Department for
Business, Energy
& Industrial Strategy

Risk Preparedness Regulations

Risk-preparedness plan for the electricity sector in Great Britain

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General Information / Introduction

Purpose of Document

This document presents the Risk Preparedness Plan for the electricity sector in Great Britain (GB). This plan identifies the risks to electricity supply and the measures in place to mitigate the likelihood of these risks materialising and the impact of those risks should they occur.

Through this Risk Preparedness Plan has been prepared in accordance with the requirement of Articles 10 and 11 of EU Regulation 2019/941 on risk preparedness in the electricity sector as it applies as Retained EU legislation in UK law ("the Risk Preparedness Regulation").

Document Development

This plan has been developed by the Department for Business, Energy and Industrial Strategy (BEIS). Relevant stakeholders including the Electricity System Operator, Electricity Transmission and Distribution Networks, Generators and the regulator Ofgem, have all been engaged and consulted with during the development of the Risk Preparedness Plan and its contents.

Document Scope

This plan applies to the electricity sector of Great Britain (GB). Energy Policy for Northern Ireland (NI) is devolved to the Northern Ireland Executive. BEIS is the competent authority on behalf of NI and has delegated some of its functions to the Department of Enterprise, Trade and Industry (DfE) in NI which will maintain its own Risk Preparedness Plan for the electricity sector.

This Risk Preparedness Plan sets out measures that are planned or taken to prepare for and mitigate identified electricity crises, this plan includes:

- A summary of electricity crisis scenarios identified in accordance with the procedures laid down in Article 7 of the Risk Preparedness Regulation.
- Defined roles and responsibilities of the BEIS Secretary of State, and tasks delegated to other bodies.
- A description of measures designed to prevent or prepare for the risks identified pursuant to Article 7, and how these risks are managed.
- A description of procedures to be followed in an electricity crisis, including corresponding schemes on information flows.
- A summary of market-based measures for coping with electricity crises.

- A summary of non-market-based measures to be implemented in electricity crises, specifying the triggers, conditions and procedures for their implementation, and indicating how they comply with the requirements laid down in Article 16 of the Risk Preparedness Regulation.
- Details of the mechanisms used to inform the public about electricity crises.
- Additional information on related and necessary plans for developing the future grid that will help to cope with the consequences of identified electricity crisis scenarios.

Governance

BEIS will maintain oversight of GB's Risk Preparedness Plan and ensure it incorporates any identified updated crisis scenarios, procedures and measure in place as they evolve and change. The Risk Preparedness Plan is subject to review every 4 years, which will be carried out by BEIS.

Roles and Responsibilities

The Risk Preparedness Regulation requires the UK to nominate a Competent Authority for the purposes of carrying out the tasks provided for in this Regulation. The Secretary of State nominated BEIS, as the Government Department responsible for energy policy, to be the competent authority for GB and NI.

As the Competent Authority, BEIS is responsible for ensuring that all relevant obligations are fulfilled in accordance with the rules laid down in the Risk Preparedness Regulation.

The Regulation came into force prior to UK's exit from the European Union. Following UK's exit from EU, GB introduced a Statutory Instrument (SI) to translate regulation to UK law but omitted some obligations for GB. Due to the interconnected nature of the Single Electricity Market in NI, it was decided that NI should comply with the full EU regulation.

Roles and Responsibilities of Competent Authority in relation to GB

In accordance with Statutory Instrument 2020/1299 for Electricity Risk Preparedness, the following tasks are being carried out by BEIS:

- Development of electricity crisis scenarios for GB in consultation with the relevant stakeholders as per article 7
- Establishment of a Risk Preparedness Plan for GB, as per articles 10 and 11.

Roles and Responsibilities of Competent Authority in relation to GB as Competent Authority for NI

- As Competent Authority, BEIS will undertake the following tasks in relation to NI:
- Review the output of the tasks delegated to DfE.
- Submission of the final RPP to the Commission for consultation as per Article 10 (4).
- Adoption of the final RPP by 5 January 2022 and ensuring publication on relevant websites (BEIS and DfE), while ensuring confidentiality of sensitive information.

In the event of a potential or actual national electricity crisis in NI, DfE will invoke the agreed emergency protocol to ensure BEIS, as Competent Authority:

- Issue an early warning or declare an electricity crisis to the Commission and the Competent Authority of the Republic of Ireland as per Article 14.

- Provide the ECG and the Commission with an ex-post evaluation report, after having consulted the regulatory authority as per Article 17 and if necessary, present these to the ECG.

Tasks delegated to DfE- NI

Energy policy is devolved to the NI Executive. In accordance with article 3 (3) of the Risk Preparedness Regulation, the following operational tasks have been informally and provisionally delegated to the NI Department for the Economy:

- Identification of national electricity crisis scenarios for NI as per article 7(1) and consulting with relevant stakeholders.
- Assessing risks in relation to the ownership of NI infrastructure relevant for security of electricity supply as per article 7(4)
- Developing a Risk Preparedness plan for NI in accordance with the requirements set out in Articles 10 and 11 and consulting with the relevant stakeholders.
- Periodically testing the NI risk preparedness plans for their effectiveness as per article 12 (3)
- Review and update the NI risk preparedness plan every 4 years, unless circumstances warrant more frequent updates
- In the event of an electricity crisis, inform relevant stakeholders of the application of any non-market-based measures as per Article 14.

Measures to Prepare for and Prevent Electricity Crises

GB has a liberalised, competitive electricity market, which operates within a strategic framework set out by the Government. This approach ensures that commercial incentives combine with efficient processes to mitigate and manage the risks of electricity disruptions.

This section sets out the measures in place to prepare for, prevent and minimise the impacts of electricity crises. These measures are embedded within relevant legislation, regulations, license conditions, industry codes, standards and guidance.

The Legislative Framework

There are three main pieces of legislation that provide the GB framework under which electricity market and emergency arrangements are set.

- The Electricity Act 1989 is the fundamental legislation that enables the regulation of electricity generation, transport, distribution and supply activities. It prohibits the undertaking of these activities without a licence, unless an exemption has been granted by the Secretary of State and; establishes the Gas and Electricity Markets Authority (GEMA) as the energy market regulator, responsible for regulating all license holders which delegates regulatory functions to the Office for Gas and Electricity Markets (Ofgem). The Act also makes emergency provisions for the BEIS Secretary of State to issue directions to electricity license holders (including those who have been provided an exemption) to preserve the security of buildings or installations; or to “mitigate the effects of any civil emergency which may occur”.
- The Electricity Safety, Quality and Continuity Regulations (ESQCR) specify safety standards which are aimed at protecting the general public and consumers from danger. In addition, the Regulations specify power quality and supply continuity requirements to ensure a reliable, efficient and economic electricity supply service for consumers.
- The Energy Act 1976 – this Act makes emergency provisions for the Secretary of State “controlling the sources and availability of energy” in the event of “an actual or threatened emergency affecting energy supplies” in the UK. The Act enables the Secretary of State to issue a Direction which has the effect of restricting, prohibiting or maximising the production and supply of energy.

