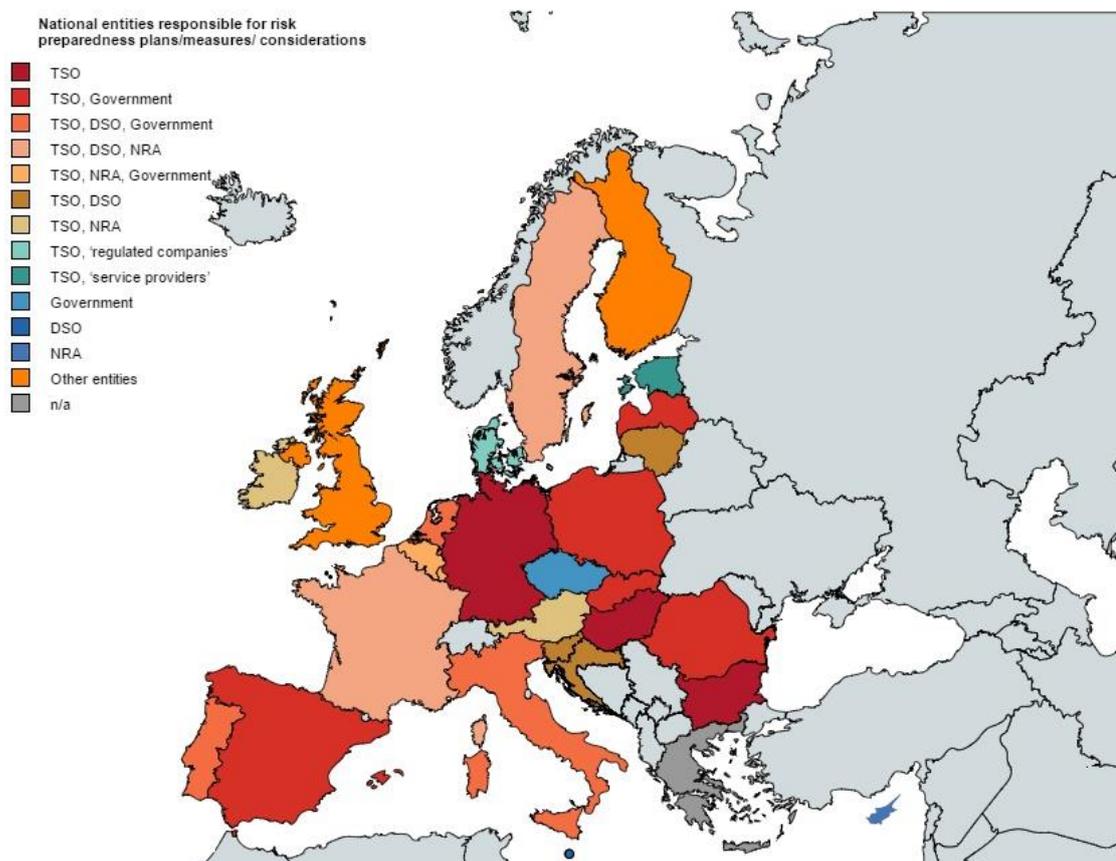
Figure 6 - National entities responsible for risk preparedness plans/measures/ considerations

National entities responsible for risk preparedness plans/measures/ considerations	Member States
TSO	BG, DE, HU
TSO, Government	ES, LV, PL, RO, SK
TSO, DSO, Government	IT, NL, PT
TSO, DSO, NRA	SE, FR
TSO, NRA, Government	LU, BE
TSO, DSO	LT, HR, SI
TSO, NRA	AT, IE
TSO, 'regulated companies'	DK
TSO, 'service providers'	EE
Government	CZ
DSO	MT
NRA	CY
Other entities ³⁰	FI, UK
Unspecified ³¹	EL

³⁰ FI – National Emergency Supply Agency and 'network operators'; UK – Network operators, Secretary of State, Energy Emergency Executive Committee and OFGEM.

³¹ EL – Division of responsibilities not clear.

Figure 7 - National entities responsible for risk preparedness plans/measures/ considerations



4.3.4 Types of measures (preventive or emergency measures)

Conclusions

A large majority of Member States' risk preparedness plans and / or measures include both preventive and emergency considerations.

In general, Member States do not always make a clear distinction between preventive and emergency measures. This distinction could be useful to clarify measures which can be adopted to prevent emergencies, and measures which can only be adopted at last resort.

The distinction between risk preparedness and emergency measures is useful as it provides a more comprehensive view of the different national frameworks. Nonetheless, the distinction is not always reflected in the laws and practices of Member States. Hence, it is common for Member States to merge the two concepts in their domestic framework (for example, some Member States incorporate risk preparedness measures in their emergency framework or vice versa).

Research shows that in twenty-seven Member States, risk preparedness plans / measures include both preventive and emergency measures (AT, BE, BG, CY, CZ, DE, DK, EE, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK, UK). In

FI, there is a particular emphasis on preventive measures and in BG, DE and PT, whilst it was not possible to determine fully the scope of several confidential TSO risk preparedness plans, research showed that some publicly available plans and guidance documents include both emergency and preventive measures. Lastly, in EL, there is no publically available information on preventive measures included in risk preparedness plans (only authorized personnel of TSO's System Operation & Control Department have access to Defence and Restoration plans).

4.3.5 Types of preventive measures covered³²

Conclusions

A significant majority of Member States take preventive measures into account, but the type of preventive measures envisaged varies significantly across Member States. A large majority of Member States focus on the adoption of market measures in their preventive framework (primarily measures directed at supply / demand, operational security and energy efficiency). In seven Member States, the information available does not allow for a categorisation of measures.

This section provides an overview of the type of preventive measures envisaged at national level, i.e. measures that can be adopted to prevent or to prepare for the event of an emergency. Two important issues need to be taken into account. First, Member States do not always make a clear distinction between measures which can be adopted for prevention purposes and measures that can be adopted to respond to an emergency (thus, on occasion, emergency measures may be mentioned); second, availability of information is limited in many Member States, as many risk preparedness plans / reports or measures are confidential. Hence, information in this section is not exhaustive aiming rather at giving an overview of preventive measures that may be adopted at national level.

Concisely, as seen previously, a majority of Member States takes preventive measures into account. Nonetheless, the type of preventive measures envisaged varies significantly across Member States. Research shows that twenty-one countries focus on the adoption of market measures³³ in their preventive framework (this concerns the countries in which information was available). In seven countries, the information available does not allow for a categorisation of measures, mainly due to the confidentiality of risk preparedness plans and measures (AT, BG, DK, EL, FI, LU and MT).

Hence, in general, Member States envisage a wide range of market measures primarily directed at supply / demand, operational security and energy efficiency. In BE, for example, before every Winter period, pursuant to instructions from the Energy Ministry, the TSO launches a call for tenders to establish a strategic reserve of

³² Emergency measures will be dealt with in detail in section 4.4.

³³ As guidance, we referred to the distinction between market and non-market measures as listed in Regulation 994/2010 concerning measures to safeguard security of gas supply, OJ L295/1 [2010], Annexes II and III.

electricity capacity of supply (the NRA gives its opinion on the prices of the offers, and the awarded contract covers a 1 to 3 years' period). Every year, the reserve capacity is re-evaluated accordingly. The strategic reserve is activated when a production deficit is identified based on the provisions carried out a few days or hours earlier, to face a foreseen and structural production deficit and avoid load shedding. The Belgian TSO also coordinates with neighbour countries to anticipate an import increase. In turn, CY law envisages that its preventive action plan includes results of a risk assessment study, measures from the supply side, measures on the demand side and the obligations imposed on electricity companies, and other relevant organizations, including those concerning the safe operation of the system. Furthermore, an NRA decision has imposed an obligation on all electricity producers using natural gas as primary fuel, to maintain a stock of alternative fuel sufficient to allow them to produce for at least eight days at the maximum capacity of each unit. However, it should be noted that no concrete measures have been enacted in Cyprus so far nor is there a legal provision dictating the publication in case of future enactment.

Subsequently, in CZ, the Emergency Decree foresees three types of preventive measures: reduction of the amount of power taken from the electricity grid in accordance with a consumption restriction plan (demand-side), complete interruption of electricity to customers by disconnecting their supply electrical equipment or by turning off parts of the grid (demand-side), and a change in the amount of power supplied by the electricity generators (supply-side). Furthermore, with regard to the import capacity / interconnection, two measures are implemented in the Czech Republic (pursuant to the TSO's Grid Code): (i) RAAS - Real Time Alarming and Awareness System, and (ii) EIS - Emergency Information System (however, no detailed information about these instruments is publically available). Furthermore, in DE, the TSO can adopt a number of measures, which can be considered as related to risk preparedness. These cover primarily market measures and interconnections; whilst in EE, the TSO must enact measures to deal with peak demand and shortfalls and is entitled to restrict or interrupt the import of electricity if this is required by the technical limitations of the system or the need to ensure security of supply. Specific requirements for imports and co-operation in relation to cross-border interconnections are also set by the national Grid Code.

In ES, the Ministry can adopt a diverse range of measures, namely, direct operation of generation facilities, transmission and distribution, establishment of special obligations of primary safety stock for the production of electricity sources; limitation, temporary modification or suspension of the rights of producers of electricity from renewable energy sources, cogeneration and waste; amendment of the general conditions of regularity in the supply generally or referred to certain categories of consumers; limitation, temporary modification or suspension of rights and guarantees of access to third party networks; limitation or allocation of primary energy supplies to electricity producers; any other measures as may be recommended by international organizations of which Spain is a member or to be determined pursuant to those agreements in which they participate. Moreover, in FR, on the supply side, a 'capacity mechanism' imposes minimum supply capacities to suppliers, which is to be certified by the TSO (this mechanism takes into consideration the interconnections with a security coefficient established by the TSO). On the demand side, 'load management' allows for the voluntary reduction in electricity demand during peak demand time. The main preventive measure relates to the 'capacity of the market' and requires operators to yearly submit certification capacity requests to the TSO. Certificates are issued to operators to reflect the projected availability of their capacities during short peak periods. FR also envisages the constitution of 'reserves of electricity' (supply-side measure) by the TSO, which allows for short-term adjustment and ensures security of supply in emergency situations (see section 4.4 on Emergency situations below).

Furthermore, additional obligations of the transmission system operator, inter alia with regard to risk preparedness, are included in the Net Code. According to the latter, FR's TSO is responsible for adopting the appropriate regime for the functioning of electricity system, for evaluating the risks posed to the electricity system, for the adoption of a plan to re-activate the electricity system and for the examination of any discrepancies of the electricity system as well as to ensure that discrepancies do not reoccur.

In HR, measures for the prevention of further spread of disturbances in the transmission grid are envisaged in a Defence Plan; further, in HU, preventive measures are applicable to producers, distributors and traders. Amongst measures related to reserves and maintenance of equipment, for example, the DSOs must register specified groups of non-interruptible users. Subsequently, in IE, the TSO development plans (which include risk preparedness measures) take into account the needs of the transmission system caused by changes in demand or in generation, changes in interconnection, interregional flow patterns and changes in asset condition.

IT provides an interesting example, having preventive measures which focus on supply / demand side market measures, as well as in other issues such as fight against corruption. Hence, in IT, monitoring systems are in place to detect imbalances between the planned supply/demand of electricity. In particular, the 'Defence Plan' addresses the following risks: unexpected peaks in demand, loss of energy generators, transitory or permanent overload of energy transformers, frequency collapse, high voltage collapse and loss of 400 kV distribution. In addition, some particular measures are also considered - a Memorandum of Understanding with the "Guardia di Finanza" (Italian financial /tax police) is in place aiming at the prevention of possible criminal infiltration in companies executing contracts, subcontracts, hires or other types of services connected with the construction of infrastructure for the national transmission grid.

In turn, in LT, the law covers measures associated with electricity security of supply, as well as risk reduction measures, risk assessments preparation measures, preparation and amendment of plan for measures of emergency situations prevention and measures for ensuring appropriate preparation for emergency situations. Subsequently, in LV, the law sets a limit on the electricity production capacity that ought to be kept at all times (e.g. at any given moment the total available electricity production capacity must be such as to ensure the volume of available electricity is not below 80% of the total electricity consumption during a certain year). Consequently, the TSO report must indicate whether or not there is a risk of the electricity production capacity to slip below that threshold. The Ministry will then decide if measures are necessary to increase the available volume of electricity. Additionally, an assessment report addresses the issue of available energy production capacity reserves in case of failure of any of the electricity system units as well as the overall status and capacity of the electricity supply systems.

In NL, the Ministry of Economic Affairs' monitoring report includes a list of enacted and foreseen measures in response to the findings of the monitoring process. Interconnections are taken into consideration in the report. Furthermore, national law obliges each grid operator to submit a "quality and capacity plan" (a so-called KCD: *kwaliteits- en capaciteitsdocument*). Further, in PL, the monitoring report of the Minister of Energy includes several examples of preventive market measures, also considering import and interconnection issues. Additionally, the interconnection capacity is taken into account while considering the possibility to import electricity by

the TSO from neighbouring systems. In PT, measures can focus on capacity testing, the security of the functioning of the grid, the balance between supply and demand for a five-year period, the estimations for security of supply for a period between five and fifteen years and the plans to invest in cross-border connections at least in the next five years (included in the Ministry's monitoring report). The law also requires the "Investment and Development Plan" of the TSO to be drafted in cooperation with other TSOs in relation to "international connections". Furthermore, the Network Operation Code requires the TSO to establish the necessary preventive measures, whilst the Manual of Procedures of the System Global Management requires the TSO to establish security plans, which are confidential. Additionally, in RO, risk preparedness measures can include both supply-side (increasing production capacities) and demand-side measures (as a last resort, reducing consumption). The measures also include reference to interconnections (via reducing / annulling of ATC and AAC).

Furthermore, in SE, preventive measures can relate to: the provision and storage of equipment; supplementing of local and regional electricity grid; complementing and strengthening of guidance and control systems including communication connections; consideration relating to the construction of new buildings, exposure to accidents; strengthening of physical protection. Moreover, preventive measures also emphasise concerns with regard to the design of the infrastructure in the electricity sector so that it becomes less vulnerable, for instance, by burying power lines and the importance of preparatory measures so that participants in the electricity sector can quickly react to severe disruptions. Notably, measures directed at the strengthening of IT-security for guidance and control of systems critical IT-processes (e.g. firewall, encryption, virus protection, uninterruptible power) are also envisaged. In turn, in SI, the TSO is responsible and authorized to take appropriate measures to prevent the occurrence or spread of disturbances to the electric power system in the shortest time possible. One such measure provides that if the granting of access to the network could endanger the safe operation of the electric power system, the TSO can partially or entirely deny access, all in accordance with prescribed rules. Another example is the possibility of the TSO, in case a production unit threatens the security of the electric power system, to require it to be switched-off. Moreover, in SK, the TSO's 'System Technical Requirements' contain preventive measures to cope with frequency deviation, such as, *inter alia*, voltage instability, frequency load-shedding, disconnection of power plants and off-takers, and, in case of threat of congestion of the electricity system, cancellation of planned shutting down of the system, changes in the grid configuration, re-dispatch of generation, reduction of cross border capacities, among other measures.

Finally, in the UK, the Electricity of Supply Emergency Code sets out measures for limiting electricity use in the longer term. Furthermore, the NRA's (OFGEM) security of supply report notes that Supplemental Balancing Reserve (SBR) and Demand Side Balancing Reserve (DSBR) has been procured for Winter 2015/16 as a result of the risks. In addition, the actions that the National Grid include renewing procurement of SBR and DSBR, interconnections with Europe importing at capacity, use of generators, and an additional GW returned to the market. Furthermore, the UK Grid Code and Distribution Code impose duties on licence holders in relation to risk assessment, preparedness and response. These Codes are owned and maintained by industry, with changes approved by the NRA (OFGEM) and place formal obligations on the GB SO to agree Black Start capability at a number of strategically located power stations, to agree 'Local Joint Restoration Plans' with power stations and DNOs, and to conduct regular Black Start tests and joint exercises. The GB SO also conducts "Local Joint Restoration Plan" desktop exercises with stakeholders (TSOs, power station, DNO, TO(s)) every 8 years for each individual plan.

In six countries - AT, BG, DK, EL, FI, and MT - risk preparedness plans / measures are confidential and information shared with the consortium / national experts was limited.³⁴ Hence, these countries were included in the same group for the purposes of this analysis. Nonetheless, regardless of the confidential information, some general information could be ascertained. In AT, most plans / risk preparedness measures are confidential and only shared amongst the relevant stakeholders. Nonetheless, Austrian law, in case of threat of disturbances or in order to eliminate existing disturbances, allows the competent Minister to send instructions to TSO and DSO (as well as traders) regarding the generation, transmission distribution and trade of electricity, to make public appeals and orders to final consumers, adopt regulations with derogations from renewable energy, amongst other measures. In MT, risk preparedness considerations seem to take into account both preventive and emergency measures. However, the plans / measures are confidential and were not shared with the consortium, hence details could not be confirmed. BG risk preparedness measures cover preventive and emergency situations. Once again details are very limited given the confidentiality of the plans. Regardless, the following preventive measures are in place, e.g. devices for preserving the stability in rotor angle; devices for preserving the frequency stability; and devices for preserving the voltage stability. Lastly, in EL, as mentioned previously, risk preparedness plans are confidential and details regarding their content were not shared by the stakeholders (the Greek TSO clarified that only authorized personnel of TSO's System Operation & Control Department have access to Defence and Restoration plans). Quite uniquely, in DK, there is an emphasis on decentralised plans, which endorse the operator's ability to adapt the 'Risk Preparedness Plans'. These plans are viewed as action-oriented operational crisis management tools. DK risk preparedness plans thus focus on mitigating and preventing emergencies. Depending on the level of application, the plans can vary in detail and perspective. At the local level, the plans can take form of a flowchart, contact list or action-scheme; at the aggregated level the plans can take the form of a decision-support-tool including statistics and risk-assessments. However, all risk preparedness plans function as dynamic documents; risk and vulnerability analysis, exercise lessons and incident evaluations qualify as continuous improvement processes.

