












Grid Code Modification Proposal Form	At what stage is this document in the process?
<div>GC0148:</div> <div>Mod Title: Implementation of EU Emergency and Restoration Code Phase II</div>	<div><div>01</div><div>Proposal Form</div></div> <div><div>02</div><div>Workgroup Consultation</div></div> <div><div>03</div><div>Workgroup Report</div></div> <div><div>04</div><div>Code Administrator Consultation</div></div> <div><div>05</div><div>Draft Grid Code Modification Report</div></div> <div><div>06</div><div>Final Grid Code Modification Report</div></div>
<p>Purpose of Modification: The EU Network Code Electricity Emergency and Restoration Code (NCER) was generally required to be implemented by Member States by 18 December 2019. By exception, some Articles within the NCER (Articles 15(5) – 15(8), 41, 42(1), (2) and (5)) relating to low frequency demand disconnection, communications resilience and critical tools and facilities are not required to be implemented until 18 December 2022. Articles 50, 48(3) and 15(9) are also related to these articles noting that Article 48(3) has an implementation date of 18th December 2024.</p> <p>This modification will complete the GB implementation of the NCER by finishing implementation of these remaining articles that were not covered in the earlier requirements under GC0108, 125, 127 and 128 including development of the System Defence Plan, System Restoration Plan and Test Plan. In addition, a number of outstanding issues from the work in phase I were raised relating to i) the ability of smaller Non-CUSC Parties to come under the umbrella of NCER and ii) the requirement for Storage Units to switch from an import mode of operation to an export mode of operation during low system frequencies, which NGESO believe is appropriate to include within the scope of this modification.</p> <p>Finally, National Grid ESO is currently working with a number of other industry parties on the Distributed Re-Start Project. This is investigating the technical feasibility and industry code changes necessary to enable Black Start and restoration services to be obtained from providers within a Distribution Network to form a Distributed Re-Start Zone (DRZ). The aim would be to use DRZ's together with other Transmission System connected providers to re-start the System in the event of a total or partial System Shutdown. As such provisions would fall under the NCER, National Grid ESO believe that all three of these areas could be efficiently addressed within a single modification.</p>	

	<p>The Proposer recommends that this modification should be:</p> <ul style="list-style-type: none"> • proceed to a Workgroup <p>This modification was raised 14 July 2020 and will be presented by the Proposer to the Panel on 30 July 2020. The Panel will consider the Proposer's recommendation and determine the appropriate route.</p>
	<p>High Impact: - Non-CUSC Parties who in future agree to provide a Defence Service or Restoration Service are likely to be affected by this modification.</p> <p>Generators who own and operate future Electricity Storage Modules will be affected through the need to transition from import to export at low system frequencies.</p> <p>Transmission Licensees, Distribution Network Operators and National Grid ESO will be affected by these proposals as a result of the requirements for enhancements to the low frequency demand disconnection scheme particularly in respect of netted demand, improved communications resilience, the robustness of critical tools and facilities, reviews to the System Defence, System Restoration and Test Plan and the capability of backup power supplies.</p> <p>Facilitating the Distributed Re-Start Project brings potential opportunities to smaller Embedded parties who traditionally would not have been able to participate in System Restoration or Defence Activities</p>
	<p>Medium Impact: - None</p>
	<p>Low Impact: - There will be a low impact on Transmission connected parties who are already bound by the requirements of the NCER and Grid Code. There will also be limited impact on those parties who are already providing a Black Start Service.</p>

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Timetable		 email address
<i>The Code Administrator will update the timetable.</i>		 telephone
The Code Administrator recommends the following timetable: <i>(amend as appropriate)</i>		Proposer: Antony Johnson
		 Antony.Johnson@nationalgrideso.com
		 07966 734856
		National Grid Representative:
		
		

Proposer Details

Details of Proposer: (Organisation Name)	Antony Johnson – National Grid ESO
Capacity in which the Grid Code Modification Proposal is being proposed: (e.g. CUSC Party)	CUSC Party – National Grid ESO
Details of Proposer's Representative: Name: Organisation: Telephone Number: Email Address:	Antony Johnson National Grid ESO 07966 734856 Antony.Johnson@nationalgrid.com
Details of Representative's Alternate: Name: Organisation: Telephone Number: Email Address:	
Attachments (No): None If Yes, Title and No. of pages of each Attachment: - Not applicable	

Impact on Core Industry Documentation.