Other pieces of legislation that are relevant to preventing or managing electricity crisis include:

- The Network and Information Systems Directive (NIS) – provides the UK Government with legal measures to increase the level of security (both cyber & physical resilience) of network and information systems that are required for the provision of “essential services” such as electricity.

- The National Security and Investment (NSI) Act 2021 – this Act minimises the risk of an electricity crisis deliberately co-ordinated by hostile state and non-state actors by screening investments to electricity infrastructure and blocking those that could pose a risk to the UK's national security.

The Licensing Regime

All persons licensed by Ofgem are required to comply with the conditions of their licences, which incorporates a range of industry codes and standards. The licences for the electricity industry are categorised into generation, transmission, offshore transmission, distribution, supplier and interconnector. The licence conditions are separated into standard licence conditions which apply to all licensees and special licence conditions which are conditions specific to each individual licensee.

Price Controls

The System Operator and electricity networks are natural monopolies and therefore there is no realistic way of introducing competition across the whole sector. Ofgem uses price controls to balance the relationship between investment in the network, company returns, and the delivery of customer focussed outputs including security of supply and network reliability.

Through this framework, network companies are incentivised to maintain high levels of system resilience and minimise customer disruptions by adequately assessing, managing and mitigating risks that could potentially lead to a loss of supply.

Industry Codes and Standards

Licensees are required to maintain, become party to, and/or comply with the industry codes and standards in accordance with the conditions of their licence. These conditions mandate the technical requirements that must be met to ensure a baseline level of reliability and resilience is met, and the risk of electricity crisis is minimised. A description of key industry and standards is provided below.

- System Operator Transmission Code (STC) - this electricity code defines the relationship between the Electricity System Operator and onshore and offshore Transmission Owners, including how they should communicate to prevent or manage emergencies.
- Grid Code (GC) - this electricity code sets out the technical requirements relating to connecting, operating and using the National Electricity Transmission System. It covers business as usual activities that enable its safe and reliable operation such as network planning, connection conditions, compliance and testing processes data requirements, as well as emergency measures such as Demand Disconnection and Electricity System Restoration.

- Distribution Code (DC) - this electricity code sets out the technical requirements relating to the connection to and use of the electricity distribution networks. Similar to the Grid Code, it sets out the requirements to business-as-usual activities that enable the safe and reliable operation of distribution networks, as well emergency measures
- Connection and Use of System Code (CUSC) - The CUSC is the commercial and contractual framework for connecting to and using the National Electricity Transmission System. By ensuring connections are made correctly and securely, it can help prevent infrastructure failure at connection points.
- Distribution Use of System Agreement (DCUSA) - The DCUSA is the commercial and contractual framework for connecting and using the Electricity Distribution Networks and system. By ensuring connections are made correctly and securely, it can help prevent infrastructure failure at connection points.
- Balancing Settlement Code (BSC) - sets out a framework for making a submission to buy or sell electricity into or out of the market at close to real time. It also covers how the market will respond to emergency situations including thresholds for market suspension and re-opening.
- National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS) – this standard sets out criteria and methodologies for planning and operating the GB Transmission System. It sets out network reinforcements measures that should be implemented or alternative operations that should be enacted to alleviate inadequacies to prevent electricity supply disruptions.
- P2/7 Engineering Recommendation – Similar to the NETS SQSS, the P2/7 is an industry standard and recommendation that helps determines design criteria for distribution connections, in order to ensure the resilience and reliability.

These are an evolving set of codes and standards that are regularly reviewed in order to ensure their relevance with the advancement of technologies, as well as being modified post-incident to ensure the sector learns and becomes more resilient to future electricity supply disruptions and crises.

Industry Measures

To meet the requirements set out in the regulatory framework, licensing regime, price controls, codes and standards, industry parties have developed a number of measures that assist companies in preparing and preventing electricity emergencies. These have been categorised according to the electricity crises that they are most likely to help prevent or prepare for, however it is important to note that these measures can be used in a range of other scenarios.

Environmental Hazards

Protection Systems (Preventative)

The electricity system is enhanced with automatic tools or protections which isolate faults on power lines or cables and return them to service if there has been no significant damage. This prevents faults from cascading into larger system disturbances, without the need for human interaction, thereby increasing the speed and effectiveness of the live risk management. These systems are particularly useful in reducing the risk of severe weather events such as high winds and lightning. An overview of key protection system is provided in Table 1 and further information is provided in the System Defence Plan[1].

Table 1 - Protection Systems

Protection System	Comments
Delayed Auto Reclose (DAR)	Automatically re-energises overhead line circuits following transient and semi-permanent faults, minimising the threat of voltage collapse.
Automatic Reactive Control Schemes (ARS)	Automatically switches in/out network assets (mechanically switched capacitors / shunt reactors) which have been installed at strategic locations across the network to control voltage levels both pre and post fault.
Static VAr Compensators (SVCs)	Used to provide fast acting reactive power response to transmission system voltage changes.

Flooding Defence Programmes (Preventative)

To reduce the risk of electricity crisis due to flooding, GB Transmission and Distribution networks are required to comply with the flood resilience requirements set out in Engineering Technical Report (ETR) 138[2]. The principles set out in ETR138 help determine which electricity substations are at risk of flooding, assess the level of this risk and proposes appropriate solutions to reduce this.

Vegetation Management Programmes (Preventative)

To reduce the risk of an electricity crisis due to high winds, DNOs are financially incentivised through their price control to manage the risk of trees and other vegetation on their network. The requirements they are required to comply with are set out in Technical Specification 43-8 and ENA Engineering Technical Report 132 and Network Operators go through a proactive Vegetation Management Programme whereby any parts of their network prone or at risk of falling trees or branches are cleared from the vicinity of overhead lines.

[1] www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0127-eu-code-emergency-restoration
[2] www.ena-eng.org/ENA-Docs/D0C3XTRACT/ENA_ET_138_-_Annex_Extract_180902050351.pdf

Seasonal and Significant Event Stockpiling of Equipment (Preparation)

To reduce the impact of electricity crisis due to severe weather, electricity network companies stockpile key parts that are commonly required to repairs faults to minimise the time taken to restore customers during power outages. Generators will undertake similar actions for critical commodities to ensure their continued operations in the event of supply chain disruptions.

Network companies also hold a number of transformer spares which helps minimise timescales to replace damaged equipment

ESO Outlook Reports (Preparation)

NGESO publishes seasonal outlook reports which provide a forecast of expected supply and demand over the summer and winter periods, as well as any potential operability / adequacy issues. These reports are published and publicly available to support the industry in its preparations for the period.