Finally, in relation to LU, there is limited information. Regardless, the research team ascertained that the TSO is required to take preventive measures to limit the degradation of security and secure the reliability and efficiency of the network, in case of an expected exceptional event. When such an event happens, the TSO must also take all necessary corrective measures to minimise the impact. Preventive and corrective measures are therefore both covered by law but concrete examples of preventive measures are not provided for by law.

³⁴ These are not the only Member States to have confidential risk preparedness plans / measures (for details on availability of risk preparedness measures see section 3.3.7 below). However, in relation to these five countries, information regarding the content of measures was not shared or was very general.

4.3.6 Time horizons for each of the measures

Conclusions

The time horizons covered by the different measures vary significantly across the Member States and no overall trend can be identified; they can vary from one year to fifteen years. Some Member States set no limits of validity for their measures, others have a system of continuous updates while at least eleven countries do not specify time horizons. It is noteworthy that some Member States take into account longer periods in their risk preparedness plans / measures, such as, for example, EE, FR, NL, PT and SK.

Time horizons covered by risk preparedness plans / risk preparedness related measures vary significantly among Member States. Depending on the type of measures, some countries cover time periods, e.g. between five and fifteen years (EE, FR, NL³⁵, PT, SK), between three and fifteen years (PL), between one and ten years (BE, FI). Alternatively, some countries stipulate a specific time horizon to be considered by specific measures, e.g. three years (LT, DE³⁶), five years (DE³⁷) or ten years (AT, LV, IE³⁸ and also NL³⁹). HU and DK do not set limits to the validity of the plans / measures in place, whilst the UK introduced a system of continuous updates and thus time horizons considerations do not apply directly. In eleven Member States the time horizons for risk preparedness plans / measures are not specified (HR, BG, CZ, IT, LT, LU, MT, RO, SE, SI, ES).

³⁵ Minister of Economic Affairs, Monitoring Report.

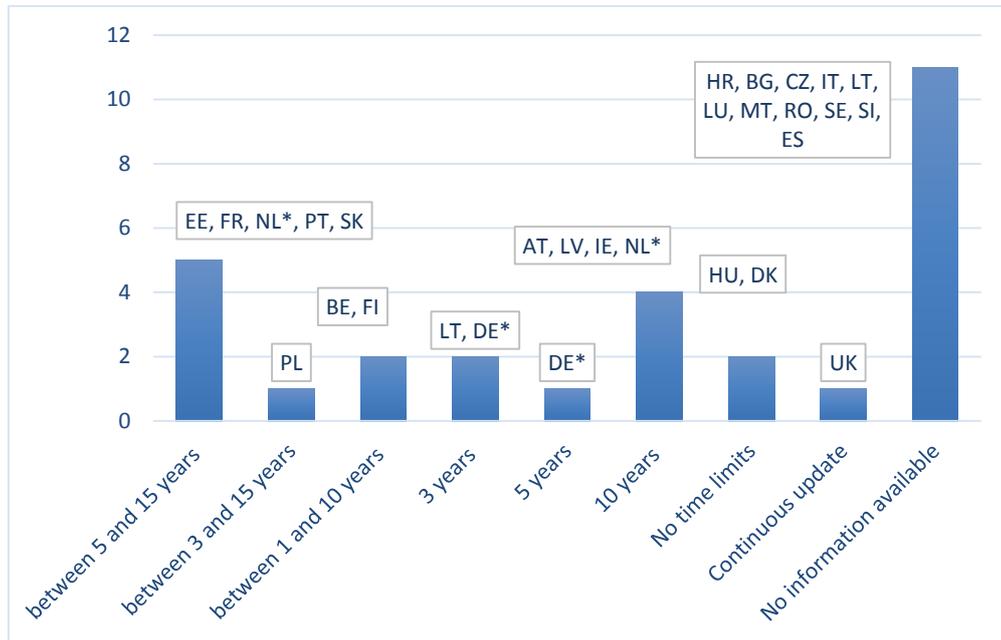
³⁶ TSO's annual generation adequacy report on the development of load coverage.

³⁷ TSO's annual report on reserve power plant demand presents results of system analyses for the next winter, and a five-year outlook.

³⁸ In IE the Transmission Development Plan covers a ten-year period, whilst the Winter Outlook covers a three months' time frame.

³⁹ Quality and Capacity Plan of Grid Operators.

Figure 8 - Time horizons



4.3.7 Coordination with neighbouring countries regarding the preparation of the plans and/or implementation of the measures

Conclusions

Coordination between Member States with regard to risk preparedness takes place predominantly at the TSO level. This study did not identify any formal bilateral agreements at Ministerial level. Although there are positive recent attempts to enhance regional cooperation (noteworthy examples are the Pentalateral Energy Forum, the so-called Baake declaration, NordBER and NordREG and a cooperation platform between PT and ES), it can be concluded that cooperation at the governmental level is still under development.

Coordination between neighbouring countries in relation to risk preparedness planning takes place predominantly at TSO level. Almost all (twenty-five) MSs⁴⁰ require coordination between national and neighbouring TSOs or engage in practice in coordination with neighbouring TSOs with regard to the drawing up or deciding upon risk preparedness plans or measures.⁴¹

It was ascertained that in ES, NL, LT and PT this coordination is clearly laid down by law (in LT, PT and NL this is also further developed in practice). In ES, the law provides for international coordination and the TSO is in charge of implementing the different measures for an adequate technical management of the peninsular and non-peninsular isolated electricity systems. Moreover, the national regulatory authority (CNMC), is in charge of monitoring the technical cooperation between the Spanish electricity and gas TSOs and the operators in other countries. Similarly, in LT, the TSO is in charge of the coordination with neighbouring countries. The Dutch TSO actively cooperates at national, regional and EU level with regard to security of supply assessment and measures. Moreover, from the stakeholder responses it appears that there is a well-established informal contact between the Dutch Ministry of Economic Affairs (MEA) and other ministries responsible for Energy in the neighbouring countries although this is rather focused on emergency situations. In addition, the Dutch MEA signed a joint declaration (initiated by the DE government and negotiated with the involvement of the European Commission, the so-called Baake declaration) on the electricity market with AT, BE, CH, CZ, DE, DK, FR, LU, NO, PL, SE. It was drawn up following the in-depth exchange initiated by Rainer Baake, State Secretary in the Federal Ministry for Economic Affairs and Energy. The declaration sets out a first set of joint steps to be taken as part of the cooperation (so called "no regret" measures). The declaration goes hand in hand with the "Second political declaration of the Pentalateral Energy Forum" (as described below). The signatories have agreed to develop a common understanding of security of supply and a common methodology on its calculation, however this has not been developed in detail at the time of writing of this report.

⁴⁰ In MT there is no TSO, but a DSO. In HR coordination with neighbouring countries takes place only in case of emergency situations. In CY there is no available information on whether there is any coordination with neighbouring countries.

⁴¹ Coordination with neighbouring countries is provided also in emergency situations and it will be mentioned separately in the respective part.

Along the same lines, in PT, as a consequence of the implementation of the Iberian Electricity Market (MIBEL)⁴², a cooperation platform between Portugal and Spain was created, which has led to the adoption of measures and procedures to maintain the equilibrium of the market, including in relation to supply disruption and shortages. Furthermore, the Portuguese TSO has several bilateral agreements with the Spanish TSO (Rede Electrica de España, REE) regarding mutual support in emergencies, in line with the relevant ENTSO-E guidelines.⁴³

In twenty other Member States (AT, BE, BG, CZ, DE, DK, EE, EL, FI, FR, HU, IE, IT, LU, LV, PL, SK, SI, SE, UK) the requirement to cooperate with other Member States is set by other documents or practices (e.g. Network Codes, Grid Codes, Development Plans, Risk Preparedness Plans, etc.). In AT, for instance, the NRA requires the TSO to coordinate with neighboring countries, namely CZ, HU, SI, IT, DE and Switzerland. At NRA level, there is no (formal) cooperation with neighboring countries. BE is part of recent regional initiatives such as CORESO (where the BE TSO collaborates with other TSOs on a bilateral, regional basis) and the Pentalateral Forum (with NL, LU, DE and FR). This Forum is a framework for regional cooperation, between Ministries, TSOs, the European Commission, Regulatory authorities and the Market Parties Platform, towards improved electricity market integration and security of supply, formalised through the Memorandum of Understanding of the Pentalateral Energy Forum⁴⁴. The Ministers for Energy of the Pentalateral countries meet regularly in order to discuss energy policy matters and give guidance to this regional cooperation. It establishes a regional forecast system for supply-demand adequacy based on all data available and on common scenarios, a harmonised classification of incidents, an emergency communication platform, a daily communication and cooperation platform and a regional plan of transmission capacities. The initiative last year celebrated its 10th anniversary and issued a Second Political Declaration and a Joint Declaration for Regional Cooperation on Security of Electricity Supply in the Framework of the Internal Energy Market on 8th June 2015⁴⁵. In addition, in BE the 'procedure of predicted scarcity' foresees the exchange of information on the situation with the neighbouring Member States by the director-general of DG Energy (FPS Economy) via the European Electricity Coordination Group.

In turn, BG's TSO recognises partnering organisations in EL, RO, Macedonia, Serbia and Turkey. In CZ, informal cooperation with neighbouring countries exists at ministerial level, in order to define the elements of the European critical infrastructure. In DE, the Federal Minister for Economic Affairs and Energy initiated and signed a declaration with interconnected neighbours (BE, NL, LU, FR, DE, AT, CH, NO, SE, DK, PL, and CZ) in which he commits to cooperate closely with the European partners on security of electricity supply (the so called Baake declaration, see above). Furthermore, DK is part of NordREG, an association of the Nordic energy regulators

⁴² The Iberian Electricity Market (MIBEL), constitutes a joint initiative from the Governments of Portugal and Spain, with a view to the construction of a regional electricity market.

⁴³ Information provided by the Portuguese Ministry and TSO.

⁴⁴ Of 6th June 2007: http://www.benelux.int/download_file/view/4191/3852/.

⁴⁵ <http://www.benelux.int/files/4414/3375/5898/Jointdeclaration.pdf>.

including NRAs from DK, FI, SE, Iceland and Norway. It has the purpose to develop an efficient electricity market in the Nordic area, to promote a legal environment for security of electricity supply, to ensure harmonised procedures for handling extreme situations and to develop information exchange systems. Moreover, within the Nordic region there is an extensive collaboration with regard to contingency planning and crisis management in the Nordic Contingency Planning and Crisis Management Forum -NordBER. In this forum, both TSO's and Government Agencies take part in common planning, analysing and experience sharing. There is some harmonisation of plans, due to common assets and based on bilateral agreements. Moreover, an agreement for auxiliary services supply is in place between Energinet.dk (DK) and Svenska Kraftnät (SE). EE has interconnections with FI – Estlink 1 and Estlink 2. The EE and FI TSO-s have given the Estlink 1 and Estlink 2 power allocation to the power exchange Nord Pool Spot. In FI, international cooperation takes place in the context of the NordREG Agreement, whilst cooperation between TSO companies of neighboring Member States in disturbance cases of the main grid is agreed in bilateral agreements. Apart from the NordREG Agreement, FI also participates in NordBER. The cooperation is regulated by a "Letter of intent regarding Nordic cooperation on emergency planning and crisis management for the power sector" from 2010 along with common action plans. FR is dealing in practice with neighbouring countries mostly on a bilateral and technical basis with other TSOs. Furthermore, the Ministry of Energy participates in the abovementioned Pentalateral Energy Forum. The NRA (CRE) collaborates with other European countries by attending working group meetings of CEER and ERGEG (Group of European Regulators for Electricity and Gas) to contribute to the optimisation of interconnections and it produces a monthly report on interconnections, analysing the allocation and management of interconnections capacities by TSOs. In 2006, the NRAs and the European Commission have launched the Electricity and Gas Regional Initiatives, to facilitate the integration of national electricity markets with concrete actions.

In relation to the UK, between TSOs there are agreed operating protocols and emergency arrangements in place for all interconnectors connecting GB to other synchronous areas (Ireland and Central Europe). In addition, the governmental energy departments and Energy Regulators from Ireland and Northern Ireland meet every quarter under the All-Island Energy Joint Steering Group, which discusses and shares information on energy issues which may relate to risk preparedness, including security of supply, EU legislative compliance requirements, major energy projects, and energy market issues.

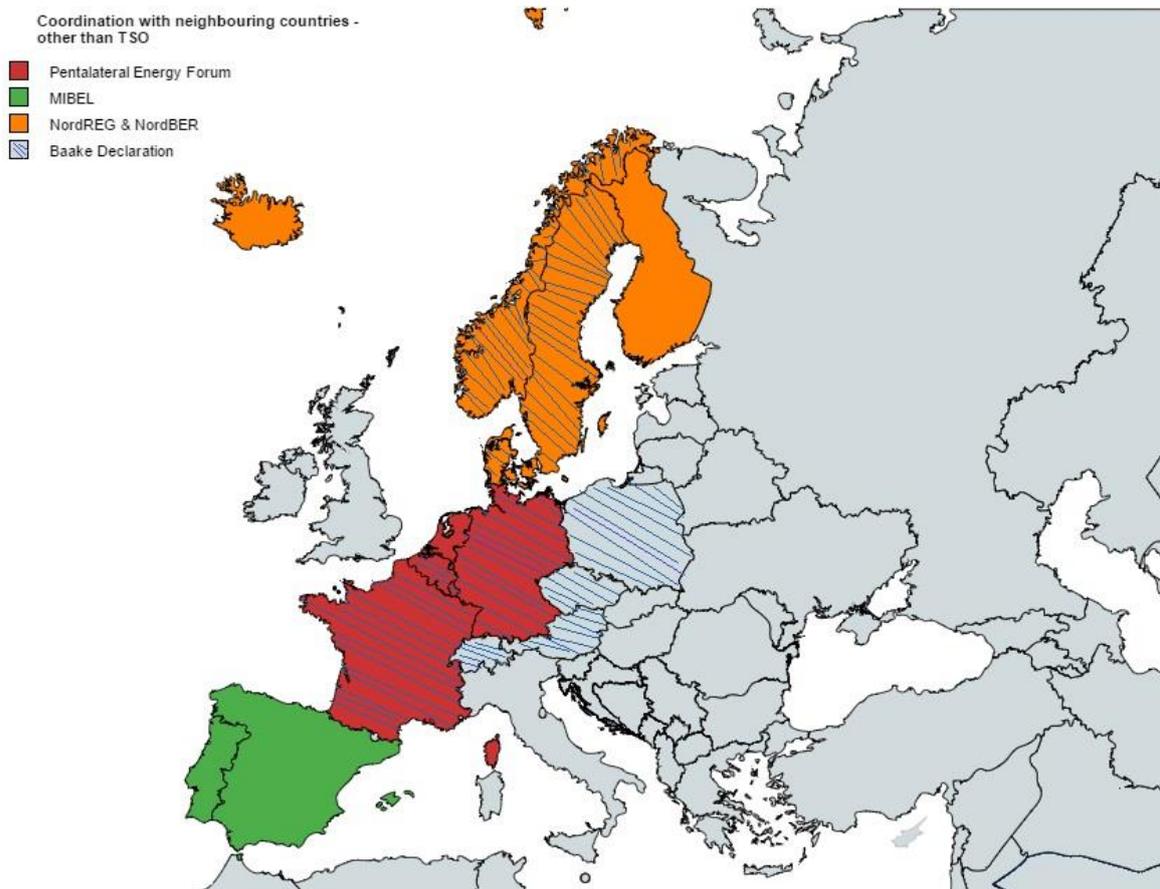
Finally, the remaining six countries (IE, IT, LU, PL, SE, SI, SK) all have developed interconnections agreements with neighbouring countries via their TSOs.

CY, HR, MT and RO can be distinguished from the previous countries, albeit for different reasons. In MT, international cooperation is operated via its DSO, given that MT does not have a TSO. Rather differently from all other Member States, CY and RO show a limited interconnection framework. Indeed, in relation to CY there is no available information on whether there is any coordination with neighbouring Member States. In relation to RO, interconnections appear to remain relatively undeveloped. However, the national NRA stated that "any security measure should be taken by TSO in close cooperation and consultation with other transmission system operators

involved, in compliance with applicable bilateral agreements.⁴⁶ Finally, in HR cooperation is envisaged in situations of emergency only.