Please mark the relevant boxes with an "x" and provide any supporting information

BSC	<input type="checkbox"/>
CUSC	<input type="checkbox"/>
STC	<input checked="" type="checkbox"/>
Other	<input checked="" type="checkbox"/>

As currently proposed, it is expected that there are likely to be consequential changes to the STC (in particular STCP 06-1 (Black Start)) and the Distribution Code, in particular Distribution Operating Code 9 (Contingency Planning) and Engineering Recommendation G99.

1 Summary

In December 2019, National Grid ESO submitted its final proposals for implementation of the European Network Code Electricity Emergency and Restoration Code (EU 2017/2196) (NCER) to Ofgem for approval. This had been the result of several years of work which under the NCER was required to be completed by 18 December 2019.

Under the NCER, there are a number of articles which have a completion date of 18 December 2022 and 18 December 2024. The aim of this paper is to outline the work that needs to be completed within GB to ensure compliance with NCER and address some other related items which neatly fit within the Emergency and Restoration Code arena.

Defect

The defect comprises three main elements. These are summarised as follows: -

- Articles 15(5) – 15(8), 41 and 42(1)(2) and (5) of the NCER have completion dates of 18 December 2022. In addition, Articles 15(9), 48(3) and 50 are consequentially related to Articles 15(5) – 15(8), 41 and 42(1)(2) and (5) of the NCER and will need to be reflected in the GB Codes.
- A number of issues were identified during the implementation of NCER Phase I relating to how Non-CUSC Parties would fall under the NCER and the ability of storage units to transition from import to export during low system frequencies
- The Distributed Re-Start Project aims to seek Black Start Services and Restoration Services from smaller Embedded parties some of which would be Non-CUSC parties and would be caught under the requirements of the NCER.

It is proposed that this modification addresses the above issues.

What

In order to address the defect, the Grid Code together with other industry related codes, (in particular the STC and Distribution Code) need to be updated to reflect the NCER requirements (Articles 15(5) – 15(8), Article 41 and 42(1), (2) and (5)) which are effective from 18 December 2022. It is noted that Articles 50, 48(3) and 15(9) are also related to Articles 15(5) – 15(8), 41 and 42(1)(2) and (5), with Article 48(3) having a completion date of 18 December 2024.

In summary, these Articles relate to the following issues: -

- Article 15(5) – 15(8) – Relate to low frequency demand disconnection in particular with reference to netted demand (i.e. the need to avoid tripping embedded generation (in particular generation which contributes to System Inertia))
- Article 41 – Relates to communication resilience, equipment redundancy, backup power supplies for 24 hours, technical requirements for voice communication facilities, TSO – TSO voice communication Systems, the ability of Type A and B Power Generating Modules to only have data communication facilities instead of voice communication facilities and the use of additional communication systems to support the System Restoration Plan if required.
- Article 42 (1), (2) and (5) – Relates to TSO's to make available critical tools and facilities such as monitoring, system state, telecommand systems, control room

interaction operational security analysis and communications facilities to facilitate cross border trade for 24 hours in the case of primary power loss. DSO's are also required to make critical tools and facilities available for 24 hours in the event of primary power loss. In addition, Substations identified as essential for the restoration plan are required to be operational in the case of primary power loss for 24 hours.

- Article 50 relates to the need to review the System Defence Plan to assess its effectiveness and the need to monitor and assess the low frequency demand disconnection scheme including the percentage of netted demand.
- Article 48(3) requires each TSO in consultation with other TSO's to define a Test Plan for testing the inter - TSO communication which requires implementation by 18 December 2024.
- Article 15(9) relates to netted demand as part of the low frequency demand disconnection scheme. Since the low frequency demand disconnection scheme (including netted demand) is to be re-visited through Articles 15(5) to 15(8), this issue would then fall within the scope of this Workgroup.