Event Forecasting and Significant Event Stockpiling of Equipment (Preparation)

To prepare for the specific risk of a severe space weather event, Electricity Transmission companies developed a real-time monitoring and warning system, which provides detailed forecasts of whether the electricity network will be affected.

System Failures

Operational Telecommunications (OPTEL) (Preventative)

The control rooms of the Electricity System Operator, Network Operators, key generators and substations are connected by a resilient Operational Telecommunication (OPTEL) capability. This means that in the event of a disruption to the public telecommunication network, operational communication between industry parties and key assets will continue.

Cross-Cutting Measures

Business Continuity and Response Plans (Preparation)

In order to ensure core electricity operational functions can be carried out at all times, generation site owners, network operators and the system operator have developed business continuity and response plans for key risks facing the sector. These set out procedures that should be followed and roles and responsibilities during emergencies.

Emergency Exercising (Preparation)

In order to ensure thar response plans and process are fit for purpose they are regularly tested through emergency exercises. These are carried out both by individual organisation as an isolated exercise, as well as cross-sector exercises.

Upon the conclusion of an emergency exercising, a lesson learnt process is carried out to identify areas that can be developed thus improving the sectors plans, processes and overall response to a potential electricity crisis.

Network Mutual Aid Agreement (Response)

The NEWSAC (North East South West Area Consortium) agreement details the application and co-ordination of mutual aid between network operators in the United Kingdom, Ireland and the Isle of Man during and after network electricity supply emergencies. Mutual aid includes the transfer of field resources and supplies between network operators and the agreement is subject to reviews at NEWSAC meetings convened in the spring and autumn. The spring meeting considers any learning points from winter events and the autumn meeting is an opportunity to prepare for the winter ahead.

Market Based Measures to Cope with Electricity Crises

GB operates four electricity markets which each have preventative measures in place that enable the electricity system to remain dynamic and respond to potential electricity before they materialise. These markets operate independently and on different timelines and include:

- Wholesale Electricity Market - electricity is traded in the Day-Ahead and Intraday Markets from one day ahead of the trading day up to shortly before real time.
- Capacity Market - capacity is traded up to five years in advance of the trading day
- The Balancing Mechanism – additional generation or reductions in consumption are procured before and into real time.
- Balancing Services – the Electricity System Operator also procures specific services to ensure the security and quality of electricity supplies, on a bilateral basis.

Wholesale Electricity Market

The wholesale market allows participants to trade a range of products so that the amount of electricity being generated broadly matches the demand required by customers. This is the primary mechanisms by which supply and demand imbalances are resolved. If the market procures sufficient generation, then need for NGESO to undertake additional actions through the Balancing Mechanism, utilise Balancing Services or implement non-market measures is minimised.

Capacity Market

The Capacity Market (CM) has been introduced by the UK Government to ensure the future security of GB's electricity supply. The CM offers all capacity providers a steady, predictable revenue stream on which they can base their future investments. In return for such revenue, providers must deliver energy at times when it is needed e.g. a potential or actual electricity crisis, or face penalties.

In GB the Government set a Reliability Standard of 3 hours Loss of Load Expectation[3] (LOLE) per year. NGESO as the delivery body of the CM assesses how much capacity should be procured to meet the Reliability Standard and this advice is scrutinised by a Panel of Technical

[3] The LOLE is the average expected number of hours per year in which supply is expected to be lower than demand under normal operation of the system. This means the number of hours per year when we expect NGESO to have to use mitigation actions, including the use of the new balancing services. The LOLE is still not a measure of the expected number of hours in which customers may be disconnected as NGESO is expected to use other mitigation actions ahead of controlled customer disconnections.

Experts before the BEIS Secretary of State decides the final amount to be procured based on NGESO's advice.

Auctions are held four years and 1 year in advance of when capacity is needed and providers that wish to participate in a Capacity Auction must seek qualification to confirm their eligibility to do so. The provides assurance that units successful in an auction will deliver on their obligations and be able to respond in the event of an imminent electricity crisis.

Balancing Mechanism

The Balancing Mechanism (BM) is used to balance electricity supply and demand close to real time. Where the NGESO predicts that there will be a discrepancy between the amount of electricity being generated and customer demand during a certain time period, they may accept a 'bid' or 'offer' to either increase or decrease generation (or consumption). The BM is used to balance supply and demand in each half hour trading period of every day. Unlike balancing services, the Balancing Market is an ad-hoc market, with no forward commitments. Participants consist of individual generating units called Balancing Mechanism Units (BMUs).

NGESO procures BM services in accordance with the relevant provisions of the Balancing and Settlement Code (BSC) and the Grid Code. Acceptance of a Bid or an Offer by the System Operator represents a binding contract with the generator or supplier which is cash settled through the systems and services managed by ELEXON.

Balancing Services

In anticipation of unexpected changes in electricity supply and demand, the ESO contracts sources of extra generation and demand from contracted generation, demand side and energy storage providers. In an electricity crisis, NGESO can ask the parties they have contracted, to provide extra services to prevent or manage any impacts.

Reserve Services

Reserve consists of generation that is synchronised to the system and able to provide additional power through increasing output from generation or reducing consumption from demand sources. There two types of reserve services are Fast Reserve and Short-Term Operating Reserve; the key difference between the two is that Fast Reserve providers must respond within much faster timescales.

Margin

This is non-synchronised generation that can be brought onto the system to provide extra power after a short delay. As a general rule of thumb, a 1000MW+ margin is considered healthy, whereas a margin of less than 500MW is considered "tight" and will trigger NGESO to issue some of the measures listed below.

Frequency Response Services

The frequency limits of the National Electricity Transmission System are set by System Operations Guideline Article 127, ESQCR and the SQSS and as such, are maintained within a range of 50 +/-0.2 Hz.

There are two categories of frequency response.

- Dynamic frequency response is a continuously provided service used to manage the normal second by second changes on the system
- Non-dynamic response is usually a discrete service triggered at a defined frequency deviation.

At any time, NGESO must have sufficient frequency response services on standby to cover the frequency loss expected by the loss of the largest generator that is synchronised and exporting power on to the transmission network. In the event that the generation loss exceeds this amount, some non-market-based measures outlined in this plan will be triggered.

Demand Side Response

Demand response is when energy users are provided with a financial incentive to turn down or turn off non-essential processes at times of peak demand helping the grid to balance supply and demand without the need for additional generation to be used. Energy users can also be asked to use excess energy from the grid, for example on a windy day. Typical processes that are turned down or off include lighting, air conditioning, electric heating, pumps, and other non-essential equipment. Participating in demand response is voluntary and is designed not to impact on day-to-day business operations. Demand response participants include commercial enterprises, large industrial users or aggregators.

Intertripping Tripping Schemes

An intertrip automatically trips a breaker that removes a generator from the GB Transmission System when it receives a specific signal. The signal is delivered when a predetermined fault on a specific part of the transmission system occurs. The requirement for an intertrip is usually identified at the time of connection of a generator and is specified within the Bilateral Connection Agreement (BCA) that is agreed between National Grid and the Generator for that connection.