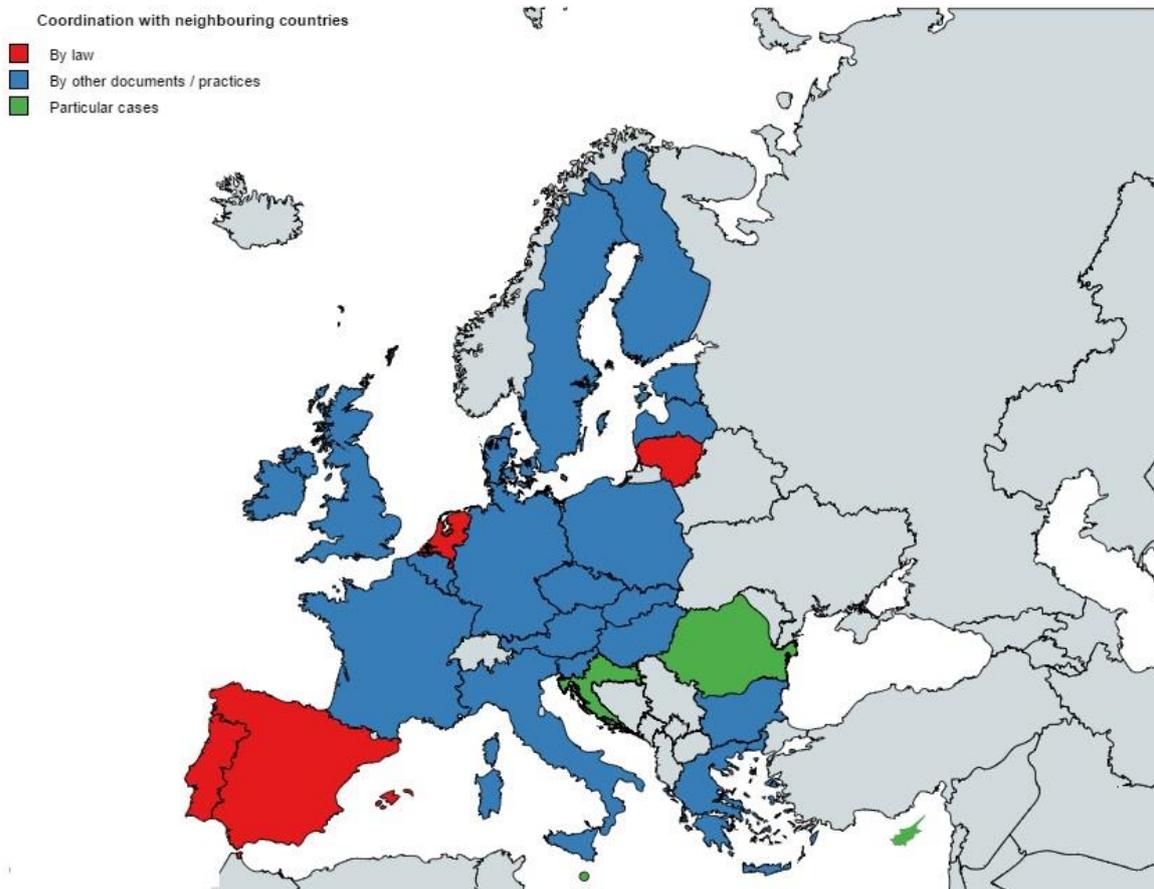
Thus, while the cooperation between TSOs is very developed, cooperation at governmental level is still under development.

Figure 9 - Coordination of risk preparedness plans / measures with neighbouring countries – Cooperation at Governmental and / or NRA level



⁴⁶ RO's TSO explained in its response that "there are not yet designated European Critical Infrastructures to collaborate on a common segment with neighbouring countries. It is possible that in the coming years will be designated European critical infrastructures through a Governmental Decision."

Figure 10 - Coordination of risk preparedness plans / measures with neighbouring countries – Type of source



4.3.8 Availability of the risk-preparedness plans and frequency of update

Conclusions

The concern with the protection of sensitive data is clearly seen in the fact that many Member States keep their risk preparedness measures or plans fully confidential. It is noteworthy that some Member States reach a balance between the need to keep some plans and measures reserved from the public and the possibility of making some information publicly available, such as AT, BE, CZ, EE, ES, FI, NL, PL, PT, SI and UK.

With regard to frequency of updates, the framework is extremely diverse (from annual, biennial or every five or ten years, for example) and no common pattern can be particularly highlighted. Several Member States require biennial updates, for example (DE, LU, PL, SI, SK). This regularity may be able to offer some stability in the national framework whilst allowing for regular updates if necessary.

Availability of the risk-preparedness plans

Out of the ten Member States which set a clear obligation for entities to draw risk preparedness plans (see above), BG, CY,⁴⁷ HR, LT, DK and SE do not make the reports or plans publicly available whilst HU, IT and RO do. CZ, FI and PT have a mixed framework as they make some measures with risk preparedness considerations publicly available (e.g. plans by public authorities, contracts for reserve power, etc.) but not all. In relation to the Member States which take into account risk preparedness considerations (but which do not draw risk preparedness plans *per se*), five make the reports, plans or measures publicly available (FR, IE, LV, LU, SK), three do not make these measures available (DE, EL, MT) and in eight other countries the situation is mixed (AT, BE, EE, ES, NL, PL, SI, UK). In PL, for example, whilst the TSO development plans, the Governmental monitoring reports and the National Critical Infrastructure Protection Programme are publicly available, however the TSO's Critical Infrastructure Protection Programme is not disclosed. Furthermore, details of some measures based on bilateral agreements between TSOs may also be covered by confidentiality clauses.

Frequency of update

Within the Member States which set a clear obligation for entities to draw up risk preparedness plans (see above), the frequency according to which these plans are updated varies significantly. Hence, in CZ, LT and SE, the law requires updates to take place on an annual basis. In CY, both the preventive and the emergency plans are updated every two years, unless a more frequent update is considered necessary. In DK, the update takes place every third year (2009-2012-2015-2018). In IT, the TSO requires an assessment of the measures of the Electricity Defence Plan every six months, whilst the load shedding plan is updated every three years. In FI, four different reports have different update frequencies required by law, namely annually, biennially, every four and every ten years. In HR, it is unclear how often the risk preparedness plans need to be updated but desk research showed that updates took place in 2006 and 2010.

In other Member States where risk preparedness considerations are taken into account in assessment reports, development plans, network codes or other documents, the frequency of updates also varies. Several Member States require biennial updates (DE, LU, PL, SI, SK). More specifically, in SI, development plans must be made for at least ten years and adopted every two years. In SK, the Security of Supply Report is annually prepared by the Ministry of Economy, in cooperation with the TSO. The TSO delivers the Defence and Restoration Plans (every two years) and the DSOs develop their own plans in coordination with the TSO's plans and vice versa. In AT, EE, IE, PT the risk preparedness plans need to be updated annually. In BE, ES, FR and NL the legislation provides for different time frames for the revision of risk preparedness plans depending on the specific nature of the respective report. For instance, in NL, the report for calamity plans is revised every five years. The Electricity Act obliges each grid operator to submit a 'quality and capacity plan' to the Netherlands Authority for Consumers & Markets every two years. According to the TSO

⁴⁷ In CY, to present, no decision on risk preparedness plans/measures in the area of security of electricity supply has been adopted. In case these measures are adopted they will, in principle, be confidential with access given only to persons and organisations directly affected.

it has a time horizon of ten years. Moreover, with regard to emergency protocols, the TSO has the obligation to compile a yearly evaluation on the degree to which measures have been taken to prevent and restore large interruptions. In the UK, different reports, plans and codes also have different regularity of updates (for example, the ESEC is reviewed on a continual basis, the TSO's restoration plans are updated biennially, whilst the NEP is updated annually).

Finally, in BG, EL, HR, HU, MT and RO there is no direct reference to the frequency of update of risk preparedness measures.

4.3.9 Conclusions

Research shows a fragmented and diverse framework in relation to national risk preparedness plans, measures and obligations concerning security of electricity supply. In general, it can be said that all Member States take into account risk preparedness considerations, although in varied degrees and depth.

Hence, only ten Member States set clear obligations to draw up risk preparedness plans (eight do so by law and two via guidance documents), whilst eighteen other countries do not have such an obligation, albeit taking risk preparedness considerations into account in reports, plans or measures. There is no specific obligation to submit a risk preparedness plan in the Electricity Directive (2009/72/EC) and in the Security of Supply Directive (2005/89/EC), which partly explains the fragmented framework of preparedness plans and measures.

A good practice can thus be identified in at least ten MSs which set clear obligations to draw up 'risk preparedness plans' (BG, CY, CZ, DK, HR, HU, LT, PT, RO and SE).

The national entities responsible for drawing risk preparedness plans or measures vary across the Member States. TSOs appear as the most involved entities by taking an active role in twenty-two Member States. In three countries, the TSO is the sole authority responsible for the adoption of risk preparedness measures, whilst in nineteen other countries the TSO cooperates or shares responsibility with the government, NRAs or DSOs.

Although TSOs appear to have a central role in the adoption of risk preparedness plans or measures, the responsible national entities and the specific role they carry still varies significantly revealing a significant diversity amongst Member States.

In relation to the types of measures adopted in risk preparedness of security of supply, research took into consideration some important preliminary factors which are relevant for the conclusions of this study. First, as noted previously, Member States do not always make a clear distinction between measures which can be adopted for prevention purposes and measures that can be adopted to respond to an emergency; second, availability of information is limited in several Member States, as many risk preparedness plans / reports or measures are confidential. With these two factors in mind, conclusions drawn in this section are general rather than comprehensive.

Research shows that in twenty-seven Member States, risk preparedness plans / risk preparedness measures include both preventive and emergency measures (AT, BE, BG, CY, CZ, DE, DK, EE, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK, UK). Within this group, FI gives a particular emphasis to preventive measures. In BG, DE and PT, although it was not possible to determine fully the scope of several confidential risk preparedness plans, research indicated that some publicly available plans and guidance documents include both emergency and preventive measures.

Lastly, in EL, plans are confidential and not enough information regarding the content of the plans is available publicly or was shared with the consortium.

The type of preventive measures envisaged varies significantly across Member States leading to a rather fragmented and non-homogeneous framework. Regardless, research shows that the large majority of Member States focus on the adoption of market measures in their preventive framework.⁴⁸ These measures vary but in general relate to, inter alia, levels of supply and demand, operational security or energy efficiency issues. Finally, in seven Member States, information available did not allow for a categorisation of measures, primarily due to the confidentiality of risk preparedness plans and measures (AT, BG, DK, EL, FI, LU and MT).

The time horizons covered by the different measures vary significantly across the Member States and there is no overall trend. Time horizons covered can vary from one year to fifteen years. Moreover, some Member States set no limits of validity for their measures, others have a system of continuous updates whilst at least eleven countries do not specify time horizons. It is noteworthy that some Member States take into account longer periods in their risk preparedness plans / measures, such as, for example, EE, FR, NL, PT and SK.

With regard to cooperation between Member States concerning the establishment and implementation of risk preparedness plans and measures, the framework is very developed at the TSO level. Nonetheless, cooperation at the governmental level is still under development; indeed, this study did not identify any formal bilateral agreements at the ministerial level. There are however positive recent attempts to enhance regional cooperation (noteworthy examples are the Pentalateral Energy Forum, the so-called Baake declaration, NordBER and NordREG and a cooperation platform between PT and ES), it can be concluded that cooperation at the governmental level is still under development.

In relation to the availability of risk preparedness plans or measures, nine Member States keep them confidential (BG, CY, DE, DK, EL, HR, LT, MT, SE), eight make them public (FR, HU, IE, IT, LU, LV, RO, SK) and eleven others have a mixed framework with some measures being released and others being kept confidential (AT, BE, CZ, EE, ES, FI, NL, PL, PT, SI and UK). The concern with the protection of sensitive data is clearly seen in the fact that many Member States keep their risk preparedness measures or plans fully confidential. It is noteworthy that some Member States reach a balance between the need to keep some plans and measures reserved from the public and the possibility of making some information publicly available, such as AT, BE, CZ, EE, ES, FI, NL, PL, PT, SI and UK.

With regard to frequency of updates, the framework is extremely diverse (from annual, biennial or every five or ten years, for example) and no common pattern can be particularly highlighted. Several Member States require biennial updates, for example (DE, LU, PL, SI, SK). This regularity may be able to offer some stability in the national framework whilst allowing for regular updates if necessary.

⁴⁸ For a distinction between market and non-market measures Regulation 994/2010 concerning measures to safeguard security of gas supply, OJ L295/1 [2010], Annexes II and III was used as guidance.

4.4 Emergency situations

Conclusions

A majority of the Member States provide a legal definition of emergency, but with varying levels of detail. This could potentially lead to disparate reactions of Member States in case of emergency events. In a majority of countries, the TSO is responsible for implementing emergency measures; the NRA, DSOs and Ministry are also involved to a lesser extent.

Although the situation differs between Member States, the most commonly used emergency measures include: restriction of electricity consumption, generation increase, use of contracted and strategic reserves and load shedding plans. Twenty Member States implement distinct levels of emergency. Good practice was found in almost half of the Member States, where measures are explicitly tailored to the different levels of emergency.

Market suspension measures are foreseen in all Member States by national legislation or operational plans but to different extents. This could potentially lead to dissimilar responses between Member States, which could potentially have consequences for neighbouring countries.

In some countries, limitations to cross-border trading capacities are foreseen. Two MS specifically include explicit legal provisions (law or regulation) on export bans.

Cooperation among Member States takes place mostly at TSO level via bilateral, multilateral agreements (e.g. CORESO in Centre West Europe, NordAm between Nordic countries, BRELL between Baltic countries) or via ENTSO-E. At governmental level, cooperation takes place via the ECG or in regional groups like the Pentalateral Forum, but no formal bilateral agreements were identified.

A majority of Member States prescribe that load shedding plans are to be implemented by the TSO, as well as the categories of consumers exempted from such measures. The categories vary across countries, however hospitals and public transport services seem to be most prevalent.

In a majority of countries, the TSO and DSOs are responsible in case of brown out or black out but no financial compensation to consumers is foreseen in case of force majeure.

4.4.1 Introduction

This section provides a comparative analysis of the measures to deal with emergency situations as regards electricity security of supply. The first part (section 4.4.2) will discuss the varying definitions of the concept of 'emergency' across the Member States. What follows is an overview of the emergency measures foreseen for each level of emergency (in case such varying levels exist) and the entities responsible for these actions (section 4.4.3). The third part (section 4.4.4) provides details on the conditions for market suspension and the authorities responsible for such measures. Subsequently, we provide an overview of the load shedding plans in place and the entities implementing them (section 4.4.5). What follows (section 4.4.6) is a description of the categories of protected consumers exempted from load shedding plans. The following part (section 4.4.7) details the responsibilities and provisions for financial compensation in case of a brown and/or black-out. The last part (section 4.4.8) presents the various levels and modes of coordination in place among Member States in case of emergency.

4.4.2 Legal definition of emergency

Thirteen Member States provide a legal definition of emergency related to electricity supply in their national laws (BE, CZ, EE, FR, HU, LT, LV, LU, MT, PT, SK, SI, UK). BE and PT legislation describe these emergency situations in a detailed manner. In BE a 2002 Royal Order defines 'emergency' situations such as natural disasters, nuclear or chemical explosions, cyber virus or the collapsing of the cyber system, technical, temporary or permanent impossibility for the network to exchange electricity, fire, explosion, sabotage, terrorist action, vandalism, criminal damage, criminal constraint or threat, war (whether declared or not) and sudden phenomena. In PT, 'emergency' in relation to energy, is described as 'a situation of difficulty in the provision or distribution of energy, which renders necessary the adoption of exceptional measures in order to guarantee essential energy supply to the defence and functioning of the State, of fundamental economic sectors and of the population's basic needs'. These difficulties can result from human or natural events and take place inside or outside PT and the foreseeable circumstances which are highly likely to lead to any of such difficulties should also be considered an emergency⁴⁹. Moreover, in PT, some examples are also provided by law⁵⁰, such as threat to the safety or physical integrity of persons, equipment, infrastructure and networks caused by serious accident or force majeure. In the remaining countries, legal definitions of 'emergency' include similar notions such as 'events which endanger the life or health of many people or cause major proprietary damage or major environmental damage or severe and extensive disruptions in the continuous operation of vital services (EE, HU, MT), cases of serious crisis in the energy market (FR), significant energy supply disruption risking to entail a major dysfunctioning or unavailability of energy supply systems (LU), a situation which threatens serious damage to human welfare or to the environment (UK), terrorist attacks (LU, UK) or malfunction in the electricity supply system (FR, HU, SK).

In LT, LV and SI, energy laws also consider different levels of emergency. More specifically, in LT, national energy law⁵¹ describes two different levels of emergency energy situations: 1) State-level emergency energy situation, 2) Municipality level emergency energy situation. Likewise, in LV, the law distinguishes between a local and national energy crisis, mostly according to the percentage of population affected. In SI, there are different levels of an emergency, i.e.: standby, state of emergency, state of black-out, state of restoration.

In five Member States (ES, FI, IE, PL, SE), even though the law does not provide an exhaustive legal definition of emergency, it contains a description of the circumstances that can lead to emergency situations. In ES, emergency situations are regulated by law,⁵² which provides for legal definitions of 'danger', 'vulnerability', 'threat' and 'risk'. These notions constitute the state of emergency in Spanish law. In FI, emergency

⁴⁹ Article 2, Decree Law 114/2001, Official Gazette, 1st Series, n. 83 of 7 of April 2001: <https://dre.pt/application/file/362658>.

⁵⁰ Article 33-B of Decree-Law 23/2009.

⁵¹ Article 33 of the Energy Law.

⁵² Law 17/2015, the National Civil Protection System (LSNPC).

conditions are set out in the law⁵³: armed attack and its immediate aftermath, threat of an armed attack on Finland, a particularly serious event or threat which impacts the population's subsistence or the foundations of the national economy, a particularly serious major accident and its immediate aftermath, a widespread dangerous communicable disease having effects comparable to those of a particularly serious major accident. In IE, national law⁵⁴ provides that the existence of an emergency and the circumstances that can lead to an emergency depend on the opinion of the TSO. Essentially, the TSO will evaluate the specific circumstances and decide on whether there is a case of emergency or not.

In BG, IT and NL, legislation does not provide for a legal definition of emergency. However, documents other than laws such as Codes or Rules describe possible events that can lead to emergency situations. In NL, the Netherlands Authority for Consumers and Markets (ACM) Cooperation Code gives examples of events that can constitute an emergency, such as terrorist attacks, natural disasters and war. In BG the Rules on the Electricity Distribution Networks Management refer to events that have significant impact on the electricity system or the distribution network as 'emergency events'. In IT, the 'Defence Plan of the Grid Code defines five possible states under which the network may function: "Normal" ("Normale"), "Alert" ("Normale di Allarme"), "Emergency" ("Emergenza"), "Interruption" ("Interruzione"), "Restoration" ("Ripristino"). Moreover, an emergency situation is triggered by the violation of N-1 Security principle in the concerned networks.