An extract of the above Articles is included in Appendix A of this paper.

In addition to the above, the opportunity is being taken to review the outstanding issues from the implementation of Phase I of the NCER (namely the need to consider how smaller parties (i.e. non-CUSC Parties) would fall under the umbrella of the NCER and how storage units should transition from an import mode of operation to an export mode of operation during low system frequencies.

As many of these issues overlap with the Distributed Re-Start Project, it is also proposed to include this within the scope of this Workgroup.

To address this defect, it is proposed to amend the Grid Code (in particular but not limited to, CC.6.5, CC.A.5, ECC.6.5, ECC.A.5, OC5, OC6 and BC2) which specifically deal with these issues. Since there is also significant overlap with the Distribution Code (in particular DOC9), it is suggested that this is established as a joint Grid Code / Distribution Code workgroup but also recognises the valued input that DNO's will bring to the discussion as part of the Distributed Re-Start work.

As a consequence, there are also expected to be consequential changes to the STC in particular STCP 06-1 (Black Start). These changes would need to be managed separately through the STC Governance Process.

Why

These changes are necessary to: -

- Ensure compliance with NCER by the required date of 18 December 2022
- Address the outstanding issues raised from implementation of Phase I of NCER.
- The Distributed Re-Start Project recognises the changing system behaviour and the need to obtain Black Start and restoration services from Embedded Generation. The code changes likely to be developed as a result of this work directly relate to the NCER with the same stakeholders, and therefore it is believed to be appropriate to include this within the scope of this workgroup.

How

The defect is to be addressed by assessing the Grid Code in particular (but not limited to) sections CC/ECC.6.3.5 (Black Start), CC/ECC.6.3.7 (Frequency Response – the addition of Electricity Storage Modules transitioning from an import mode to an export mode during low system frequencies), CC/ECC.A.5 (Technical Requirements for Low frequency Relays), OC5.7 (Black Start Testing), OC6 (Demand Control), OC9 (Contingency Planning) and BC2 (Post Gate Closure Process – in particular BC2.9 (Emergency Circumstances)). It is likely that there may be requirements for additional data which if required would need to be placed in the Planning Code (PC) with consequential updates made to the Data Registration Code.

The issue of Non-CUSC parties falling under the requirements of the NCER and how they would interface with the Grid Code and System Defence Plan, System Restoration Plan and Test Plan requires further discussion within the workgroup as there are a number of ways this issue could be addressed, for example through Grid Modification GC0117 (Improving transparency and consistency of access arrangements across GB by the creation of a pan-GB commonality of PGM requirements), through the Open Networks Work or via some other mechanism.

In view of the significant involvement of Distribution Network Operators and Embedded Parties, the Distributed Re-Start Project and the need to make consequential changes to the Distribution Code Legal text and G99, it is proposed that this should be a combined Grid Code / Distribution Code Workgroup.

The work group which is established will also need to be aware of wider developments such as but not limited Grid Code modifications GC0117, GC0134, GC0143, Open Networks and the “Black Start Standard”.

2 Governance

Justification for Self-Governance Procedures

The Proposer believes that this modification should be subject to Self-Governance on the basis of: -

The modification is unlikely to discriminate between different classes of Grid Code Parties and is unlikely to have a material effect on:

- i) Existing or future electricity customers;*
- ii) Competition in the generation, distribution, or supply of electricity or any commercial activities connected with the generation, distribution or supply of electricity,*
- iii) The operation of the National Electricity Transmission System*
- iv) Matters relating to sustainable development, safety or security of supply, or the management of market or network emergencies*
- v) The Grid Code’s governance procedures or the Grid Code’s modification procedures*

Requested Next Steps

This modification should proceed to a Workgroup

3 Why Change?

As noted above, Articles 15(5) – 15(8), Article 41 and 42(1), (2) and (5) of the EU Network Code Electricity Emergency and Restoration Code (NCER) become effective on 18 December 2022. As these requirements are part of the NCER, they are enshrined in European law and therefore supersede GB law. Although Brexit will have an impact on the relationship with Europe, the approach is that there is still a requirement to implement the requirements of NCER in the required timeframes until formerly instructed otherwise.