Market Actions

In the event that the markets are unable to procure sufficient generation or services to safely operate the system, NGESO can intervene in the market and undertake further actions. These are outlined in Tables 2 and 3 and summarised below. All actions are price ordered and NGESO would undertake the cheapest actions first (listed at the beginning of the tables) before moving to the more expensive actions. The actions that NGESO undertakes first will

depend on how far in advance the electricity crisis has materialised (e.g. day ahead, 4 hours in advance of real time or real time).

Table 2 - Summary of everyday market-based actions NGESO can take to prevent / manage an electricity crisis

Everyday actions	Comments
Accept all available deliverable generation offers	Scheduled at Day Ahead, actions taken in real time
Issue warning instructions to cold BMUs	Scheduled at Day Ahead, actions taken in real time
Buy energy from continental Europe	Scheduled at Day Ahead, Except action taken from Day Ahead to 4 days ahead of real time.
Reconfigure Closed-Circuit Gas Turbines to increase available energy	Scheduled at Day Ahead, managed within day
System Operator (SO) to SO trades	NGESO to trade with other SO's in Europe and Ireland. Scheduled within 4 hours of real time.
Reconfigure Transmission Network	Changing network configurations to reduce congestion. Actions can be taken Day Ahead, up to real time.

Table 3 - Summary of enhanced market-based actions NGESO can take to prevent / manage an electricity crisis

Enhanced Actions (if everyday actions and insufficient)	Comments
Recall generation assets from outage	Anytime through to control room timescales.
Issue an Electricity Margins Notice (EMN)	Request to market to increase available energy or reduce demand. Likely to be issued at Day Ahead and updated regularly
Taking additional actions obtained through EMN	Managed in real time.
Issue a Capacity Market Notice (CMN)	Driven by calculation of Market data at 4 hours ahead of real time

Deliverable Offer

Where the market has been unable to provide sufficient generation to balance demand or safely operate the system, NGESO will accept all available offers that have been submitted by generators via the Balancing Market. This ensures that all available generation is running.

There may be some scenarios where NGESO is unable to accept all generation offers e.g. in the event of a transmission constraint which means that there is not enough transmission capacity to move the electricity from the point of generation to the point of demand. In these scenarios, NGESO will have to undertake further actions listed below.

Warming Instructions

In the event that NGESO requires access to additional generation, it can instruct generators to bring their unit(s) to a state where they are capable of synchronising with the system within a given timescale. The unit will then either remain in standby until the end of its capability or be instructed to run via an offer in the BM.

BM start up instructions are issued by NGESO via the Electronic Dispatch Logging (EDL) system. The instruction will specify a standby target time. This is the time at which the unit must be ready to synchronise by. If NGESO wishes to terminate the start-up instruction at any point prior to the standby target time, the instruction to cease will also be issued via EDL.

Buy Energy from Continental Europe

The GB electricity system operates several connections to continental Europe and Ireland through interconnectors with France, Ireland, Belgium and the Netherlands. Electricity flows through the interconnectors are primarily driven by the price differentials between the markets. In the event where additional generation is required, NGESO traders are able to trade within the European energy markets to buy electricity to flow into GB across the interconnectors up the capacity of the interconnectors.

Reconfigure Closed-Circuit Gas Turbines (CCGTs)

Some CCGTs station that operate as a single BMU may have additional turbines that haven't been declared in the BM but can provide additional generation capacity. In the event that additional generation is required, NGESO can ask these stations to declare this additional capacity to the market so offers can be accepted in the BM.

SO-SO Trade

In the event where additional generation is required within the market gate closure period[4], NGESO can engage with the TSOs of interconnected countries to secure additional electricity to flow in to GB via the interconnectors to manage the energy shortfall.

Reconfigure Transmission Network

NGESO can request that the Transmission Owners change the configuration of the Transmission Networks to reduce network congestion which allows for increased power flows and enables more generation to run. Typical actions include changing substation running arrangements, re-optimising Quad Booster taps to rebalance flows on key circuits, utilising

[4] Gate closure refers to the moment after which the bids submitted to the exchange cannot be modified.

enhanced circuit ratings which permits increased power flows for defined periods of time or conditions.

Recall Assets from Outage

NGESO can request that transmission circuits that are on planned outage be returned to service in accordance with a pre agreed ERTS (Emergency Return to Service) time. Return transmission circuits to service will increase network capacity, especially across constrained parts of the Transmission System allowing increased power flows and therefore permitting more generation to be run.

Market Notices

There are three key market notices that NGESO can issue to wider industry participants to help prevent an electricity crisis: Capacity Market Notices (CMNs), Electricity Margin Notices (EMNs) and Negative Reserve Active Power Margins (NRAPM) Notice.

- CMNs act as reminders to Capacity Market participants to pay attention to any system notices or instructions that may appear from NGESO. They are automatically issued when the trigger level set by Government under the Capacity Market rules (500MW above expected demand and NG's operating margin) has been breached.
- EMNs are notifications issued to the market to ask power stations to make more generation available for a short period of time in order to maintain NGESO's operational surplus. EMNs are not automated and are issued based on the operational judgement of NGESO's Control Room, however this would generally be 500-700MW below Margin requirement.
- NRAPMs are issued to the market to tell power stations that they may need to turn down their output to retain system stability. NRPAMs would be issued by NGESO at times of low demand, or in periods where less controllable generation connected directly to distribution networks makes up more of the supply, and additional flexibility is required on the system.

Non-market-based measures to enact during electricity crises

The market-based measures identified in the previous section are preventative. If the electricity crisis persists and/or materialises, non-market-based measures can be implemented once all market-based options have been exhausted to prevent or minimise the impacts. The measures consist of:

- Automatic system protection schemes to prevent system collapse and;
- Manual procedures to disconnect demand, instruct generation and restore power

Non-market-based measures will be activated when the system is in an emergency state, as defined in System Operation Guideline Article 18(3), or when operational security analysis undertaken by NGESO requires the activation of a measure. Where these measures have a significant cross border impact, NGESO will coordinate impacted TSOs.

An overview of non-market-based measures is provided in Table 4 and further detail in thresholds, system conditions and processes for implementation are provided in Table 4.

Table 4 - Summary of Non-Market-Based Actions NGESO can take to prevent / manage an electricity crisis

	Emergency Actions	Comments
Demand	Electricity System Restoration (ESR)	In the event of total or partial failure of the National Electricity Transmission System, NGESO would instruct network operators and relevant generators to initiate their System Restoration Plans to restore power.
	Issue Demand Control Imminent (DCI) system warning	this alerts network operators to the high likelihood of demand control measures being implemented in 30 minutes.
	Demand Control Instruction	This instructs network operators to execute their demand control plans. This instruction will contain the level of reduction required to avoid the shortfall and specifies the demand control stages required.
	Rota Load Disconnection	In the event of long-term and significant damage to the system, all prolong shortfalls in generation (weeks or months), the ESO and DNOs could implement controlled power cut on a rotational basis to enable an equal distribution of the available electricity supply to customers (known as 'rota load disconnections'), whilst maintaining supplies to pre-designated protected sites.
	Automatic Low Frequency Demand Disconnection Scheme	LFDD is the last line of defence to maintain stability and prevent a full system collapse. If the frequency drops below statutory limits, DNOs have relays that can disconnect a defined amount of demand.