In HR, the law⁵⁵ defines the following notions: "extraordinary situations", "extraordinary event", "catastrophe", "crises situation", "large scale disturbance". The latter notions refer indirectly to "emergency" without, however, using explicitly this word, contrary to the previous two categories where either the law or other documents describe circumstances which may lead to emergency situations

Finally, in six Member States, namely AT, CY, DE, DK, EL, RO, national law does not provide for a legal definition or description of an emergency or emergency situations (in law, regulation or other policy documents) at all..

⁵³ Emergency Powers Act (1552/2011).

⁵⁴ Regulation 18(7) of S.I. 445/2000.

⁵⁵ Electricity Market Act.

Figure 11 - Definition of emergency (statistics)

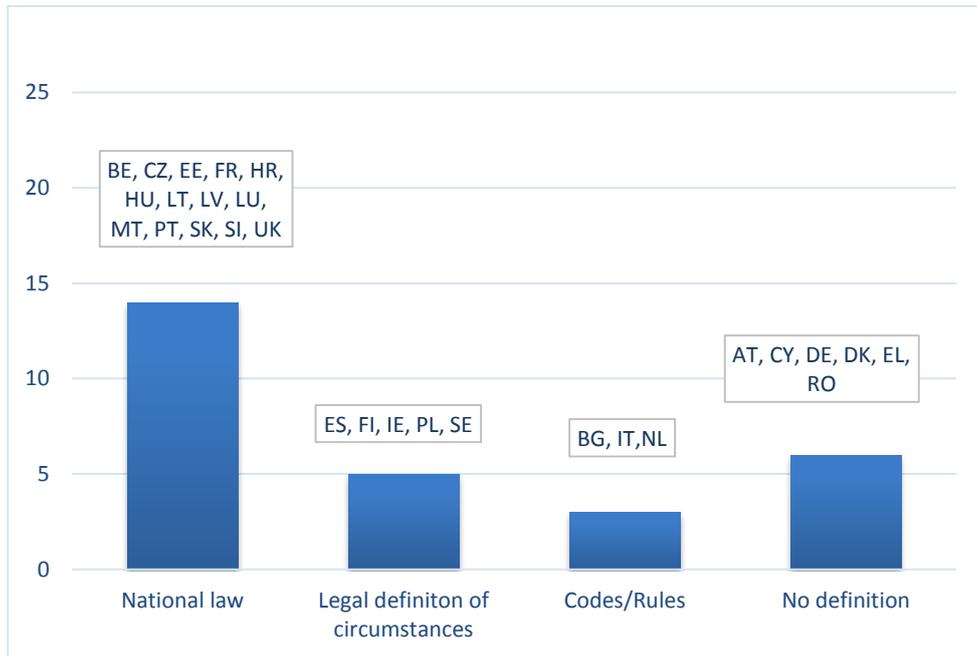
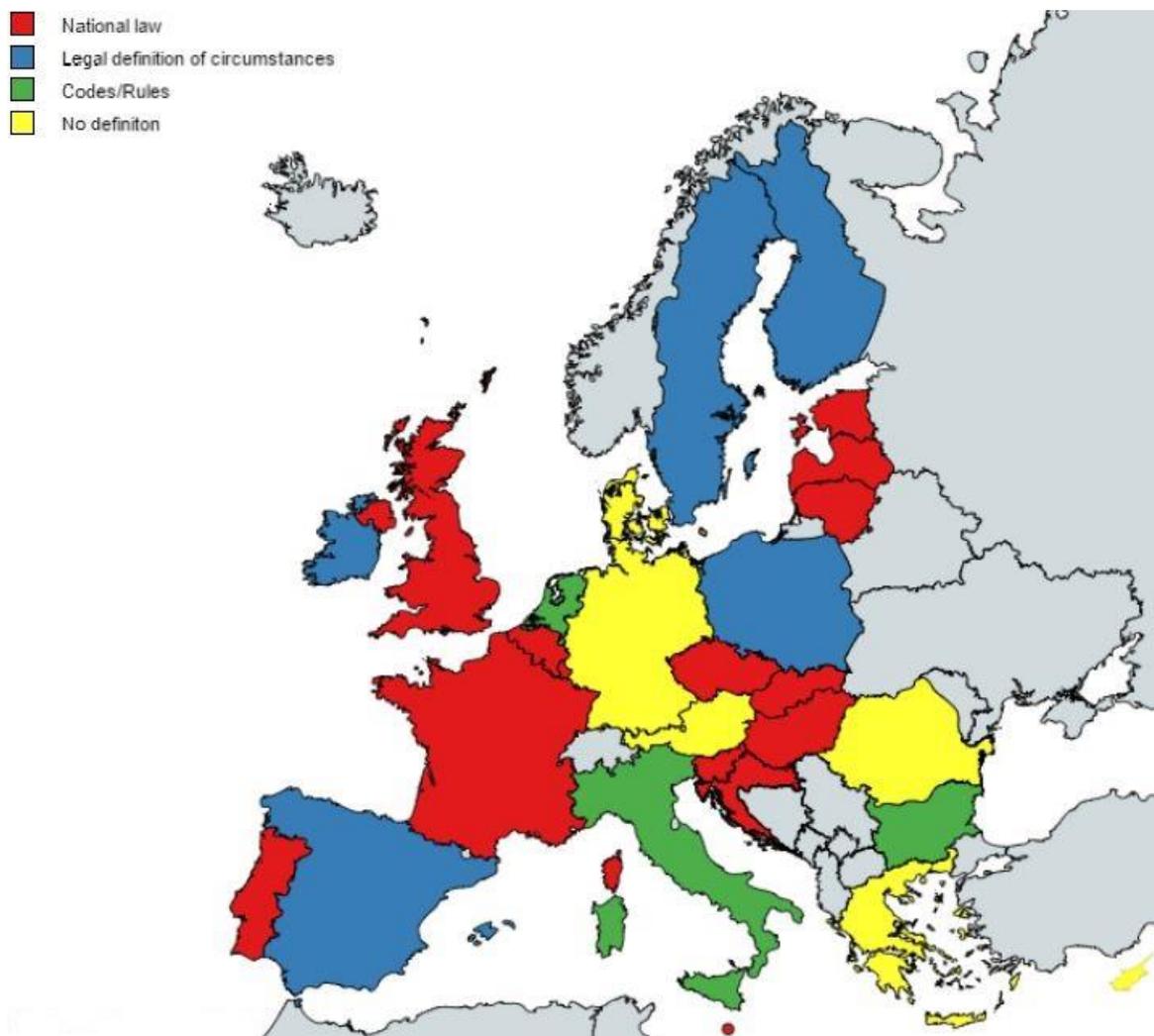


Figure 12 - Definition of emergency (map)



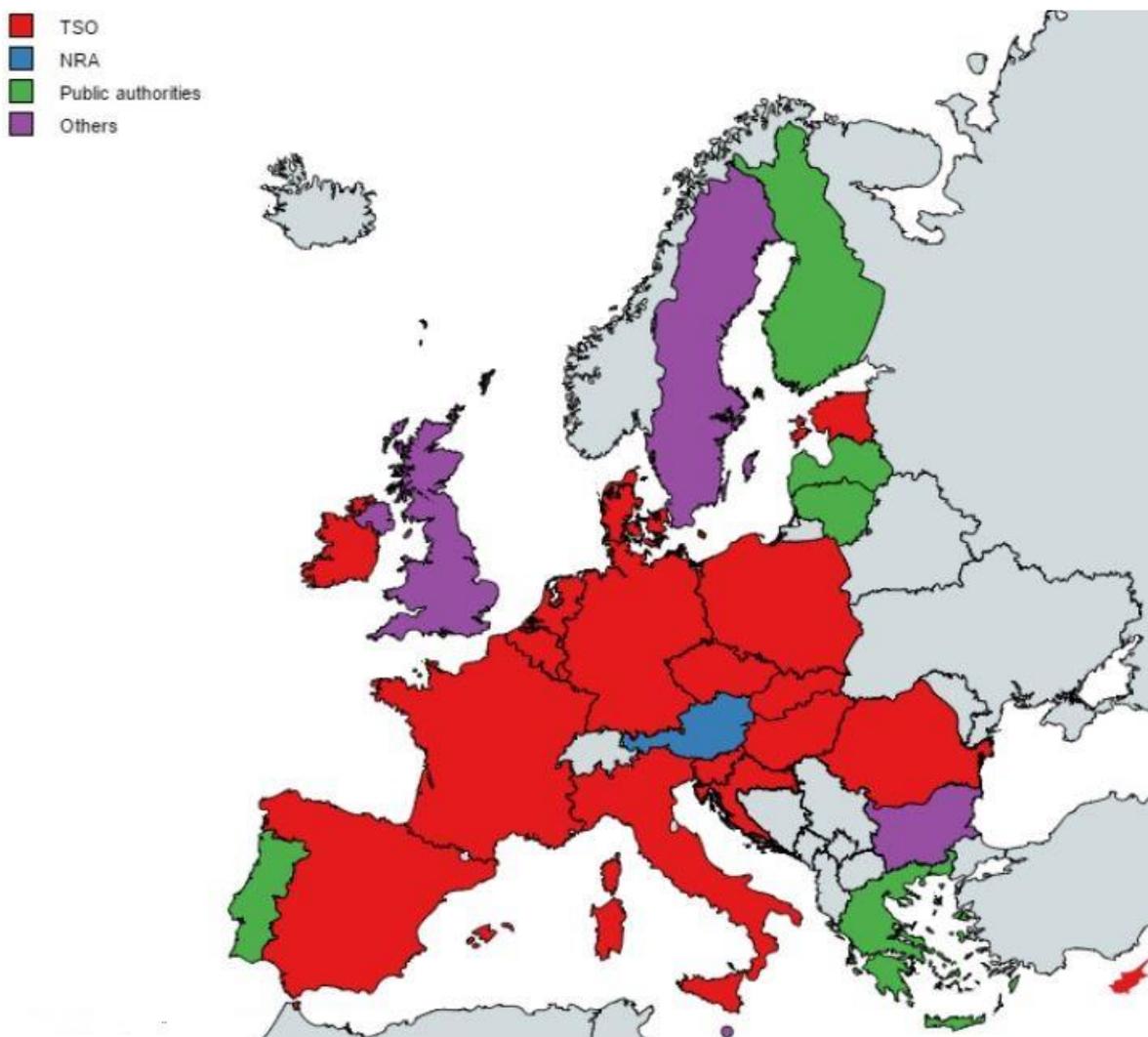
4.4.3 Actions and measures foreseen for the various levels of emergency, and entity/ies with the authority to decide

Twenty Member States (BE, CZ, DE, DK, EE, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, NL, PT, SE, SI, UK) implement distinct levels of emergency. For instance, the IE Grid Code foresees the following gradual emergency levels: amber alert (reserve requirement), red alert (load shedding plan) and blue alert (black-out). In IT, the Defence Plan defines a state of Alert (N-1 criterion not met anymore), Emergency (extended energy outage), Interruption (actions taken to deal with the emergency) and Restoration (restoring plan). Eight Member States (AT, BG, CY, EL, MT, PL, RO, SK) do not mention different levels of disturbance in their energy legislation.

In nineteen Member States (BE, CY, CZ, DE, DK, EE, ES, FR, HR, HU, IE, IT, LU, NL, PL, PT, RO, SI, SK) the TSO is in charge of putting in place emergency measures; upon decision or approval of a Ministry in four of these countries (BE, DE, NL, PT), and upon approval of the NRA in one country (SK). In the nine other countries, the situation appears to be much more heterogeneous. In AT, the NRA is the entity in charge of implementing the emergency measures, while in BG, both the TSO and the

DSO are involved. In EL, the General Secretariat for Civil Protection implements the emergency measures, whilst in FI, the Ministry of Economy and in LT, the Government and the coordination centres of emergency are the entities responsible. Further, in LV, the entities with the authority to implement the emergency measures are the State Energy Crisis Centre and in MT this is the DSO. In SE, the Ministry, the NRA and the TSO are in charge at the various levels of emergency. Finally, in the UK, the DSO implements local measures on the indication of the Energy Emergencies Executive and its Committee.

Figure 13 - Authority responsible to implement emergency measures



Emergency measures are explicitly tailored to different levels of emergency in DE, DK, EE, FR, HU, IT, LU, LV, NL, SE, SI, UK but not in the other Member States.

Example – Emergency measures tailored to different levels of emergency

In IT, the Defence Plan envisages that for the Alert State, the TSO may use the dispatching resources available as reserves, reduce cross border exchange with other TSOs, and disconnect consumers through interruptible contracts. In an emergency state the TSO resorts to automatic and manual load shedding plans and counter measures agreed with other TSOs, which lead to the state of interruption. Finally, in the restoration state, the TSO activates the restoration plan.

Emergency measures may be part of national legislation including general energy law (in FR, “*Energy Code*”, in PT “Decree-Law 114-2001) or regulation (in NL, *Ministerial decree on tariff structures and conditions for electricity and the NRA System Code*) and specific orders and decrees (e.g. *Energy Intervention Powers Act* in AT, *Emergency Decree* in CZ and HU) or part of operational plans from TSOs (e.g. *System Defence Plan* in FR, *Electricity Supply Emergency Code* in UK, *Electricity Transmission Network Code* in PL, *Defence Plan* in IT).

On the basis of desk research and stakeholder responses, when countries specify the different possible types of measures foreseen to deal with emergency situations, these include:

- Contracted reserves (BE, FI, FR, IT, NL, SI)
- Strategic reserves (BE, FR, NL, PT, SI, UK)
- Generation increase (DE, EE, HU, IE, LT, NL, PT, RO, SE, SI, UK)
- Extra import through interconnection (BE, HU, IE, IT)
- Restriction on electricity consumption (BG, CZ, EE, HU, IE, LT, LV, MT, NL, PL, PT, RO, SE, SI, SK)
- Interruptible contracts (FR, HU, IT)
- Suspend transaction in the regulated electricity market (HU, RO)
- Control of energy market (FR, LT)
- Load-shedding plans (AT, BE, BG, CZ, DE, DK, EE, ES, FR, HR, HU, IE, IT, LT, LU, MT, NL, PL, PT, RO, SE, SI, SK, UK)

Example - Restriction on electricity consumption

In PT, Decree-law 114/2001 includes measures aiming at increasing consumer awareness in order to foster a more rational energy consumption or, alternatively, measures imposing compulsory restrictions, such as, inter alia: restrictions on the use of privately owned vehicles, restrictions on the operation of public transport, restrictions on the use /time of use of certain equipment, restrictions on the type of lightning authorised or introduction / replacement towards more energy efficient equipment / materials.

Example - Interruptible contracts

In FR, the Energy Code provides that every year the TSO concludes contracts with consumption sites for interruptible capacities from 60 to 300MW. The TSO may proceed, on its own initiative, to the power suspension of the interruptible consumption sites for 15 minutes to one hour, no more than 10 times per year. Interruptible contract holders receive an annual financial compensation related to the volume of interruptible capacities and the numbers of days of availability of these capacities.

It should be noted that our research shows that, in certain MS, some abovementioned measures can be triggered both as risk preparedness measures and emergency measures. This is in particular true for strategic reserves (BE, FR, UK), extra import through interconnection (BE), generation increase (EE), limitation of the use of electricity (CZ, EE, RO, SI, SK). Such overlap may be caused by the fact that preventive measures and emergency measures are often described in the same legal,

regulatory or operational documents due to the absence of a clear distinction between risk preparedness and emergency plans in some countries. Moreover, due to the different interpretations of the various levels of emergency, some Member States trigger both preventive and emergency measures in case of serious risk or early stage of emergency.

For example in SK, the TSO has the authority to take electricity restrictive measures both to prevent an emergency and during an emergency pursuant to the Energy Act (e.g. in the event of the risk/threat of congestion in certain elements of the transmission system, the dispatching control centre of the TSO can reduce cross-border capacities or cancel intraday trading).

The following sections 4.4.3 and 4.4.4 will focus more specifically on market suspension measures as well as load shedding plans which are the most common responses to emergency situations.

4.4.4 Conditions for market suspension and entity/ies with the authority to decide

Market suspension measures are foreseen in all Member States but not to the same extent, and based on varying types of rules. Market suspension rules are organised by national legislation in the following twenty countries: AT (*Decree by the Ministry of Economy*), BE, BG, CY (*Market Rules*⁵⁶), CZ (*Energy Act*), DE (*Energy Act*), EE (*Electricity Market Act*), ES (*Royal Decree 337/2014 and Order IET / 2013/2013*), FI (*Emergency Power Act*), FR (*Energy Code*), HR (*Energy Act and Electricity Market Act*), HU (*Emergency Decree*), IT (*Legislative Decree 79/99*), LT (*Energy Act*), LU (*Electricity Act*), PT (*Decree-Law 114/2001*), RO (*Law on the Functioning of the competitive market*), SE (*Electricity Act*), SI (*Energy Act*), SK (*Energy Act*⁵⁷).

Market suspension measures are also set up in operational plans of the TSO in IE (*Grid Code*), LV (*Net Code*), PL (*Electricity Transmission Network Code*), UK (*Grid Code*) or from the DSO in MT (*Network Code*), or from the Ministry (*Emergency Plan* in DK), or from the NRA in NL (*ACM System Code and Network Code*).

EL does not have specific provisions on market suspension within its legislation but follows ENTSO-E policy requirements and procedures.