It is also noted that Articles 15(5) – 15(8), Article 41 and 42(1), (2) and (5) of the NCER also link to Articles 50, 48(3) and 15(9). Any change to Articles 15(5) – 15(8) will have a direct impact on Article 15(9) and as such Article 15(9) will need to come within the scope of this work. Article 48(3) has a specific completion date of 18th December 2024 and hence it would be appropriate to include this change within the scope of this workgroup.

During the latter stages of Phase I of the implementation of the NCER towards the end of 2019, two key outstanding issues were raised. These being: -

- How would NCER apply to Non-CUSC Parties
- Further clarity on the performance requirements of energy Storage Units when transiting from an import mode of operation to an export mode of operation during low system frequencies (NCER Article 15(3)).

National Grid ESO is committed to addressing these issues and believes it appropriate to address these as part of this work.

Finally, the Distributed Re-Start Project has been established to encourage new providers of Black Start and Restoration services to contribute to the Black Start strategy. The aim is not only to encourage new providers of Black Start Services such as HVDC, wind, solar and storage, where historically transmission connected thermal generation has been used but more importantly the use of embedded generation to start sections of the Distribution Network which can be used to re-energise and contribute to the overall Black Start strategy which overall would enable the total system to be established, more quickly.

Since the Distributed Re-Start project could include smaller providers who offer defence and restoration services (some of which would be Non-CUSC Parties) they would automatically be caught under the requirements of the NCER. In order to facilitate these provisions, there will need to be consequential code changes (in particular a review of the obligations on DNO's, the introduction of new sections of the code relating to the establishment of Distribution Re-Start Zones (DRZ's) and amendments to the current Local Joint Restoration Plans (LJRP's)). Since many of these issues overlap and fall within the NCER, the Proposer believes it is efficient and effective to combine these issues through this Workgroup and would also advocate that it is established as a joint Grid Code / Distribution Code Workgroup.

4 Code Specific Matters

Technical Skillsets

The technical skill sets required to assess this modification include: -

- Knowledge of the EU Emergency and Restoration Code (NCER)
- Knowledge of the GB Grid Code in particular CCs, ECC's, OC6, OC9 and BC2
- Knowledge of the Black Start and restoration process
- Knowledge of the Distribution Code
- Familiarity with the Distributed Re-Start Project would be useful but not essential

Reference Documents

In December 2019, National Grid ESO submitted its proposed solution to the National Regulatory Authority (Ofgem) for implementation of the European Electricity Emergency and Restoration Code (NCER). This includes the following documents which details of the work including Ofgem's decision letters: -

- Grid Code Modification GC0108 (EU Code: Emergency & Restoration: Black start testing requirement – Available at: -
<https://www.nationalgrideso.com/industry-information/codes/grid-code/modifications/gc0108-eu-code-emergency-restoration-black-start>
- Grid Code Modification GC0125 (EU Code Emergency & Restoration: Black Start testing requirements for Interconnectors) – *Approved – 5th February 2020*
<https://www.nationalgrideso.com/codes/grid-code/modifications/gc0125-eu-code-emergency-restoration-black-start-testing-requirements>
- Grid Code Modification GC0127 (EU Code Emergency & Restoration: Requirements resulting from System Defence Plan) – *Approved – 5 February 2020*
<https://www.nationalgrideso.com/codes/grid-code/modifications/gc0127-eu-code-emergency-restoration-requirements-resulting-system>
- Grid Code Modification GC0128 (GC0128 EU Code Emergency & Restoration: Requirements resulting from System Restoration Plan) – *Approved 5 February 2020*
<https://www.nationalgrideso.com/codes/grid-code/modifications/gc0128-eu-code-emergency-restoration-requirements-resulting-system>

In addition, the following documents were also submitted to Ofgem and their current status is noted below in italics.

- System Defence Plan – *Submitted December 2019 - Awaiting Approval*
- System Restoration Plan – *Submitted December 2019 - Awaiting Approval*
- Test Plan – *Submitted December 2019 - Awaiting Approval*

All the above materials can be found from the attached link.