	Emergency Actions	Comments
Generation	Emergency Assistance (EA) request to other System Operators	In the event that the ESO foresees a difficulty in meeting the expected demand or maintaining system security, it can request EA from neighbouring countries with which there is electricity interconnection. This action would be taken in real time and it's only applicable if the capacity is available on interconnectors.
	Maximum Generation	in the event that additional generation output is required for a short period during times with system stress NGESO can ask for power stations to generate at maximum capacity, in excess of normal technical and commercial parameters.
	Fuel Security Code (FSC)	In the event of a fuel supply emergency the UK Government can instruct power stations to use alternative fuels sources to generate electricity
Restoration	Electricity System Restoration (ESR)	In the event of total or partial failure of the National Electricity Transmission System, NGESO would instruct network operators and relevant generators to initiate their System Restoration Plans to restore power.

Manual Demand Disconnection

Demand Control

In the event of insufficient power generation being available to meet demand, NGESO can work with network companies to reduce the amount of demand by decreasing the voltage across distribution networks and then, in subsequent stages, disconnecting portions of demand.

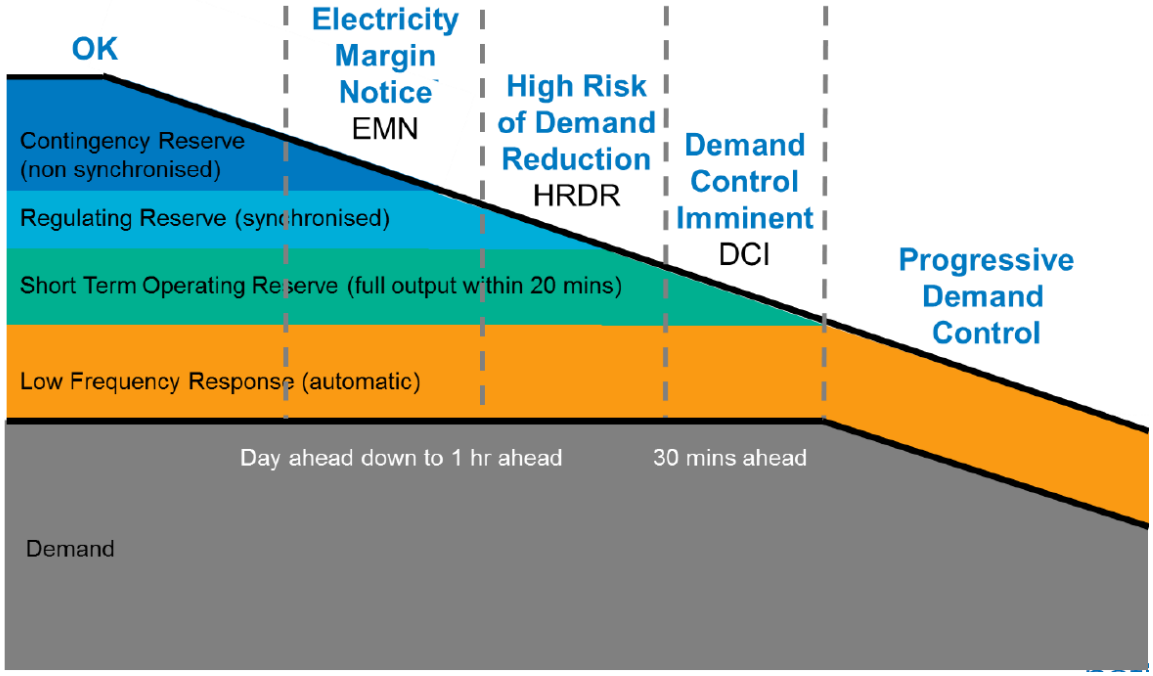
Demand Control is implemented when a loss of generation exceeds the amount of reserve being held by the ESO, or in the event of breakdown or operating disruptions on any part of the National Electricity Transmission System. It can be used in the event of a forecast or sudden shortfall of generation that is only expected to last a few hours.

NGESO uses a hierarchy of notices to communicate these actions to the wider industry.

- High Risk of Demand Reduction (HRDR) - in the event that an issued EMN or CMN does not provide the required capacity the ESO will issue a HRDR notification to inform Distribution Network Operators (DNOs) and transmission connected customers of the increased risk of a demand reduction and the location of that potential reduction. Industry participants are required to prepare their demand reduction arrangements.
- Demand Control imminent (DCI) - A DCI notice will be issued when a demand control instruction is expected in the following thirty minutes.
- Demand Control Instruction - The instruction will contain the level of reduction required to avoid the shortfall and specifies the demand control stages required.

Figure 1 below shows the trigger levels at which these Notices would be issued.

Figure 1 – Trigger levels for when Emergency Measures would be issued by NGESO



The procedure that DNOs must follow for the implementation of demand control is set out in Operating Code (OC) 6 however a summary is provided in Table 4.

Table 5 – Summary of Demand Control Disconnection Procedure

Initiator	Role
NGESO	Identify Megawatt (MW) demand reduction required and timescale for delivery
	Power System Manager sanctions Demand Control actions and issues Demand Control Imminent (DCI) system warning, if time permits
	Power System Manager to contact Transmission System Manager and confirm timescale for delivery and required method [voltage reduction or demand disconnection]
PROCESS HANDED TO Transmission Operators	
Transmission Network Operator	Confirm required Demand Control Volume (MW) and method with NGESO Power System Manager
	Determine number of stages required and which Distribution Network Operators to instruct
	Communicate Number of stages to relevant DNOs
PROCESS HANDED TO Distribution Network Operators	
Distribution Network Operator	Confirm required Demand Control Volume (MW) and method with Transmission System Manager
	Execute Demand Control Instruction. Each DNO must ensure that their netted Demand Reduction remains at the instructed level until NGESO instructs otherwise.

Rota Load Disconnection

Rota Load Disconnections would be implemented in the event where a prolonged generation shortfall has been forecast by NGESO or significant network damage has been experienced and; it is expected to take a number of weeks / months to resolve these issues.

In this scenario NGESO and DNOs would look to UK Government to allow the implementation of controlled power cuts on a rotational basis to enable an equal distribution of the available electricity supply to customers (known as ‘rota load disconnections’), whilst maintaining supplies to pre-designated Protected Sites.