In twenty-two countries (AT, BE, CY, CZ, DE, DK, EE, EL, ES, FR, HR, HU, IT, LU, LV, NL, PL, RO, SE, SI, SK, UK), market suspension measures are implemented by the TSO.

In the remaining six countries (BG, FI, IE, LT, MT, PT) the entities in charge of implementing market suspension measures are the following. In MT, such measures are implemented by the DSO, in BG and PT by both TSO and DSO, while in FI, the measures are implemented by both the TSO and NRA, by the TSO in IE and by the Coordination centre of emergencies in LT.

⁵⁶ The so-called 'Trading and Settlement Rules'.

⁵⁷ Complemented with Electricity Restrictive Plans.

Four Member States (AT, CY, EL, LV) indicate that their respective entity in charge of market suspension (see above) can do so in emergency conditions, without more precision on the types of measures.

For nineteen countries, the available market suspension measures are more detailed and include:

- Activation of strategic reserves (BE, FR, IT, NL, PT, SI, UK)
- Limitation of the generation of electricity supply (BG, ES, FR, HR, HU, IT, LT, MT, NL, PL, PT, SK)
- Restriction of electricity consumption (CZ, FI, FR, HU, IT, LT, LU, MT, NL, PL, SE, SK)
- Restriction of export (DK, EE, FR, IT, LT, NL, PL, RO, SE, SI, SK)

With regards to export bans, only SI specifically includes a legal provision in its legislation (Energy Act) and the TSO Regulation SONPO (System operating instructions for electricity transmission network). Additionally, in RO cross border capacity cancelation and export-bans are allowed pursuant to regulations and procedures approved by the NRA and in bilateral agreement with neighbouring TSOs. Nevertheless, the following possibilities to execute some form of export ban, either by multilateral agreements, national law or TSO regulations rules, have been found in other Member States:

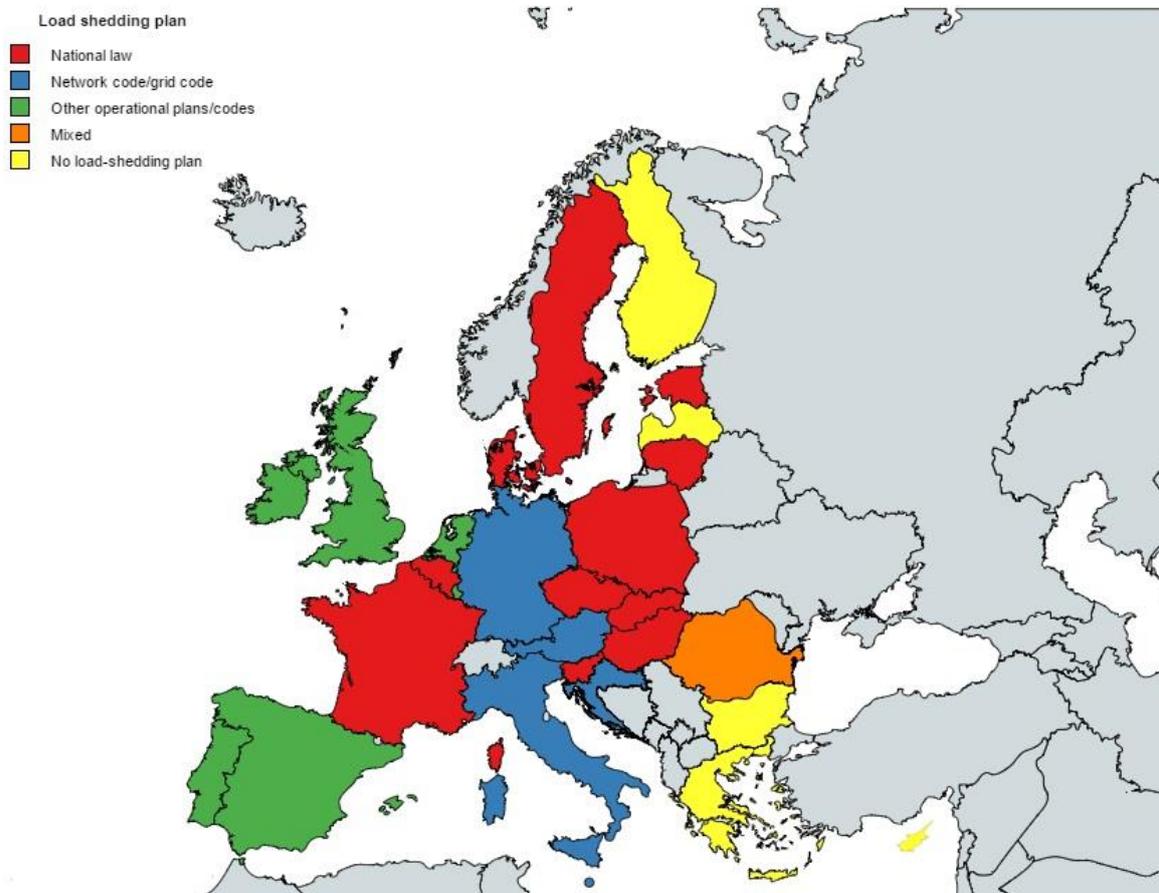
- In DK and SE the TSO may proceed to implement limitations to export following the *Nordic System Operation Agreement* and in IT, the TSO can proceed to intra-day freezing of the exchange capacities in line with the *Pentalateral Handling of the Control Program on the Italian Northern Interconnection*.
- Similar measures are provided by national law in EE where the TSO may reduce cross-border trading capacities deriving from the *Electricity Market Act*, but also in PL (Energy Law) and SK (Energy Act). In FR (*Energy Code*) and LT (*Energy Act*), the Government may control the import and export of energy products.
- Such measures are provided by Regulations such as in NL, where the NRA System Code allows for the curtailment of exports by the TSO.

The tightly linked Nordic power markets have the rule to try to be kept running as long as possible and when this is no longer possible, the markets and security issues are taken care of domestically.

4.4.5 Load-shedding plans, and entity/ies with the authority to decide

Twenty-three Member States (AT, BE, CZ, DE, DK, EE, ES, FR, HR, HU, IE, IT, LT, LU, MT, NL, PL, PT, RO, SE, SI, SK, UK) foresee a load-shedding plan as emergency measure.

Figure 14 - Load shedding plan – Member States overview



The load-shedding plan (or plans) is (or are) determined by national law in eleven Member States (BE, CZ, DK, EE, FR, HU, LT, PL, SE, SI, SK). In AT, DE, HR, IT and MT these plans are detailed in network or grid codes. In ES, IE, LU, NL, PT and UK load-shedding plans are contained in other operational plans/codes focused on the actions to be taken in the event of emergency situations (e.g. Operational Procedures in ES, Authority for Consumers and Markets Cooperation Code in NL, the Electricity Supply Emergency Code in UK).

In RO, there is a mixed system governing three types of load-shedding plans: manual (established by the grid code), loads limitation (established by national law) and automatic (according with the ENTSO-E Policy 5).

The entity in charge to plan and design its actual implementation varies considerably among Member States⁵⁸. Load shedding plans are developed by public entities/the Ministry in BE, DK and UK. For example, a specific Law describes the practical

⁵⁸ the study team was not able to retrieve detailed information through desk research and stakeholder survey for all the 23 Member States. Missing information for: CZ, DE, EE, RO, SE, SI, SK.

procedures in BE⁵⁹ and DK⁶⁰, while in UK the Energy Emergencies Executive Committee reviews the load-shedding plans continually. In FR, the load shedding plan is designed by responsible Ministry in cooperation with the TSO and DSOs. In LU, NL and PT, it is developed by the TSO together with the DSOs. The TSO is the entity responsible in ES, HR, HU, IT & LT. In MT and IE, the DSO(s) develop their own load shedding plans. In AT, the regulatory authority sets a step-by-step plan⁶¹ that provides for measures concerning load shedding.

In the majority of the Member States (AT, BE, CZ, DK, EE, ES, HR, HU, IT, FR, LU, LT, NL, PL, PT, RO, SE, SI, SK, UK), load-shedding plans are implemented by the TSOs in cooperation with the various DSOs, but the entity responsible for taking the ultimate decision about its implementation varies. In thirteen countries, it is the national TSO, which may proceed on its own initiative to establish (an intentionally engineered) power shutdown (CZ, DK, EE, ES, HR, HU, IT, FR, LU, NL, PL, SE, SI, SK). At the time being, the four German TSOs have different load shedding plans, but they established working groups in order to coordinate⁶².

In MT, load-shedding plans are implemented by the DSO. Likewise, in IE, load-shedding responses are carried out by DSOs in response to specific events. In addition, the IE NRA has the power to direct the TSO or DSOs to discontinue their activities if necessary in order to protect the continuing supply of electricity.

In AT, BE, RO, PT and the UK, the government or appointed ministry is in charge of activating the load-shedding plan.

In LT, the law⁶³ determines three entities which can decide on electricity disconnection: 1) government, government's appointed institutions and (or) director of municipality's administration can order disconnection of supply of energy or energy resources in general, 2) TSO and DSO both have the rights to disconnect users to avoid emergency situations, 3) the energy company has a right to temporarily suspend or limit the supply of energy to consumers, in order to control the emergency situation.

No load shedding plans are foreseen in BG, CY, EL, FI and LV. Nevertheless, similar practices are in place in the event of an emergency situation. For example, In FI, the government can take a decision to curtail or prohibit the use of electricity for others than central functions if a national emergency is declared. In EL, even though load-shedding plans are not pre-determined by law, in practice the DSO can announce intentional power shutdowns when deemed necessary.

⁵⁹ The outage plan set down by ministerial decree on 3 June 2005.

⁶⁰ TF 2.1.2 Aflastningsforskrift.

⁶¹ Technical and Organisational Rules for Grid Operators (TOR).

⁶² However, the study team was not able to retrieve detailed information through desk research and stakeholder survey.

⁶³ Point 20 of the Government's Resolution No 12 on approval of procedure of supplying the consumers with energy and (or) energy resources during the emergency energy situation dated 13 January 2003.

4.4.6 Categories of customers protected from load-shedding

Along with the load shedding plans, most Member States define the categories of consumers to be exempted from such curtailment measures. These protected categories are defined in eighteen countries (BE, CZ, ES, EL, FR, HR, HU, IE, IT, LT, LU, MT, NL, PL, PT, SE, SI and UK). Information is missing in relation to DE⁶⁴, no protected consumer lists are foreseen in AT, DK and SK. In thirteen out of the aforementioned eighteen Member States, the categories of protected customers are described in specific legislation (BE, CZ, EL, ES, FR, HR, HU, LT, PL, PT, RO, SE and SI), whereas in IT, IE, LU and NL these categories are listed in the respective load shedding plans (in IT, these categories have been further amended by law - so called "*Electricity Bonus*"⁶⁵). In the UK the list of protected consumers is described in the Electricity Supply Emergency Code and in MT, the categories of protected costumers are defined in the risk assessments and the risk treatment plans.

In six countries (BG, CY, EE, FI, LV and RO) there is no explicit provision excluding particular fixed categories from load-shedding, but measures to avoid energy curtailments to some costumers considered as critical/protected are in place. For example, in BG the system automatics are developed on the basis of certain categories of protected consumers, pursuant to which in case of deficiency they are switched-off in differentiated manner. In EE, despite the fact that there are no protected customers in electricity, when introducing the load shedding schemes, the TSO consults the distribution networks to achieve schemes where 'sensitive consumers'⁶⁶ will be influenced less by load shedding. Similarly, in FI, in a load shedding situation the DSOs, according to their preparedness and emergency plans, try to avoid disconnecting the supply to most 'critical customers'⁶⁷. These customers are listed by the DSOs themselves. The LV laws do not have protected consumer categories but define three energy user groups that experience different levels of energy consumption restrictions: the first group is more protected and includes mainly all national authorities and bodies that are considered of critical importance, the second group is less protected and third group may be subject to considerable restrictions in emergency scenarios.

CY and RO laws provide that it is forbidden to disconnect "vulnerable customers" (i.e. economically weak household customers suffering from energy poverty, elderly costumers) from the network even in an electricity crisis situation. However, in RO these provisions are not applicable to non-domestic customers. The protection of

⁶⁴ No information was found on the basis of desk research or through the stakeholder consultation.

⁶⁵ Decree 28/12/2007 of the Ministry of Economic Development.

⁶⁶No further details or an exact list was retrieved through desk research and/or stakeholder consultation.

⁶⁷ No further details or an exact list was retrieved through desk research and/or stakeholder consultation.

“vulnerable customers” is also foreseen in EL, HR and MT, where the laws provide priorities in electricity supply in crisis situations. Under the provision of “vulnerable customers”, CY, EL and MT also take into account specific characteristics regarding their territories: customers in non-interconnected areas/islands are entitled to special services in terms of price, quality, and security of supply compared with other customers.

In SK, even though no protected electricity customer list is defined (in contrast to the gas sector), the law sets out the order in which electricity restrictive measures have to be applied to industries and population.

It was not possible to identify the detailed lists of protected customers in all Member States, and data collected display different level of details. For example, in SE, specifically protected customers are end users with an important position or function in society (i.e. significance for life and health, significance for the functioning of society, representing significant economic value, representing major impact on the environment, representing significant social or cultural value) that have been given priority according to an eight-grade scale. However, no information is publicly available on the content of these lists. Similarly, in MT the categories of protected customers are defined in the risk assessments and the risk treatment plans, which are confidential. Nevertheless, it is possible to highlight some common threads, as follows.

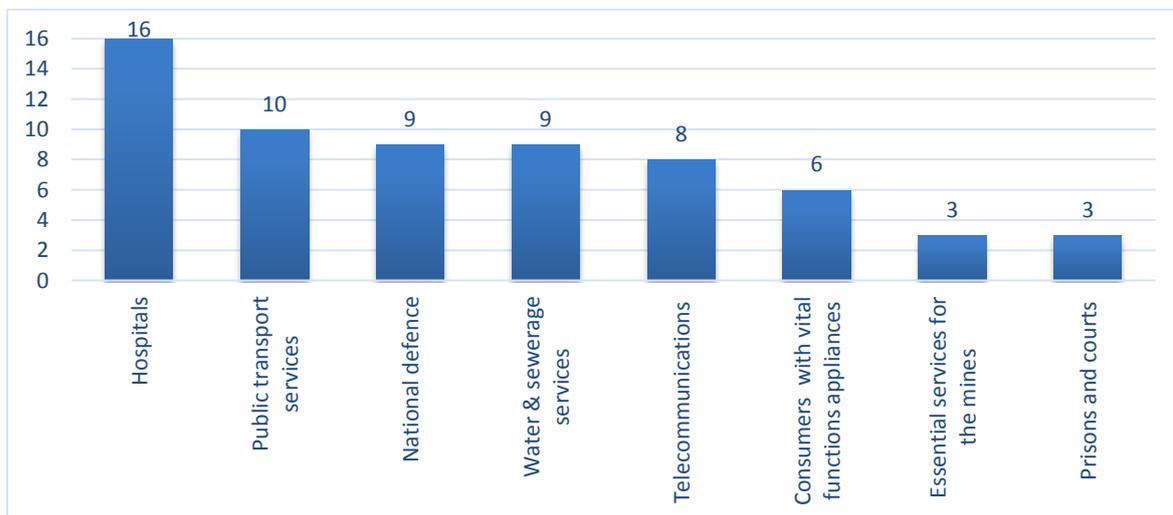
In sixteen Member States (BE, CZ, EL, ES, FR, HR, HU, IE, IT, LU, LT, NL, PL, PT, SI and UK), the protection or exclusion of hospitals and / or health care services from energy curtailments is explicitly mentioned. Moreover, in CY, EL, ES, HR, HU, IT, PT and RO it is also explicitly stated that consumers who need mechanical aids, especially persons who need a constant power supply in order to operate appliances to support or monitor vital functions or who suffer from a severe disability are excluded for the load-shedding (in CY, EL, HR and RO this category is part of the definition of “vulnerable customers”). Despite the fact that a protected consumer list does not exist, SK’s DSOs shall keep a register of vulnerable household whose vital functions depend on the electricity and notify them about each planned limitation of interruption of electricity distribution to their off-take points.

Sixteen Member States (BE, CZ, LU, EL, ES, FR, HR, HU, IE, IT, LT, NL, PL, PT, SI, UK) have a list of national strategic industries and/or public services considered as priority and consequently not subjected to any electricity restrictive measures (in IE, these priority customers are only exempt from planned load shedding, and therefore they could still experience outages due to unplanned electricity interruptions). These categories vary considerably among Member States, but common patterns can be found:

- Ten Member States (CZ, IT, EL, ES, HU, IE, LU, PL, SI & UK) exempt major public transport services (airports, ports and railways) and/or public transport security management systems (in FR, HU & IT) from energy curtailments;
- Nine Member States (CZ, EL, ES, FR, HR, NL, LU, PL & PT) include strategic sites for national defence and the public security bodies (i.e. army and/or police forces) as priority customers;
- Nine Member States (CZ, EE, ES, HU, IE, LT, NL, SI & UK) exempt water and sewerage distribution services;
- Eight Member States (BE, CZ, HU, IE, LU, NL, SI & UK) exempt telecommunications and/or emergency communication services;
- Essential services for the mine industry are excluded in CZ, HU and IT.

In addition to the above-listed industries, CZ, ES, HU, IE and UK 's lists consider additional categories defined as "vital services" (called "crucial consumers" in HU) and take the following into account: gas storage facilities (in HU & UK), oil refineries (in HU & UK), facilities providing essential food suppliers (in UK & HU), prisons and courts (in ES, IE & UK), public lighting (ES) and funeral services (ES).