<https://www.nationalgrideso.com/industry-information/codes/european-network-codes/other-enc-documents>

In addition, a code modification relating to a clarification of aligned Market suspension arrangements is currently being addressed through Grid Code modification GC0144.

<https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0144-alignment-market-suspension-rights-eu>

Information relating to the Distributed Re-Start Project can be found from the attached link.

<https://www.nationalgrideso.com/innovation/projects/distributed-restart>

5 Solution

The issue comprises three parts. These are summarised as follows: -

- The need to consider Articles 15(5) – 15(8), Article 41 and 42(1), (2) and (5) of the NCER and to consider to Articles 50, 48(3) and 15(9) of NCER
- The need to consider how non-CUSC parties fall under the scope of the NCER and how storage units transition from an import mode to an export mode of operation during low system frequencies
- Consider the code changes necessary to accommodate the Distributed Re-Start Project.

The solution will require assessment by the Workgroup but in its broadest sense the solution will comprise the following.

- Articles 15(5) to 15(8) and Article 15(9) relate to the low frequency demand disconnection scheme. This in particular will require a review of CC/ECC.A.5 (Technical Requirements for low frequency relays for the automatic disconnection of supplies at low frequency) and OC6 (Demand Control) notwithstanding the fact that any code change will need to reflect any equipment changes and it is important that where such changes are necessary they can be implemented in the time frames required. Any changes in the Grid Code will also require some re-assessment of the Distribution Code.
- Article 41 relates mainly to communications systems. This will require assessment of the communications requirements in CC/ECC.6.5 of the Grid Code and a review of the control telephony standards which fall under the relevant electrical standards. There is also likely to be a need for a consequential change to some of the STC Procedures (which would be managed under the STC Governance Process) and a review of telephony and data requirements in the Distribution Code. A review of the Control Telephony Standard (one of the Relevant Electrical Standards) is also likely to be required.
- Article 42 (1), (2) and (5) relate to critical tools and facilities which will require a review of the Connection Conditions (CC's) and European Connection Conditions (ECC's) as well as the Distribution Code. There may also be a need to review G99.
- Article 50 will require a review of the data submitted as part of the Low Frequency Demand Disconnection Scheme and settings and netted demand. Some of this data is already submitted as part of OC6 though a further review may be required in respect of netted demand. In addition, Article 50 requires a review of the System Defence Plan. Whilst the current document is subject to approval by the Regulator, further refinements will be necessary in respect of review and an assessment of its effectiveness,

- Article 48(3) is largely linked to Article 41 but will require a test plan for testing TSO communication systems. This will require a consequential change to the STC.
- Article 15(9) is dependent upon the outcome and discussions of Articles 15(5) – 15(8) held within the workgroup.
- Inclusion of smaller Non-CUSC Parties falling under the requirements of NCER could be achieved in a number of ways. This could be through a change to the threshold between Large and Small Power Stations (as being considered through GC0117), contractual arrangements, work being undertaken as part of the Open Networks work or other measures such as those being considered through the Distributed Re-Start Work.
- The requirements for Electricity Storage Modules to transition from an import mode of operation to an export mode of operation was raised as an alternative as part of GC0127. This, together with international experience and the proposal to apply the requirement to new Electricity Storage Modules may provide a suitable approach as to how this issue could be addressed.
- The Distributed Re-Start project aims to encourage Embedded Providers to provide Black Start Services and Restoration Services. The creation of Distribution Restart Zones (DRZ's) would require code changes but the NCER would also apply to such parties and therefore whilst the codes are being updated it is appropriate to include this functionality within the scope of the work, especially in view of the level of interested stakeholder engagement.
- In view of the high level of interaction between National Grid ESO and Distribution Network Operators, the Proposer believes it would be appropriate to establish this as a combined Grid Code / Distribution Code Workgroup.