There are 18 stages of ESEC which can progressively disconnect between 5-90% in increments of 5% within a single 3-hour period. The larger the generation shortfall, the higher number of load blocks that will be disconnected within a single 3-hour period.

The implementation of ESEC requires Emergency Powers which are available to the BEIS SoS through the Energy Act 1976. These powers will enable BEIS to direct DNOs to restrict the supply of electricity to sites, other than Protected Sites, by rota disconnections to achieve a specified level of reduced demand.

The procedure that BEIS and DNOs must follow for the implementation of ESEC is set out online and a summary is provided in Table 5.

Table 6 - Summary of Rota Load Disconnection Procedure

Initiator	Role
BEIS	Confirm required implementation of ESEC, reduction required and timescale for delivery with NGESO.
	Agree implementation of ESEC with Secretary of State and obtain Emergency Powers
	Issue Directions to NGESO, TOs and DNOs
PROCESS HANDED TO Electricity System Operator	
NGESO	Update BEIS on demand reduction required no later than 14.00 the day ahead
PROCESS HANDED TO Distribution Network Operators	
DNOs	Develop a Variable Rota Disconnection Plan[5] (VRDP).
PROCESS HANDED TO Electricity System Operator	
NGESO	Develop Indicative Rota Plan[6]
PROCESS HANDED TO BEIS	
BEIS	Confirm Indicative Rota Plan no later than 15.00 the day ahead
PROCESS HANDED TO Electricity System Operator	

[5] The VRDP divides non-protected sites in a Network Operator's licence area into 18 x 5% demand, load blocks. Each demand block is given a suffix letter (A, B, C, D, etc) and all connected customers are assigned a block letter corresponding to the relevant point of connection on the network. Demand blocks are sequenced for disconnection

[6] NGESO will assess optimum margin of remaining generation available and the level of flows on interconnections with neighbouring transmission systems and develop an indicative rota plan which outlines the level of disconnection considered necessary for the following 24-hour period.

NGESCO	Generate Implementation Rota Plan and detailed Activation Schedules[7].
	Issue these schedules to Network Operators by 17.30 the day ahead.
PROCESS HANDED TO Distribution Network Operators	
DNOs	Activation Schedule executed. Each DNO must implement rota load disconnections until NGESO instructs otherwise.

Automatic Demand Disconnection

Low Frequency Demand Disconnection

The Low Frequency Demand Disconnection (LFDD) scheme is designed to limit the fall in frequency for extreme events beyond those defined as 'secured' events in the SQSS and Operating Code OC6 (Demand Control) of the Grid Code.

In the event that the frequency drops below 48.8 Hz, for a certain period of time, the LFDD scheme would be triggered to disconnect – through a series of relays - a defined amount of demand to balance electricity supply and demand.

The Grid Code requires Distribution Network Operators to install these relays across the Distribution Network. If the frequency continues to drop, the LFDD can automatically disconnect a total of up to 60% of demand across the network.

The procedure that NGESO and Network companies must follow, in the event of a Low Frequency Demand Disconnection for the implementation of demand control is set out in OC 6 however a summary is provided in Table 6.

Table 7 - Summary of LFDD Procedure

Initiator	**Role**
Distribution Network Operators	Notify the Transmission Security Engineer with an estimate of the Demand reduction which has occurred under automation Low Frequency Demand Disconnection, including the name of the Demand Block that has been disconnected and the approximate MW Demand that has been disconnected by each block
PROCESS HANDED TO Electricity System Operator	

[7] The schedules will confirm detailed timings for the disconnection and reconnection of Load Blocks and shall be treated as a set of instructions for implementation by the Network Operators

NGESO	Power System Manager to initiate escalation processes and issue notification of Automatic Low Frequency Demand Disconnection
	Power System Manager to contact Transmission System Manager and confirm timescales and volumes for reconnection of demand
PROCESS HANDED TO Transmission Operators	
Transmission Network Operator	Determine number of disconnection blocks required for reconnection and which Distribution Network Operators to instruct
	Transmission System Manager to contact relevant Distribution System Managers and confirm disconnection blocks required for reconnection and timescales for reconnection.
PROCESS HANDED TO Distribution Network Operators	
DNOs	Reconnect demand blocks

Fuel Security Code (FSC)

Where NGESO identifies a fuel supply shortage which has the potential to lead to shortfall of available generation, the BEIS Secretary of State may exercise powers contained in the Electricity Act 1989 to call and manage a Fuel Security Period (FSP).

The FSC provides an administrative structure designed to enable compliance with directions issued under Section 34 or 35 of The Electricity Act 1989 by the Secretary of State. The FSC enables the Secretary of State to direct operators of power stations (not less than 10MW generated capacity) as to the level of fuel and other materials which it must keep in stock and to direct the manner in which the power station operator uses such stocks; and operates its power stations. It also describes the arrangements for the recovery of exceptional costs. The procedure that NGESO, Network companies and DNOs must follow, in the event of a Fuel Supply Emergency is set out here however a summary is provided in Table 7.

Table 8 - Summary of FSC Procedure

Initiator	**Role**
NGESO	NGESO becomes aware of circumstances that could lead to a Fuel Security Emergency.
	NGESO notifies BEIS of the requirement to implement the FSC and make recommendations as to the most appropriate way to manage the Emergency.
PROCESS HANDED TO BEIS	

BEIS	Confirm required implementation of FSC and agree actions requires to manage the Emergency.
	Agree implementation of FSC with Secretary of State and obtain Emergency Powers
	Issue Directions to NGESO and generators
PROCESS HANDED TO Electricity System Operator	
NGESO	NGESO to: – assess the capability and availability of power stations to meet demand; – the ability to balance the supply and demand for electricity; and – the ability of the GB Transmission System to accommodate the prevailing pattern of availability and capability of generation to meet demand from Customers.
	Issue Emergency Instructions to Generators as required
PROCESS HANDED TO Distribution Network Operators	
Generators	Execute Emergency Instructions

Emergency Assistance

Agreements are in place with neighbouring TSOs to provide Emergency Assistance. The contracted service is for blocks of energy to be provided across HVDC Interconnectors for specific periods of time and detailed procedures are set out in the relevant Balancing and Ancillary Services Agreement for each interconnector.

Neighbouring countries should accept an EA request as long as it does not result in a difficulty in meeting the expected demand on its own system or a difficulty in maintaining security on its own transmission system. A minimum of two minutes' notice to the start of EA delivery should be given.

Maximum Generation

Where a Maximum Generation Service Agreement is in place between NGESO and a Generator, the Generator will use reasonable endeavours to make available and provide maximum generation from each of its BMUs. NGESO will request the Maximum Generation Service prior to the instruction of any measures related to Demand Control. This will be via Emergency Instructions and detailed procedures are set out in CUSC Section 4.2.