Figure 15 – Member States and protected consumer categories⁶⁸



The chart shows on the horizontal axis the most prevalent types (i.e. mentioned by more than three Member States) of 'protected consumer' categories and on the vertical axis the number of Member States associated.

4.4.7 Brown- and blackout: responsible entity and financial compensation for customers

Responsible entities

TSOs and DSOs are responsible in case of a brown- or black-out⁶⁹ in HR, LV and SK. Moreover, in CZ for example, the TSO is the entity responsible for ensuring the safe operation of the transmission system whereas the DSOs are responsible for safeguarding the reliable operation of the distribution system. The restoration of the electricity system is the full responsibility of the TSO. In FI, brown-outs are implemented by the DSOs, according to instructions from the TSO, and black-outs by the TSO. In SE, the DSOs are liable for providing economic compensation in cases of electricity disruptions. In FR, the TSO is the entity in charge.

⁶⁸ Based on sixteen out of twenty-eight Member States (AT, BG, CY, DE, DK, EE, FI, LV, MT, RO, SE and SK are excluded).

⁶⁹ A brownout is an intentional or unintentional drop in voltage in an electrical power supply system. Intentional brownouts are used for load reduction in an emergency, see for example: Steven Warren Blume Electric power system basics: for the nonelectrical professional, John Wiley & Sons, 2007 p. 199. A blackout is a short- or long-term loss of the electric power to an area (which is usually unintended). See for example: https://en.wikipedia.org/wiki/Power_outage.

Furthermore, in PL, in case of interruption and restrictions (e.g. lower quality) of electricity supply, both TSO and DSOs are liable as long as the interruption exceeds a certain length of time. In case of imposed limitations on supply and consumption of electricity, the law allocates responsibility to the TSO. However, this responsibility is limited to the extent that the TSO itself is responsible for the imposed limitations or in case it committed negligence. In IT, DSOs are the entities in charge, whilst in HU, a committee consisting of market participants, the TSO and the Hungarian Energy Office (HEO) are responsible for negotiating additional costs incurred from a crisis situation attributable to the affected persons. Furthermore, in LU, the Government and the TSO are the entities responsible in cases of a sudden crisis on the electricity market (brown and blackouts).

In EE, the TSO is responsible for direct costs (for instance, in case an order was given to change the generation level) and for loss of property if it was caused by its activities. Likewise, in LT, the TSO is responsible for the preparation and implementation of the System Restoration Plan after a blackout. In NL, the TSO is the entity in charge of ensuring that small interruptions will not transform into large interruptions or total black-outs. In ES, the TSO is responsible for breaches of the quality levels of supply in border points, to the extent attributable to it. In PT, the TSO may be considered liable in damages in cases where it did not take the adequate and necessary measures to prevent damages. Portuguese law also envisages the possibility of the creation of an Arbitration Commissions to decide on compensation to private entities in consequence of exceptional measures that were adopted in cases of crisis.

The electricity supplier is responsible in case of a brown- or black-out in CY, EL and RO. In AT, Grid operators are requested to maintain security of supply and the NRA has to support this to an appropriate extent. Similarly, in DE, Grid operators are generally responsible. In IE, EirGrid is responsible for controlling and operating the transmission system.

Moreover, in BE, BG and MT, the responsibility in case of a brown- or black-out is not clearly stated. In particular, in MT⁷⁰ and SI⁷¹, in case of a black- or brown out, the liability falls upon the organisation/entity or individual that caused the blackout or brown out.

In the UK, the OFGEM has Quality of Service Guaranteed Standards, which are service levels that must be met by electricity distribution companies. In DK there is no information available on this subject.

Financial compensation for customers

First and foremost, all Member States exclude rights to compensation in case of force majeure. Furthermore, in AT, BE, BG, IE, NL there are no specific legislative provisions for financial compensation in case of a brown-out or a black-out. Consumers have to base their claims on general provisions on damages. In particular, in NL the Network Code sets out the rules for compensation which is possible only in case of a 'large interruption' ('*grote storing*'), in case the electricity transmission has been disrupted for more than one hour for large customers or more than four hours for households. Also in CZ, the law does not directly allocate responsibility for brown- or black outs.

⁷⁰ Stakeholder response on behalf of the DSO (Enemalta).

⁷¹ Art. 146/V of the Energy Act, Civil law.

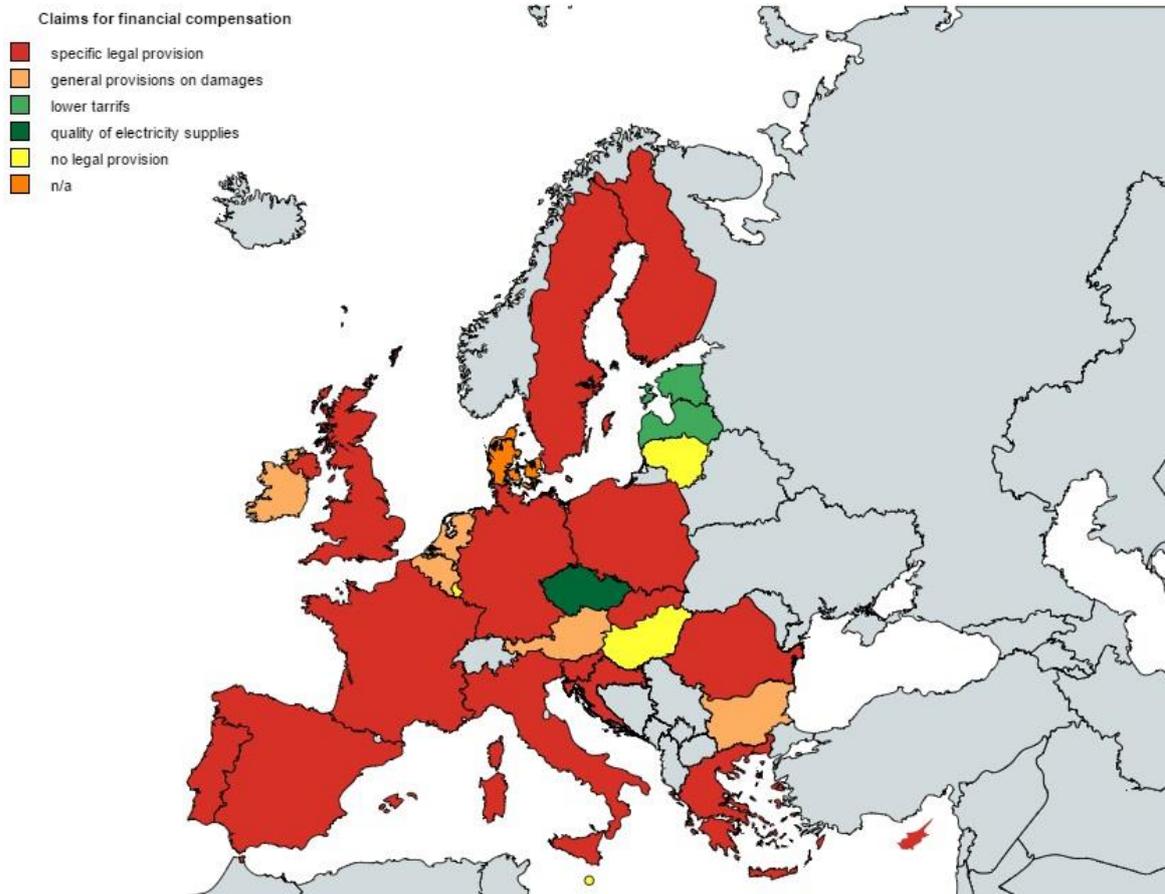
However, general rules concerning the financial compensation for consumers in case of interruption of electricity supply are set out in a Decree on the quality of electricity supplies and related services in the electricity sector.

In HU, MT, LT and LU there is no legal provision for financial compensation to consumers for losses caused by suspension or termination of electricity transmission when such termination or suspension was needed to avoid emergency situations or in the event of a sudden crisis.

In LV, consumers are not entitled to receive compensation from the energy supplier but the DSO shall apply a lower tariff during periods of improper electricity supply and TSO compensates any losses incurred by the electricity user during periods of such improper supply. Likewise, in EE, the consumers are entitled to a reduction of network tariffs in case the quality requirements set by a ministerial regulation are not met (i.e. the interruption of electricity supply exceeds certain predetermined time limits). Moreover, in the event the Government imposes security of supply measures, it must establish the grounds for the calculation of expenses incurred as a result of implementing the measures, as well as the list of persons who are required to pay compensation for such expenses and of persons who are entitled to compensation, and the extent of and procedure for the compensation of expenses.

In fifteen countries (CY, DE, EL, ES, FI, FR, HR, IT, RO, PL, PT, SE, SK, SI, UK), consumers have the right to ask for compensation from the responsible entity when damages are caused from the other parties' fault, in case of breaches of electricity quality indicators or in the event that the electricity supply is interrupted unreasonably or unduly long. For instance, in SE, consumers are entitled to economic compensation for outages longer than 12 hours when power disruptions may not last longer than 24 hours (given certain conditions). In FI, the law provides a compensation mechanism depending on the existence of defects or errors in electricity distribution, the discrepancy between the agreed and the provided quality, possible mistakes in relation the bill. Likewise, in FR, the consumers are subject to compensation from the TSO in conditions set by a ministerial order. The rules for financial compensation constitute a compensation mechanism that foresees the amounts due, depending on the degree of the electricity disruption. In ES the system operator and manager of the transmission network will be responsible for breaches of the quality levels of supply in border points, to the extent attributable to it. In EL, consumers may be compensated by the Public Power Corporation S.A. (PPC) in case of a random interruption of the low voltage network of electricity supply, which results in a damage to their electric devices. In CY, the Electricity Authority of Cyprus (EAC) introduced a Customer Chart describing the services that are guaranteed by EAC as Distribution System Owner/Operator and licensed Supplier. In case of failure of provision of the services guaranteed, EAC commits to pay the customers an indicative amount of money as compensation to this effect. In IT, the consumer has the right to ask for a financial compensation from the DSO in the event of electricity interruptions, which are classified based on time length. The degree of compensation is thus contingent upon this classification. In PT, private parties may be entitled to financial compensation as a consequence of exceptional measures adopted in cases of crisis. In DK there is no available information.

Figure 16 – Claims for financial compensation



4.4.8 Coordination with other Member States in an emergency situation

The systems or agreements to cooperate among Member States in case of emergency are relatively similar to those used to coordinate preventive measures, due to the fact that preventive measures and emergency measures often take part of the same plans.

All Member States, except for CY⁷², refer to collaboration between TSOs in case of emergency, using the instruments provided by ENTSO-E, such as, the ENTSO-E Awareness System (EAS), the Real-time Awareness, the Alarm System (RAAS) and the Crisis Communication Tool (CCT), in line with the binding Operational Handbook. EAS is an information platform, which allows TSOs partners a real-time global view of the European grid, while the CCT enables TSOs to rapidly communicate an incident or potential incident to other TSOs. The TSOs also follow the ENTSO-E Network Code on Emergency and Restoration, which provides Pan-European requirements regarding the design, implementation and activation of system defence and restoration plans, communication systems and suspension/restoration of market mechanisms. DE

⁷² CY does not have a TSO.

indicates that information can also be requested through the “European critical infrastructure protection contact point”⁷³.

In practice, all necessary data for assessment of the operational situation in the region is exchanged between the TSO Control Center’s SCADA systems in real-time, allowing TSOs to coordinate both for the implementation of preventive measures and in situation of emergency. The TSOs can see in its SCADA system when something happens in the neighbouring power system. Subsequently, there will be email and phone communication between Control Rooms and, if needed, joint actions to relieve the situation will be agreed upon.

Example – Regional cooperation: NordAM

The Nordic countries have a long tradition of cooperation, as the Nordic electricity market is a common market. Information will thus be exchanged at government level as well as TSO level. The Nordic TSOs have an agreement of mutual support of reparation resources in case of large disturbance: Nordic Asset Management Forum (NordAM). The following measures are envisaged in case of serious risk of energy shortage in one of the Nordic countries:

The TSO will consider to postpone planned outages of relevant part of network/grid (in order to allow more electrical energy flowing to the affected areas);

The TSO will assist other Nordic TSOs in a dialogue with the German TSOs regarding possible activation of more energy production from the south (to reduce the Nordic energy deficit);

If a long term energy shortage in the Nordic system should result in a serious risk of power shortage, TSO might be forced to act according to the plans for Critical power shortage (“Kritisk effektbrist”) - e.g. ordering manual load shedding – provided that the operation reliability is endangered.

The three Baltic⁷⁴ TSOs also agreed on a common System Restoration Plan, setting up the procedures of communication and restoration in case of emergency. Besides, an agreement (i.e. *Agreement on Parallel Operation of the Power Systems* - BRELL agreement) has been concluded among Belarus, Russia, Estonia, Latvia and Lithuania TSOs regarding activity within the unified system, including an obligation to provide emergency energy reserves.

The Coordination of Electricity System Operators (CORESO) was the first regional technical coordination centre, bringing together the TSOs of FR, UK, BE, PT, IT and DE. CORESO and other regional centres, such as the Transmission System Operator Security Cooperation (TSC) (AT, CH, CZ, DE, DK, HR, HU, NL, PL, SI), provide day-

⁷³ Following 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.

⁷⁴ EE, LV, LT.

ahead forecasts and real-time security analyses alerting TSOs in case of major disruption. Bilateral agreements are also in place between TSOs in other Member States including possible measures and information exchange procedures in case of emergency situations. For example, in HU, these bilateral TSO agreements cover:

- Operational limits (active power and voltage on the cross-border lines);
- Protection schemes and their setting values (in the interest of determination of possible overloading) on the cross-border lines;
- Settings of Parallel Switching Devices (for resynchronization) on the cross-border lines;
- Extent and form of information exchanges;
- List of contact persons.

A “black start” agreement between the UK and IE exists so that each TSO can provide mutual support in an emergency. This agreement consists of a number of strategically located power stations which are able to operate without external electricity supply to re-energize the local network and eventually power up other neighbouring plants. In addition, both Northern Ireland and IE electricity system operators belong to the All-island Single Electricity Market.

In EL, the TSO has an agreement with the neighbouring countries’ TSO’s to provide mutual help by any means in emergency situations.

As a consequence of the Italian Blackout of 2003, there are separate agreements between the IT TSO and its counterparts in four countries (FR, CH, AT, SI). In particular, the agreements between IT and SI TSOs cover data log and the exchange of foreign grid status (TM/TS). IT and FR TSOs are also bound by “common reserves”.

Since 2011, the “Downward MEAS” (Mutual Emergency Assistance Service) establishes the conditions for reciprocal TSO support in emergency situations, namely set up by FR, IT, ES, PT or DE with their respective neighbours.

CY has an isolated system and is not bound to coordination agreements with other Member States. In MT, the DSO is linked by an Operational Agreement with the IT TSO.

We have not been able to find any information on the cooperation between NRAs outside ACER, except in AT, where the TSO informs the NRA in case of emergency, and the latter decides which entity to contact.

At governmental level, we have not identified any bilateral cooperation agreements; only informal communication between Ministries seems to exist (e.g. the Dutch Ministry responsible for Energy indicated having well-established contact with its counterparts in the neighbouring countries, which can be used in the context of crisis management). Information exchange and coordination between governments for both preventive measures and emergency measures takes place more at regional level, for instance within the Pentalateral Energy Forum (AT, BE, DE, FR, LU, NL) or the Baltic Energy Market Interconnection Plan “BEMIP” (DE, DK, EE, FI, LT, LV, PL, SE) and at European level in the framework of the Electricity Coordination Group.

4.4.9 Conclusions

The results of our analysis indicate that a majority of Member States (BE, CZ, EE, FR, HU, LT, LV, LU, MT, PT, SK, SI, UK) provide a legal definition of emergency in their national laws and take into consideration different causes of emergencies, such as

natural disasters, criminal damages, terrorist actions or malfunction in the electricity supply system. In five Member States (ES, FI, IE, PL, SE), even though an exhaustive legal definition is not provided, we identified laws that describe circumstances that can lead to emergency situations. In BG, IT and NL, regulatory codes or other non-legislative rules describe possible events that can lead to system disturbances. In six Member States (AT, CY, DE, DK, EL, RO) national law, regulation or other policy documents do not provide for a legal definition or description of “emergency” at all, which would leave room for interpretation at practical level. The abovementioned varying approaches and levels of detail in the definition of an emergency could potentially lead to disparate reactions of Member States in emergency events.⁷⁵

Regarding the actions and measures foreseen in an emergency situation, we have identified that the measures are explicitly tailored to the different levels of emergency in twelve Member States (DE, DK, EE, FR, HU, IT, LU, LV, NL, SE, SI, UK). In nineteen Member States (BE, CY, CZ, DE, DK, EE, ES, FR, HR, HU, IE, IT, LU, NL, PL, PT, RO, SI, SK) the TSO is in charge of implementing such emergency measures and only upon Ministry’s approval in four of these countries (BE, DE, NL, PT). Other entities are in charge of their implementation in the remaining ones.

Emergency plans differ considerably among Member States. Nevertheless, it was possible to identify common threads. Commonly used measures in emergency events are restriction on electricity consumption, generation increase, disconnection of end users, use of contracted reserves and use of strategic reserves.

Market suspension measures are foreseen in all Member States but not to the same extent, nor under the same type of rules. Market suspension rules are organised by national legislation in twenty-one Member States (AT, BE, BG, CY, CZ, DE, EE, ES, FI, FR, HR, HU, IE, IT, LT, LU, PT, RO, SE, SI, SK) but they are also set up in operational plans of the TSOs (LV, PL, SK, UK), of the DSO in MT, of the Ministry in DK and of the NRA in NL. This could potentially lead to dissimilar responses between Member States which could have consequences for neighbouring countries.⁷⁶

Only SI and RO specifically include explicit legal provisions on export bans. Limitations to export and reduction of cross-border trading capacity measures are also in place in other Member States (DK, EE, IT, PL, SE, SK). In FR and LT the Government may control the import and export of energy products and in NL, the “System Code” allows for the curtailment of exports by the TSO. In contrast to these restrictive measures, the Nordic power markets apply the rule to keep the interconnections running as long as possible; only when it is no longer feasible, the markets and security issues can be taken care of domestically.