6 Impacts & Other Considerations

This modification will have the following impacts: -

- In order to satisfy the requirements of Articles 15(5) – 15(8), Article 41 and 42(1), (2) and (5) which become effective 18 December 2022 it is expected to result in additional requirements on Grid Code Parties in particular but not limited to Generators (including Generators who own and operate Electricity Storage Modules), HVDC System Owners, National Grid ESO, Distribution Network Operators, Non-Embedded Customers. In addition, there will be an impact on Non-CUSC Parties who wish to offer Black Start, System Defence and System Restoration Services.
- There will also be an impact on Transmission Licensees but such impacts will have to be assessed through the STC Panel.
- There will be a substantial change in respect of the Grid Code and Distribution Code, particularly in respect of the establishment of Distributed Re-Start Zones, Local Joint Restoration Plans and linkage with the Black Start Strategy.

As a further consideration, the NCER refers to Significant Grid Users (SGU's) which are also referenced in the Appendices of the System Defence Plan and System Restoration Plan. In view of the fact that the workgroup is to consider the application of the NCER to smaller Non-CUSC Parties and that it will also cover the Distributed Re-Start Project, it is important that when the Workgroup nominations are circulated, there is appropriate representation from all parties who may be affected by the workgroup proposals.

Does this modification impact a Significant Code Review (SCR) or other significant industry change projects, if so, how?

Not applicable.

Consumer Impacts

The application of the NCER to Non-CUSC Parties and the introduction of the Distribution Re-Start Project should enable the System to recover more quickly in the event of a Blackout. The advantage to Consumers is the ability for supplies to be more quickly re-established whilst also recognising the changing energy landscape.

7 Relevant Objectives

Mandatory for the Proposer to complete.

Impact of the modification on the Applicable Grid Code Objectives:

Relevant Objective	Identified impact
(a) To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity	Positive
(b) Facilitating effective competition in the generation and supply of electricity (and without limiting the foregoing, to facilitate the national electricity transmission system being made available to persons authorised to supply or generate electricity on terms which neither prevent nor restrict competition in the supply or generation of electricity);	Positive
(c) Subject to sub-paragraphs (i) and (ii), to promote the security and efficiency of the electricity generation, transmission and distribution systems in the national electricity transmission system operator area taken as a whole;	Positive
(d) To efficiently discharge the obligations imposed upon the licensee by this license and to comply with the Electricity Regulation and any relevant legally binding decisions of the European Commission and/or the Agency; and	Positive
(e) To promote efficiency in the implementation and administration of the Grid Code arrangements	Neutral

This modification will provide alignment with the NCER and promote the use of alternative options available to National Grid ESO in event of a Total or Partial System Shutdown. All of these elements are seen as positive in facilitating the Grid Code objectives.

8 Implementation

It is proposed for this modification to proceed to a Workgroup. As the issue covers a wide range of ESO and Distribution Network Code issues, it is suggested that this modification is established as a joint Grid Code / Distribution Code Workgroup. As a consequence, it is suggested that Distribution Code Representatives consider this issue at the Distribution Code Review Panel with a view to agreeing to form a combined Grid Code / Distribution Code Workgroup.

In terms of timescales, it is proposed to present this issue to the July GCRP and following confirmation from the Distribution Code Panel that it is appropriate to establish a joint Grid Code / Distribution Code Workgroup, it is anticipated the first workgroup would be held in the third Quarter of 2020 following the nomination process. Other than Article 48(3) of the NCER, the solution needs to be completed by 18 December 2022.

9 Legal Text

The legal text will be delivered and developed during the course of the Workgroup. This together with the workgroup findings will then be subject to a Workgroup Consultation.

10 Recommendations

Proposer's Recommendation to Panel

Panel is asked to:

- Propose a workgroup is established to address this issue.
- Members of the Grid Code Review Panel who are also members of the Distribution Code Panel are requested to present this issue to the Distribution Code Panel and recommend it is established as a joint Grid Code / Distribution Code Workgroup.

11 Modification guidance and using this template

Grid Code Development Forum

Prior to raising a formal modification, we encourage Proposer's to bring their modification to the Grid Code Development Forum to gain industry views on the Proposal and enable the modification to be developed prior to being formally submitted.

If you would like more information, please contact The Code Administrator at Grid.Code@nationalgrideso.com

Code Administrator Support

The Code Administrator is available to help and support Proposers with the drafting of any modifications, including guidance on the completion of this template and the wider modification process.