The NETSO shall be entitled to request assistance for active power from SGUs which do not already provide a balancing service. Upon request from the NETSO any SGU shall make available all its active power, conforming to its technical constraints. The NETSO may only do this after it has activated all balancing energy bids available.

Electricity System Restoration

Electricity System Restoration refers to the technical process that would be implemented by the electricity sector to restore power in the event of a total or partial failure of the GB electricity system.

NGESO currently has a legal obligation in its licence condition to ensure that GB has the capability to restore power in the event of a full system collapse. This is achieved by procuring restoration services from specific generators. Detailed procedures for System Restoration are set out in the System Restoration Plan[8].

[8] www.nationalgrideso.com/document/135211/download

Crises Procedures and Information Flows during an Electricity Crisis

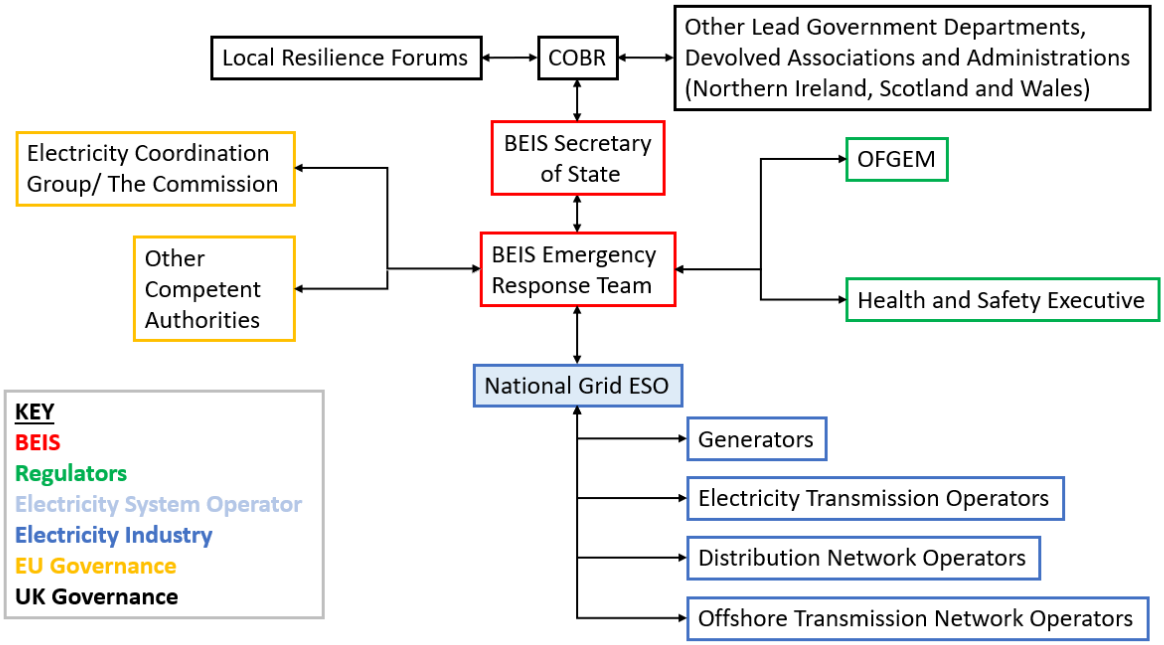
This National Emergency Plan: Downstream Gas & Electricity (NEP), describes the national arrangements established between BEIS, the electricity industry, the Office of Gas and Electricity Markets (Ofgem) and the European Commission and other interested parties for the safe and effective management of electricity supply emergencies. The detailed procedures to be followed in electricity crises, including the corresponding information flows are set out in this document and can be accessed online.

Following activation of an emergency crises, individual organisations will be responding and operating according to their agreed internal procedures. This section does not provide detailed guidance for individual organisations but sets out the overarching response structure, interactions between organisations, identifying the communication routes and reporting procedures.

BEIS is the Lead Government Department for energy supply emergencies as set out in the UK Government arrangements for responding to an emergency ('CONOPS'). Cabinet Ministers are responsible for managing the Cross-Government response to a national energy and operate the Cabinet Office Briefing Rooms (COBR). COBR will only convene if the emergency is of a sufficient level. The electricity industries are responsible for the operational management of an emergency, for notifying BEIS and ensuring that appropriate information is provided to the central government response to inform effective strategic decision making as required.

Industry will also interface directly with the local Strategic Coordination Groups (SCGs) on local issues and for consequence management. This is often through a utilities sub-group though arrangements vary across SCGs. The Resilience & Emergencies Division of Ministry of Housing, Communities & Local Government (MHCLG) in England, and Devolved Administrations, provide a link to central government for local responders, and may facilitate groups or mechanisms to co-ordinate emergencies that overwhelm individual LRF boundaries or resources.

The following diagram, figure 2, describes the relationships for a national gas or electricity supply emergency, recognising that a response may include one or both sectors, given the close interactions between the two.



Situational Assessment and Management

The key tasks in the co-ordinated response are shown in the following figure.

To fulfil its LGD responsibilities, BEIS will require industry data on a regular basis (see battle rhythm section below). All information will be provided by industry in an appropriate format agreed with BEIS. A BEIS Incident Reporting Framework is provided in the diagram below is in place specifically for disruption scenarios. Any differing requirements will be communicated with industry at the early stage of a response and kept under review throughout. This process will enable the information from all providers to be readily assimilated for onward communication, including to COBR and wider government, and with key stakeholders.

FROM:		TO:
BEIS	Send Preparation Request	Electricity System Operator, Transmission and Distribution Network Operators, Ofgem and Energy Networks Association (ENA)
↓		
ESO and Network Operators (both Transmission and Distribution)	Return completed Preparation Updates	BEIS Ofgem and ENA
↓		
BEIS	Send Disruption Template with specific reporting timescales	Electricity System Operator, Transmission and Distribution Network Operators, Ofgem and ENA
↓		
ESO and Network Operators (both Transmission and Distribution)	Return completed Disruption Report	BEIS Ofgem and ENA
↓		
BEIS	Consolidated Position	Wider-UK Government, ENA, Ofgem and Network Operators
↓		
Energy Networks Association	Consolidated media briefing	Wider-UK Government, Electricity System Operator, Transmission and Distribution Network Operators, Ofgem

Assessment and action plan

Assessment of the information will consider the following issues:

- Immediate actions required to protect life and property and to prevent the further escalation of the emergency;
- Longer-term actions required to manage the consequences and assist with recovery; and
- Ownership for the actions and any requirement to implement government emergency powers.

Using this information, BEIS will work with industry to develop a strategy and action plan that will result in appropriate and cohesive actions to manage the incident consequences. The action plan is intended to assist with the management of the consequences of the emergency and to support industry in containing and resolving the incident. It is not intended to directly control the technical response of industry to the emergency.

Specifically, BEIS will:

- Identify electricity supply priorities arising from the incident;
- Identify the consequences of the emergency for Other Government Departments;
- Develop and make recommendations to government on strategic options;
- Request emergency powers to manage the incident, as appropriate.