We have not identified any formal bilateral agreements at government level; thus coordination is restricted to regional initiatives, for instance within the Pentalateral Forum or the BEMIP, and in the framework of the Electricity Coordination Group. In

⁷⁵ This was not raised through our stakeholder questionnaires, and thus should be regarded as a cautious assumption.

⁷⁶ This was not raised through our stakeholder questionnaires, and thus should be regarded as a cautious assumption.

addition, all Member States, except CY, refer to collaboration between TSOs in case of emergency, using the instruments provided by ENTSO-E such as the ENTSO-E Awareness System (EAS), Real-time Awareness and Alarm System (RAAS) and the Crisis Communication Tool (CCT), in line with the binding Operational Handbook. As the Nordic countries have a long tradition of cooperation, information exchange occurs at both governmental and TSO level. The Nordic TSOs have an agreement of mutual support of reparation resources in case of large disturbance (NordAM). The three Baltic TSOs also agreed on a common System Restoration Plan, setting up the procedures of communication and restoration in case of emergency. Besides, the BRELL agreement has been signed between LV, EE, LT, Russia and Belarus TSOs regarding activity within the unified system, including an obligation to provide emergency energy reserves. The current legislation does not require Member States to warn other countries and the EU when there is an emergency situation but only to notify them in case they take safeguard measures (Article 42 of the Electricity Directive). This is in contrast to the security of supply in the gas sector, where signals tailored to different levels of criticality (e.g. early warning and alert) can promote the use of market based measures and formally highlight the vulnerability (in the Nordic case, for example, it is possible to keep the interconnections running and only if and when no longer feasible are non-market interventions allowed).

Twenty-three Member States foresee a load-shedding plan as emergency measure. In most of the Member States, load-shedding plans are implemented by the TSOs in cooperation with the various DSOs, but the entity responsible for taking the ultimate decision about its implementation varies. In thirteen countries (CZ, DK, EE, HR, HU, IT, FR, LU, NL, PL, SE, SI, SK), it is the national TSO which may proceed on its own initiative to establish an intentionally engineered power shutdown. In other Member States, load-shedding plans are implemented by the DSO or by the government/Ministry. In five countries (BG, CY, EL, FI and LV), no load shedding plans are foreseen, even though similar engineered power shutdown practices are in place.

A majority of Member States define priority consumers that should be exempted from curtailment measures in their load-shedding plans. These protected categories are explicitly defined in most countries (BE, CZ, FR, ES, EL, HR, HU, IE, IT, LT, LU, MT, NL, PL, PT, SE, SI & UK). In six countries (BG, CY, EE, FI, LV and RO) a straightforward provision does not exist, however types of "protected consumer" categories are foreseen. Only three Member States (AT, DK and SK) do not have a protected consumer list in place. In addition, the categories of protected consumers vary considerably; a majority of the countries have different views on which industries/public services are to be considered as "strategic" and therefore excluded from energy curtailments. Nevertheless, sixteen Member States (BE, CZ, EL, ES, FR, HR, HU, IE, IT, LT, LU, NL, PL, PT, SI and UK) explicitly mention the exclusion of hospitals/health care services from load-shedding.

In the majority of Member States, the respective legal regime allocates the entities that are responsible in the event of brown- and blackouts. TSOs and DSOs are usually in charge in these situations of electricity disruptions. With regard to financial compensation for consumers, in none of the Member States consumers are entitled to compensation if the brown- and blackout is caused due to force majeure. There are also other legislative provisions for financial compensation to consumers under circumstances, such as in case of improper electricity supply, in case of a large interruption, when the interruption of electricity supply exceeds the prescribed values or when the electricity supplier interrupts its electricity supply unreasonably.

5- SUMMARY OF FINDINGS INCLUDING CONCLUSIONS AND GOOD PRACTICES

This section draws all our information together, presenting a summary of our findings and conclusions for each of the researched and analysed sub-areas. It should be noted that this was a 'fact finding' study and that it therefore focuses on providing an overview of the factual situation in the Member States with regard to the rules and practices concerning risk assessment, risk preparedness and emergency situations. Nevertheless, based on the results of this fact-finding exercise, we believe we can highlight some good practices that may be useful input for further investigation and development of possible policy actions by the European Commission.

5.1 Summary of findings and conclusions

5.1.1 Risk assessment

Our analysis shows both similarities and diversities among the twenty-eight EU Member States with regard to the legal frameworks and practices concerning the assessment of electricity security of supply risks.

Obligation to carry out a risk assessment

The similarity exists in the fact that all Member States have a general obligation to ensure the monitoring of electricity security of supply, by complying with the requirement set out in Article 4 of Directive 2009/72/EC, from which implicitly follows the obligation to assess electricity supply risks. In nine Member States an explicit obligation prevails (by law) to carry out an assessment of risks.

National entities responsible for risk assessment and the division of their roles

The (combination of) national entities (TSOs, the competent Ministries, the NRAs and the DSOs) responsible for risk assessment and the division of their roles, which are often defined by law, vary across the Member States. TSOs play a major role in the assessment of risks in a majority of the countries. In line with Article 7 of Directive 2005/89/EC, the TSOs are in practice the main entity involved in the preparation of the risk assessment and monitoring reports and in charge of ensuring the security of electricity supply in practice.

Types of risks to be assessed

With regard to the types of risks to be assessed, good practice was found in a vast majority of the countries (AT, BE, BG, CZ, DE, DK, EE, ES, FI, FR, HU, IE, IT, LT, LU, MT, NL, PL, PT, SE, SK, SI, UK), which describe the types of risks covered under the assessments. The level of detail in which the types of risks are described varies and a high level of detail was found in AT, IE, UK. In five countries the types of risks to be assessed are not or very generally described (CY, EL, HR, LV, RO).

There exists a patchwork of types of risks covered under the assessments in the Member States. Diversity in types of risks and their definitions will be (partly) due to the existence of varying electricity risks at national level and different national circumstances (e.g. weather, electricity resources and location). **Nevertheless, disparate (definitions of) types of risks to be assessed can potentially cause**

difficulties in the cooperation between neighbouring Member States, when preventing and addressing such risks.⁷⁷

5.1.2 Risk preparedness plans

Existence of a national obligation to draw risk preparedness plans

Research shows a fragmented and diverse framework in relation to national risk preparedness plans, measures and obligations concerning security of electricity supply. In general, it can be said that all Member States take into account risk preparedness considerations, although in varied degrees and depth.

Hence, only ten Member States set clear obligations to draw up risk preparedness plans (eight do so by law and two via guidance documents), whilst eighteen other countries do not have such an obligation, albeit taking risk preparedness considerations into account in reports, plans or measures. There is no specific obligation to submit a risk preparedness plan in the Electricity Directive (2009/72/EC) and in the Security of Supply Directive (2005/89/EC), which partly explains the fragmented framework of preparedness plans and measures.

Good practice can thus be identified in at least ten Member States which set clear obligations to draw up 'risk preparedness plans' (BG, CY, CZ, DK, HR, HU, LT, PT, RO and SE).

Responsible national entities

The national entities responsible for drawing risk preparedness plans or measures vary across the Member States. TSOs appear as the most involved entities, taking an active role in twenty-two Member States. In three countries, the TSO is the sole authority responsible for the adoption of risk preparedness measures, whilst in nineteen other countries the TSO cooperates or shares responsibility with the government, NRAs or DSOs.

Although TSOs appear to have a central role in the adoption of risk preparedness plans or measures, the responsible national entities and the specific role they carry still varies significantly revealing a significant diversity amongst Member States.

Types of measures (preventive / emergency)

In relation to the types of measures adopted in risk preparedness regarding security of supply, research took into consideration some important preliminary factors which are relevant for the conclusions of this study. **First, as noted previously, Member States do not always make a clear distinction between measures which can be adopted for prevention purposes and measures that can be adopted to respond to an emergency; second, availability of information is limited in several Member States, as many risk preparedness plans / reports or measures are confidential.** With these two factors in mind, conclusions drawn in this section are general rather than comprehensive.

⁷⁷ This issue was not raised in our stakeholder questionnaires, so further research may be necessary to ascertain this assumption.

Research shows that in twenty-seven Member States, risk preparedness plans / risk preparedness measures include both preventive and emergency measures (AT, BE, BG, CY, CZ, DE, DK, EE, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK, UK). Within this group, FI gives a particular emphasis to preventive measures. In BG, DE and PT, although it was not possible to determine fully the scope of several confidential risk preparedness plans, research indicated that some publicly available plans and guidance documents include both emergency and preventive measures. Lastly, in EL, plans are confidential and not enough information regarding the content of the plans is available publicly or was shared with the consortium.

Types of preventive measures

In relation to the types of preventive measures envisaged by Member States, at least **twenty-seven Member States take preventive measures into account. Nonetheless, the type of measures envisaged varies significantly across Member States leading to a rather fragmented and heterogeneous framework.** Regardless, **research shows that the large majority of Member States focus on the adoption of market measures in their preventive framework.**⁷⁸ These measures vary but in general relate to, inter alia, levels of supply and demand, operational security or energy efficiency issues. In seven Member States, information available did not allow for a categorisation of measures, primarily due to the confidentiality of risk preparedness plans and measures (AT, BG, DK, EL, FI, LU and MT).

The types of preventive measures envisaged by Member States are varied and the fact that many of them are confidential limited the information accessed to in this study. Regardless, there are clearly two main visible features: first, in general, the distinction between preventive and emergency measures is not clearly defined at national level; second, a large majority of Member States envisages the adoption of preventive market measures in their risk preparedness plans and considerations.

Time horizons of plans / measures

The time horizons covered by the different measures vary significantly across the Member States and there is no overall trend. Time horizons covered can vary from one year to fifteen years. Moreover, some Member States set no limits of validity for their measures, others have a system of continuous updates whilst at least eleven countries do not specify time horizons. It is noteworthy that some Member States take into account longer periods in their risk preparedness plans / measures, such as, for example, EE, FR, NL, PT and SK.

Cooperation with neighbouring countries

⁷⁸ For a distinction between market and non-market measures Regulation 994/2010 concerning measures to safeguard security of gas supply, OJ L295/1 [2010], Annexes II and III was used as guidance.

With regard to cooperation between Member States concerning the establishment and implementation of risk preparedness plans and measures, the framework is very developed at the TSO level. Nonetheless, **cooperation at governmental level is still under development**; indeed, this study did not identify any formal bilateral agreements at ministerial level. There are, however, positive recent attempts to enhance regional cooperation (noteworthy examples are the Pentalateral Energy Forum, the so-called Baake declaration, NordBER and NordREG and a cooperation platform between PT and ES), it can be concluded that cooperation at the governmental level is still under development.

Availability of plans / measures and frequency of updates

In relation to the availability of risk preparedness plans or measures, nine Member States keep them confidential (BG, CY, DE, DK, EL, HR, LT, MT, SE), eight make them public (FR, HU, IE, IT, LU, LV, RO, SK) and eleven others have a mixed framework with some measures being released and others being kept confidential (AT, BE, CZ, EE, ES, FI, NL, PL, PT, SI and UK). The concern with the protection of sensitive data is clearly seen in the fact that many Member States keep their risk preparedness measures or plans fully confidential. **It is noteworthy that some Member States reach a balance between the need to keep some plans and measures reserved from the public and the possibility of making some information publicly available, such as AT, BE, CZ, EE, ES, FI, NL, PL, PT, SI and UK.**

With regard to frequency of updates, the framework is extremely diverse (from annual, biennial or every five or ten years, for example) and no particular common pattern can be highlighted. Several Member States require biennial updates, for example (DE, LU, PL, SI, SK). This regularity may be able to offer some stability in the national framework whilst allowing for regular updates if necessary.

5.1.3 Emergency situations

Definition of emergency

The results of our analysis indicate that a majority of Member States (BE, CZ, EE, FR, HU, LT, LV, LU, MT, PT, SK, SI, UK) provide a legal definition of emergency in their national laws and take into consideration different causes of emergencies, such as natural disasters, criminal damages, terrorist actions or malfunction in the electricity supply system. In five Member States (ES, FI, IE, PL, SE), even though an exhaustive legal definition is not provided, we identified laws that describe circumstances that can lead to emergency situations. In BG, IT and NL, regulatory codes or other non-legislative rules describe possible events that can lead to system disturbances. In six Member States (AT, CY, DE, DK, EL, RO) national law, regulation or other policy documents do not provide for a legal definition or description of "emergency" at all. **The abovementioned varying approaches and levels of detail in the definition of an emergency could potentially lead to disparate reactions of Member States in emergency events.**

Actions and measures foreseen for the various levels of emergency and entity(ies) with the authority to decide

Regarding the actions and measures envisaged in an emergency situation, we have identified that **the measures are explicitly tailored to the different levels of emergency in twelve Member States** (DE, DK, EE, FR, HU, IT, LU, LV, NL, SE, SI, UK). In nineteen Member States (BE, CY, CZ, DE, DK, EE, ES, FR, HR, HU, IE, IT, LU, NL, PL, PT, RO, SI, SK) the TSO is in charge of implementing such emergency

measures and only upon Ministry's approval in four of these countries (BE, DE, NL, PT). Other entities are in charge of their implementation in the remaining ones.

Emergency plans differ considerably among Member States. Nevertheless, it was possible to identify common threads. Commonly used measures in emergency events are restriction on electricity consumption, generation increase, disconnection of end users, use of contracted reserves and use of strategic reserves.

Conditions for market suspension and entity(ies) with authority to decide

Market suspension measures are envisaged in all Member States but not to the same extent, nor under the same type of rules. Market suspension rules are organised by national legislation in twenty-one Member States (AT, BE, BG, CY, CZ, DE, EE, ES, FI, FR, HR, HU, IE, IT, LT, LU, PT, RO, SE, SI, SK) but they are also set up in operational plans of the TSOs (LV, PL, SK, UK), of the DSO in MT, of the Ministry in DK and of the NRA in NL. **This could potentially lead to dissimilar responses between Member States which could have consequences for neighbouring countries.**⁷⁹

Only SI and RO specifically include explicit legal provisions on export bans. Limitations to export and reduction of cross-border trading capacity measures are also in place in other Member States (DK, EE, IT, PL, SE, SK). In FR and LT the Government may control the import and export of energy products and in NL, the "System Code" allows for the curtailment of exports by the TSO. **In contrast to these restrictive measures, the Nordic power markets apply the rule to keep the interconnections running as long as possible; only when it is no longer feasible, the markets and security issues can be taken care of domestically.**

Load-shedding plans and entity(ies) with authority to decide

Twenty-three Member States envisage a load-shedding plan as emergency measure. In a majority of Member States, load-shedding plans are implemented by the TSOs in cooperation with the various DSOs, but the entity responsible for taking the ultimate decision about its implementation varies. In thirteen countries (CZ, DK, EE, HR, HU, IT, FR, LU, NL, PL, SE, SI, SK), it is the national TSO which may proceed on its own initiative to establish an intentionally engineered power shutdown. In other Member States, load-shedding plans are implemented by the DSO or by the government/Ministry. In five countries (BG, CY, EL, FI and LV), no load shedding plans are foreseen, even though similar engineered power shutdown practices are in place.

Categories of customers protected from load-shedding

A majority of Member States define priority consumers that should be exempted from curtailment measures in their load-shedding plans. These protected categories are explicitly defined in most countries (BE, CZ, FR, ES, EL, HR, HU, IE, IT, LT, LU, MT, NL, PL, PT, SE, SI, UK). In six countries (BG, CY, EE, FI, LV, RO) a straightforward provision does not exist, however types of "protected

⁷⁹ This was not raised through our stakeholder questionnaires, and thus should be regarded as a cautious assumption.

consumer” categories are foreseen. Only three Member States (AT, DK, SK) do not have a protected consumer list in place. In addition, **the categories of protected consumers vary considerably; a majority of the countries have different views on which industries/public services are to be considered as “strategic” and therefore excluded from energy curtailments.** Nevertheless, sixteen Member States (BE, CZ, EL, ES, FR, HR, HU, IE, IT, LT, LU, NL, PL, PT, SI, UK) explicitly mention the exclusion of hospitals/health care services from load-shedding.

Brown- and blackout: responsible entity; financial compensation for customers

In a majority of Member States, the respective legal regime allocates the entities that are responsible in the event of brown- and blackouts. TSOs and DSOs are usually in charge in these situations of electricity disruption. With regard to financial compensation for consumers, in none of the Member States consumers are entitled to compensation if the brown- and blackout is caused due to force majeure. There are also other legislative provisions for financial compensation to consumers under circumstances, such as in case of improper electricity supply, in case of a large interruption, when the interruption of electricity supply exceeds the prescribed values or when the electricity supplier interrupts its electricity supply unreasonably.