In developing strategic options to address a electricity supply emergency BEIS will take account of:

- Public safety;
- Protection of property and key infrastructure;
- Maintenance of national economic performance; and
- Public and media communication.

Daily rhythm

Following activation of a response, BEIS will set out a daily rhythm and communicate this to all relevant stakeholders. The battle rhythm will set the pace and tempo of the response, taking account of key milestones and events such as meetings and teleconferences and the major actions necessary to support these milestones. The daily rhythm will identify key timings and deadlines for submission of information or implementation of actions. The daily rhythm will be reviewed regularly and updated as appropriate.

Procedures for stand-down / closure and review

It is the responsibility of BEIS to confirm the closure of the emergency response phase of an emergency. BEIS will liaise with industry, and Other Government Departments, including the Civil Contingencies Secretariat, in making this decision, and will ensure this is communicated to all stakeholders. Some scenarios may result in longer term actions to support the return to normality (the 'recovery phase'). In such scenarios, BEIS will maintain its lead co-ordination role, providing support to industry and updates to central government as appropriate.

Following closure of a response, BEIS will lead a review of the incident to ensure any lessons are identified, taking account of the views of key stakeholders. The review will consider the following issues:

- The effectiveness of the emergency response;
- The nature of the emergency including cause, course and consequences;
- Quality and effectiveness of internal and external communications;
- Actual outcome against desired/anticipated outcome; and
- Action plan to address identified deficiencies

Mechanisms for Informing the public

Communication with both the public and media during an emergency response is a critical function and it is vital that external communications are co-ordinated, consistent, clear and timely. To ensure effective co-ordination of messages detailed arrangements have been established between industry partners and with BEIS and there are supporting procedures and best practice guides in place, which include the need for early activation and regular communication between responders. These arrangements are subject to regular review and are maintained separately to this Plan.

In previous major incidents the Energy Networks Association (ENA), has co-ordinated industry-wide communications which has enabled individual network operators to tailor their communications with regional customers. The ENA will generally take a role in a national communications function where:

- Two or more DNOs are affected
- Multiple licence areas over a large area are affected
- National media take an interest in the extent of an incident or an incident is significantly trending on social media

To help with the frequent changes in detail and the high demand for information in an electricity crisis, a number of delivery methods will be used.

- Website – network companies will have a dedicated section of its website for emergency advice and information. During major incidents a pop-up banner will appear giving people the option to go straight to a page of the latest information.
- Twitter – Companies will post latest information and links to advice pages on its site hourly. ENA will also aim to re-tweet updates from individual companies affected.
- Press releases – Updates will be circulated to list of news desk and other stakeholders.
- 105 Number - The 105 number enables effective and streamlined communication between network operators and the public during power disruptions, Customers can flag an electrical outage can request important information such as estimated restoration times or support, during disruptions.

Annex A: Template for the Risk Preparedness Plan

The template below has been extracted directly from the regulation requirement document.

SUMMARY OF THE ELECTRICITY CRISIS SCENARIOS

Describe briefly the electricity crisis scenarios identified in accordance with the procedure laid down in Article 7, including the description of the assumptions applied.

ROLES AND RESPONSIBILITIES OF THE SECRETARY OF STATE

Define the role and responsibilities of the Secretary of State and the bodies to which tasks have been delegated. Describe which tasks, if any, have been delegated to other bodies.

PROCEDURES AND MEASURES IN THE ELECTRICITY CRISIS

Procedures and measures

Describe procedures to be followed in the cases of an electricity crisis, including the corresponding schemes on information flows;

Describe preventive and preparatory measures;

Describe measures to mitigate electricity crises, in particular demand-side and supply-side measures, whilst indicating in which circumstances such measures can be used especially the trigger of each measure.

Specify how the transmission system operator and the distribution system operators should act in order to decrease the consumption;

Describe the mechanisms used to inform the public about the electricity crisis.

STAKEHOLDER CONSULTATIONS

In accordance with Article 10(1), describe the mechanism used for and the results of the consultations carried out, for the development of this plan, with:

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

Annex B: Relevant articles from the Regulation

The relevant articles regarding the content requirement of the Risk Preparedness Plan (below) has been extracted directly from the regulation requirement document.

CHAPTER II

Risk assessment

Article 7

Identification of electricity crisis scenarios

In identifying the electricity crisis scenarios, the Secretary of State must consult the transmission system operator, the distribution system operators that the Secretary of State considers to be relevant, the relevant producers or their trade bodies, and the regulatory authority.

The Secretary of State must update the electricity crisis scenarios every four years, unless circumstances warrant more frequent updates.

CHAPTER III

Risk-preparedness plans

Article 10

Establishment of risk-preparedness plans

On the basis of the electricity crisis scenarios identified pursuant to Article 7, the Secretary of State must establish a risk-preparedness plan, after consulting distribution system operators considered relevant by the Secretary of State, the transmission system operator, the relevant producers or their trade bodies, the electricity and natural gas undertakings, the relevant organisations that represent the interests of industrial and non-industrial electricity customers, and the regulatory authority.

The risk-preparedness plan shall consist of measures as provided for in Article 11. Those measures shall be clearly defined, transparent, proportionate and non-discriminatory.

The risk-preparedness plan shall be developed in accordance with Article 11 and with the template set out in the Annex. If necessary, Secretary of State may include additional information in the risk-preparedness plan.

The Secretary of State must publish the risk-preparedness, while ensuring confidentiality of sensitive information, in particular information on measures relating to the prevention or mitigation of consequences of malicious attacks.

The Secretary of State must adopt and publish the first risk-preparedness plan on or before 5 January 2022. The Secretary of State must update the risk-preparedness plan every four years, unless circumstances warrant more frequent updates.

Article 11

Content of risk-preparedness plans as regards national measures

The risk-preparedness plan must set out measures that are planned or taken to prevent, prepare for and mitigate electricity crises as identified pursuant to Article 7. It must at least:

contain a summary of the electricity crisis scenarios, identified in accordance with the procedures laid down in Article 7;

establish the role and responsibilities of the Secretary of State and describe which tasks, if any, have been delegated to other bodies;

describe the measures designed to prevent or prepare for the risks identified pursuant to Article 7;

establish detailed procedures to be followed in electricity crises, including the corresponding schemes on information flows;

identify the contribution of market-based measures in coping with electricity crises, in particular demand-side and supply-side measures;

identify possible non-market-based measures to be implemented in electricity crises, specifying the triggers, conditions and procedures for their implementation, and indicating how they comply with the requirements laid down in Article 16

describe the mechanisms used to inform the public about electricity crises;

include information on related and necessary plans for developing the future grid that will help to cope with the consequences of identified electricity crisis scenarios.

This publication is available from: www.gov.uk/beis

If you need a version of this document in a more accessible format, please email enquiries@beis.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.