Cooperation with neighbouring countries in emergency situations

We have not identified any formal bilateral agreements at government level; thus coordination is restricted to regional initiatives, for instance within the Pentalateral Forum or the BEMIP, and in the framework of the Electricity Coordination Group. In addition, all Member States, except CY, refer to collaboration between TSOs in case of emergency, using the instruments provided by ENTSO-E such as the ENTSO-E Awareness System (EAS), Real-time Awareness and Alarm System (RAAS) and the Crisis Communication Tool (CCT), in line with the binding Operational Handbook. As the Nordic countries have a long tradition of cooperation, information exchange occurs at both governmental and TSO level. The Nordic TSOs have an agreement of mutual support of reparation resources in case of large disturbance (NordAM). The three Baltic TSOs also agreed on a common System Restoration Plan, setting up the procedures of communication and restoration in case of emergency. Besides, the BREL agreement has been signed between LV, EE, LT, Russia and Belarus TSOs regarding activity within the unified system, including an obligation to provide emergency energy reserves. The current legislation does not require Member States to warn other countries and the EU when there is an emergency situation but only to notify them in case they take safeguard measures (Article 42 of the Electricity Directive). This is in contrast to the security of supply in the gas sector, where signals tailored to different level of criticality (e.g. early warning and alert) can promote the use of market based measures and formally highlight the vulnerability (in the Nordic case, for example, it is possible to keep the interconnections running and only if and when no longer feasible are non-market interventions allowed).

5.2 Concluding remarks

The availability of electricity is an indispensable condition for the working of a well-functioning modern society and the security of its supply poses numerous challenges, namely the limited storable capacity, its demand inelasticity and the need for a continuous balance between supply and demand. Furthermore, considering that security of energy supply is an issue for which markets alone cannot provide an adequate response, it constitutes a policy concern where the EU, in cooperation with the national governments, needs to step in. Given that the existing EU legal framework leaves Member States room for discretion, the rules and practices in the

area of electricity security of supply vary across the twenty-eight Member States, with regard to risk assessment, risk preparedness and response to emergency situations.

More particularly, the conclusions to this study on the current risk preparedness rules and practices in the area of electricity security of supply show a relatively fragmented landscape among Member States. Security of electricity supply may, in a number of Member States, still be considered a national issue, although it can be seen that (bilateral and regional) cooperation is starting to develop at the policy level (while this is much more established at a technical level (TSOs, DSOs)).

In summary, this study found that, generally, Member States address risk assessment of electricity security supply in a comparable way due to the monitoring requirements derived from the Electricity and the Electricity Security of Supply Directives. Although a majority of the countries describe the types of risks, variation exists in the types and level of detail of such risks. While this could (partly) be explained by the existence of country or regional specific electricity supply risks and circumstances, disparate (definitions of) types of risks to be assessed can potentially cause difficulties in the cooperation between neighbouring Member States, when preventing and addressing such risks.

In turn, risk preparedness is addressed in various ways across the Member States, which leads to varying legal frameworks and practices at national level, both in terms of form and content. Hence, even when good practices can be identified, for example, in the Member States which set clear obligations to draw up 'risk preparedness plans', the content, depth, source or periodicity of these plans remains diverse. This heterogeneity can be partly explained by the inexistence of a common EU framework in relation to risk preparedness in electricity supply. These diverse national strategies may pose some challenges to the security of energy supply as a whole in the EU.

Finally, the national landscape across the EU with regard to the response to emergency situations is also fragmented. This is particularly seen in the varying level of detail in the definition of an emergency, in the involvement of various entities and their roles and in the level of detail of national emergency plans and measures including diverging levels of protection of consumers. Indeed, it appears that responses to emergencies in electricity supply are often seen as sensitive issues belonging to the national sphere.

Having drawn all our results together, this "fact finding" study provides a wealth of useful information on the various provisions and practices, as well as on the similarities, gaps and inconsistencies between the national strategies responding to short-term risks of electricity scarcity. What is more, the study has identified some good practices across the Member States in each of the three areas of analysis (risk assessment, risk preparedness and emergency situations), allowing the European Commission to further investigate and tackle existing inconsistencies, ultimately resulting in a more secure and efficient EU energy policy.

6- ANNEX

6.1 ANNEX 1 - List of Risk assessment plans, Risk preparedness plans and Emergency plans

Member State	Risk Assessment report	Risk preparedness plan or source of preventive measures	Emergency plan or source of emergency measures
Austria	Link not available	<p>Network Development Plans</p> <p>https://www.apg.at/en/grid/grid%20expansion/Netzentwicklungsplan</p>	<p>Load-shedding plan</p> <p>http://www.e-control.at/documents/20903/26553/2015-07-21_Monitoring+Report+Versorgungssicherheit+Strom.pdf/c995aa0a-9c0c-470a-bd0b-69658c3fe2f3</p>
Belgium	<p>Report on electricity supply 2012-2017</p> <p>http://economie.fgov.be/fr/binaries/Rapport_moyens_production_electricite_2012-2017_20120702_FR_tcm326-186312.pdf</p> <p>Strategic needs for winter 2016-2017</p> <p>http://economie.fgov.be/fr/binaries/Analyse_Elia_periode_hivernale_2016_2017_tcm326-276766.pdf</p>	<p>Rescue Code and Restoration Code (see Appendix 10)</p> <p>http://www.elia.be/~media/files/Elia/Products-and-services/Aansluiting2/20130627-Connection-Contract_update-B10.pdf</p>	<p>Electricity Act</p> <p>http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=1999042942&table_name=loi</p> <p>Ministerial Order establishing an electricity load shedding plan</p> <p>http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=2005060341&table_name=loi</p>
Bulgaria	Link not available	Link not available	Link not available

Croatia	Annual report on the security of electricity supply https://www.hops.hr/wps/wcm/connect/5200f0bc-ad9d-4a28-bc6c-4cfd1a25c793/Sigurnost_opskrbe_2014_HOPS_objava.pdf?MOD=AJPERES		
Cyprus	Link not available	Link not available	Link not available
Czech Republic	Annual Reports http://www.ote-cr.cz/about-ote/annual-reports?searchterm=ZPR%C3%81VA%20O%20O%C4%8CEK%C3%81VAN%C3%89%20ROVNOV%C3%81ZE&set_language=en	Model Action Plan http://www.mpo.cz/zprava152633.html ; Info in ENG available: http://www.mpo.cz/dokument12498.html	Emergency plans of the TSO http://www.ceps.cz/CZE/Media/Tiskove-zpravy/Documents/%C4%8C%C3%A1stV_15_fin.pdf
Denmark	System Plan 2015 http://www.energinet.dk/SiteCollectionDocuments/Engelske%20dokumenter/Om%20os/System%20Plan%202015.pdf Strategy Plan 2014 https://www.energinet.dk/SiteCollectionDocuments/Engelske%20dokumenter/Om%20os/UK-StrategiPlan-2014.pdf	Vulnerability Analysis for Civil Contingency Planning http://brs.dk/eng/inspection/ccontingency_planning/Documents/Background_paper_on_DEMAs_approach_to_risk_and_vulnerability_analyses.pdf The risk preparedness plan is confidential.	Crisis Management in Denmark http://brs.dk/viden/publikationer/Documents/Crisis%20Management%20in%20Denmark_UK.pdf The electricity sector emergency plan is confidential.

Estonia	<p>TSO Security of Supply Report (2015)</p> <p>http://elering.ee/security-of-supply-reports-2/ and http://elering.ee/varustuskindlus-e-aruanded/</p> <p>National Development Plans</p> <p>https://valitsus.ee/et/eesmargid-tegevused/arengukavad</p>	<p>Guidelines for preparing Risk Assessment Plan and Continuous Operation Plan:</p> <p>https://www.riigiteataja.ee/akt/13326401</p> <p>TSO security of supply report (English Summary)</p> <p>http://elering.ee/security-of-supply-reports-2/</p>	Link not available
Finland	Link not available	Link not available	Link not available
France	<p>Generation adequacy report on the electricity supply-demand balance in France</p> <p>http://www.rte-france.com/sites/default/files/2016_01_13generation_adequacy_report_executive_summary.pdf</p> <p>Electricity supply demand balance</p>	<p>Memento on the electricity system security</p> <p>https://eco2mix.rte-france.com/uploads/media/pdf_zip/publications-annuelles/memento_surete_2004_complet.pdf</p>	<p>Safeguard and Defence plan</p> <p>https://clients.rte-france.com/htm/fr/mediatheque/telecharge/reftech/15-07-06_article_3-4_v2.pdf</p>

	for winter 2015-2016 http://www.rte-france.com/sites/default/files/analyse_h_2015.pdf		
Germany	Monitoring report 2015 http://www.bundesnetzagentur.de/SharedDocs/Downloads/EN/BNetzA/PressSection/ReportsPublications/2015/Monitoring_Report_2015_Korr.pdf?__blob=publicationFile&v=4	Risk preparedness plans are confidential.	State Civil Protection Act https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwirtsC9po7MAhVJfxoKHdAtBQOQFggcMAA&url=http%3A%2F%2Fwww.bbk.bund.de%2FSharedDocs%2FDownloads%2FBBK%2FDE%2FFIS%2FDownloadsRechtundVorschriften%2FRechtgrundlagenBundeslaender%2FSH%2FKatSG_SH.pdf%3F__blob%3DpublicationFile&usq=AFQjCNFUuHyswsSDvM4bykkfAaFJUvmdxg Energy Act https://www.gesetze-im-internet.de/bundesrecht/enw_g_2005/gesamt.pdf
Greece	Generation Adequacy Report http://www.admie.gr/fileadmin/groups/EDAS_DSS/Meleti_eparkeias	Link not available	Link not available

	final.pdf		
Hungary	NRA Report (2014) http://archivum.mekh.hu/gcpdocs/96/mekh_orzaggyulesi_beszamol_o_2014.pdf		Rotational Load Shedding-plan https://www.mavir.hu/documents/10258/19284/Elj%C3%A1r%C3%A1srend/65ecd125-d39b-4fa9-b3a4-7c9a90d4634c
Ireland	Electricity Security of Supply Monitoring Report (2014)	Draft Development plan 2013-2023 http://www.pleanala.ie/misc/PCI/PCI1/DAF1/North%20South%20-%20Draft%20Application%20File/Reference%20Documents/EirGrid%20(2013)%20Draft%20Transmission%20Development%20Plan%20Draft_2013-2023_For_Public_Consultation.pdf	National Gas Supply Emergency Plan 2014-16 http://www.cer.ie/docs/001003/CER14784%20National%20Gas%20Supply%20Emergency%20Plan%202014-16.pdf
Italy	Forecast for electricity supply and demand 2015-2025 http://download.terna.it/terna/0000	Emergency plan for the safety of electrical system (PESS)	Defence Plan http://download.terna.it/terna/0

	/0744/15.PDF	http://download.terna.it/terna/0000/0105/37.pdf	000/0123/69.PDF
Latvia	Assessment report https://www.em.gov.lv/lv/nozares_politika/energijas_tirgus_un_infras_truktura/dabasgazes_un_ekstro_energijas_parvades_sistemas_operatoru_ikkgadeja_novertejuma_zinojumi/	Link not available	Link not available
Lithuania	Annual Report on Electricity and Natural Gas Markets of the Republic of Lithuania to the European Commission http://www.regula.lt/SiteAssets/naujienu-medziaga/2015-rugsejis/GALUTINIS%20METINE_ATASKAITA_EK_2015_EN.pdf	Link not available	Link not available
Luxembourg	Energy Monitoring Report 2014 http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/NATIONAL_REPORTS/National_Reporting_2015/NR_nl/C15_NR_Luxembourg_NL_v2.pdf	Reconstitution and Safeguard Code http://www.creos-net.lu/fileadmin/dokumente/downloads/publications_tech_niques/pdf/fr_info_code_reconstitution_sauvegarde.pdf	Emergency plan in case of energy shortage http://www.infocrise.public.lu/pictures/photos/rupture-energie/PLAN-RUPTURE-ENERGIE-VERSION-PUBLIQUE-FRA-GUEDES.pdf
Malta	Link not available	Network Code	Link not available

		http://enemalta.com.mt/EnemaltaStorage//Images/Files/Network%20Code/Network%20Code%20EMC%20Approved%20%20October%202013.pdf	
Netherlands	<p>Report Monitoring security of supply 2014-2030</p> <p>https://www.rijksoverheid.nl/documenten/rapporten/2015/09/21/monitoringsrapportage-leveringszekerheid-elektriciteit-en-gas-voor-europese-commissie</p> <p>Monitoring report 2015</p> <p>https://www.rijksoverheid.nl/documenten/rapporten/2015/09/21/monitoringsrapportage-leveringszekerheid-elektriciteit-en-gas-voor-europese-commissie</p>	<p>Quality and capacity plan (overview)</p> <p>http://www.hoogspanningsnet.com/wpcontent/uploads/TenneT_KCD_Deel_1_131220.pdf</p> <p>Net Code</p> <p>https://www.acm.nl/nl/publicaties/publicatie/14381/Netcode-Elektriciteit/</p>	Link not available
Poland	<p>Report on result of monitoring of security of electricity supply</p> <p>http://bip.me.gov.pl/node/14223/dif</p>	<p>TSO Development plan (Direct link)</p> <p>http://www.pse.pl/index.php?id_zid=115&did=581&lang_id</p>	Link not available

	<p>f/79124/79526#</p>	<p><u>=1</u></p> <p>Report on result of monitoring of security of electricity supply</p> <p>http://bip.me.gov.pl/node/14223/diff/79124/79526#</p> <p>Risk Preparedness Plan (NCIPP)</p> <p>http://rcb.gov.pl/wp-content/uploads/NPOIK-dokument-glówny.pdf</p> <p>Risk Preparedness Plan (NPCM)</p> <p>http://rcb.gov.pl/wp-content/uploads/KPZK-2013-2015.tj...pdf</p>	
Portugal	<p>Report on the monitoring of security and supply of the national electric system</p> <p>http://www.erse.pt/pt/consultaspublicas/consultas/Documents/49_1/RMSA-E%202012.pdf</p>	<p>TSO Investment and Development Plan</p> <p>http://www.centrodeinformacao.ren.pt/PT/publicacoes/PlanoInvestimentoRNT/PDIRT%202012-2017%20(2022)/PDIRT%202012-2017%20(2022)%20-</p>	

		<p>%20Julho%202011.pdf</p> <p>DSO Investment and Development Plan</p> <p>http://www.erse.pt/pt/consultaspublicas/consultas/Documents/49_1/PDIRD%202015-2019%20-%20Plano.pdf</p> <p>Network Operation Code</p> <p>http://www.erse.pt/pt/electricidade/regulamentos/operacaodasredes/Documents/RO R%202014%20SE.pdf</p>	
Romania	<p>National report 2014</p> <p>http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/NATIONAL_REPORTS/National_Reporting_2015/NR_nl/C15_NR_Romania-NL.pdf</p>	<p>Energy Act</p> <p>http://www.executie-instalatii-gaze.ro/files/_pdf/Legea_1_23_2012_a_energiei_electrice_si_a_gazelor_naturale.pdf</p>	<p>Order approving the Regulation on the establishment of safeguard measures in crisis</p> <p>http://www.cez.ro/edee/content/file-other/rumunsko/cez/cezv/legislatie/legi-reglementari-in-vigoare/reglementari/ordin-142-03-12-2014.pdf</p> <p>Operational procedures for load shedding plans</p>

			http://www.transelectrica.ro/documents/10179/146982/PO+Modul+de+elaborare+si+d e+aplicare+a+Normativului+de+limitare+a+consumului+de+energie+electrica,%20pe+transe,%20in+situatii+de+criza+aparute+in+functionar ea+SEN/e3b96df2-624d-41ec-aa4d-2feac917e899
Slovakia	National report 2014 http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/NATIONAL_REPORTS/National_Reporting_2015/NR_En/C15_NR_Slovakia-EN.pdf	Energy Act http://www.urso.gov.sk/sites/default/files/z_251-2012_en.pdf	Ministerial Decree concerning the procedure of application of restrictive measures during state of emergency http://www.economy.gov.sk/ext_dok-vestnik1_2013/140539c?ext=orig
Slovenia	Development of the Transmission System 2015-2024 http://www.eles.si/files/eles/userfiles/vsebinski_dokumenti/Na%C4%8Drt%20razvoja%20prenosnega%20omre%C5%BEja%20RS%202015-2024.pdf	System operating instructions transmission of electricity (SONPO) http://www.pisrs.si/Pis.web/pregledPredpisa?id=NAVO1048	Protection and Rescue Plan http://www.sezana.si/dokument.aspx?id=6069
Spain	Development plan of the electricity transmission system 2015-2020	Law establishing measures for the protection of critical	Electricity Act http://www.ree.es/sites/default/

	http://www.minetur.gob.es/energia/planificacion/Planificacionelectricidadygas/desarrollo2015-2020/Documents/Planificaci%C3%B3n%202015_2020%20%202015_12_03%20VPublicaci%C3%B3n.pdf	infrastructures https://www.boe.es/buscar/pdf/2011/BOE-A-2011-7630-consolidado.pdf	files/01_ACTIVIDADES/Documentos/ProcedimientosOperacion/PO_resol_18may2009.pdf
Sweden	Swedish Electricity and Gas market 2014 http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/NATIONAL_REPORTS/National_Reporting_2015/NR_En/C15_NR_Sweden-EN.pdf	Electricity Preparedness Plan https://www.riksdagen.se/sv/Dokument-Lagar/Lagar/Svenskforfattningssamling/sfs_sfs-1997-288/	Act on total defence and increased preparedness http://www.riksdagen.se/sv/Dokument-Lagar/Lagar/Svenskforfattningssamling/Forordning-19921403-om-arbet_sfs-1992-1403/?bet=1992:1403
United Kingdom	Electricity security of supply, a commentary on National Grid's Future Energy Scenarios for the next three winters report https://www.ofgem.gov.uk/sites/default/files/docs/2015/07/electricitysecurityofsupplyreport_final_0.pdf Statutory Security of Supply Report 2015	Grid Code http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Grid-Code/ Distribution Code http://www.dcode.org.uk/	Electricity Supply Emergency Code https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/396424/revised_esec_january_2015.pdf

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/468170/51686_HC_482_DECC_Print.pdf

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