The Code Administrator offers a service of informally reviewing draft modifications prior to them being formally submitted. This designed to assist individuals writing their modification proposal.

Completing this form

Please complete all sections unless specifically marked for the Code Administrator. Green italic text is provided as guidance and should be removed before submission.

Acronym table and reference material

Acronym	Meaning
CUSC	Connection and Use of System Code
DRZ	Distributed Re-Start Zone
ESO	National Grid Electricity System Operator
G99	Engineering Recommendation G99
LJRP	Local Joint Restoration Plan
NCER	Network Code on Electricity Emergency and Restoration
SGU	Significant Grid User
STC	System Operator Transmission Owner Code
TSO	Transmission System Operator

Appendix A Relevant Extracts from NCER

Articles 15(5) – 15(9)

5. *Each TSO shall design the scheme for the automatic low frequency demand disconnection in accordance with the parameters for shedding load in real-time laid down in the Annex. The scheme shall include the disconnection of demand at different frequencies, from a 'starting mandatory level' to a 'final mandatory level', within an implementation range whilst respecting a minimum number and maximum size of steps. The implementation range shall define the maximum admissible deviation of netted demand to be disconnected from the target netted demand to be disconnected at a given frequency, calculated through a linear interpolation between starting and final mandatory levels. The implementation range shall not allow the disconnection of less netted demand than the amount of netted demand to be disconnected at the starting mandatory level. A step cannot be considered as such if no netted demand is disconnected when this step is reached.*
6. *Each TSO or DSO shall install the relays necessary for low frequency demand disconnection taking into account at least load behaviour and dispersed generation.*
7. *When implementing the scheme for the automatic low frequency demand disconnection pursuant to the notification under Article 12(2), each TSO or DSO shall:*
 - (a) *avoid setting an intentional time delay in addition to the operating time of the relays and circuit breakers;*
 - (b) *minimise the disconnection of power generating modules, especially those providing inertia; and*
 - (c) *limit the risk that the scheme leads to power flow deviations and voltage deviations outside operational security limits.*

If a DSO cannot fulfil the requirements under points (b) and (c), it shall notify the TSO and propose which requirement shall apply. The TSO, in consultation with the DSO shall establish the applicable requirements based on a joint cost-benefit analysis.
8. *The scheme for the automatic low frequency demand disconnection of the system defence plan may provide for netted demand disconnection based on frequency gradient provided that:*
 - (a) *it is activated only:*
 - (i) *when the frequency deviation is higher than the maximum steady state frequency deviation and the frequency gradient is higher than the one produced by the reference incident;*
 - (ii) *until the frequency reaches the frequency of the demand disconnection starting mandatory level;*
 - (b) *it complies with the Annex; and*
 - (c) *it is necessary and justified in order to maintain efficiently the operational security.*

9. *In case the scheme for the automatic low frequency demand disconnection of the system defence plan includes netted demand disconnection based on frequency gradient, as described in paragraph 8, the TSO shall submit, within 30 days of the implementation, a report containing a detailed explanation of the rationale, implementation and impact of this measure to the national regulatory authority.*

Article 41

1. *Each DSO and SGU identified in accordance with points (b) and (c) of Article 23(4), each restoration service provider and each TSO shall have a voice communication system in place with sufficient equipment redundancy and backup power supply sources to allow the exchange of the information needed for the restoration plan for at least 24 hours, in case of total absence of external electrical energy supply or in case of failure of any individual voice communication system equipment. Member States may require a minimum backup power capacity higher than 24 hours.*
2. *Each TSO shall establish, in consultation with the DSOs and SGUs identified in accordance with Article 23(4) and with restoration service providers, the technical requirements to be fulfilled by their voice communication systems as well as by the TSO's own voice communication system in order to allow their interoperability and to guarantee that the TSO's incoming call can be identified by the other party and answered immediately.*
3. *Each TSO shall establish, in consultation with its neighbouring TSOs and the other TSOs of its synchronous area, the technical requirements to be fulfilled by their voice communication systems as well as by the TSO's own voice communication system in order to allow their interoperability and to guarantee that the TSO's incoming call can be identified by the other party and answered immediately.*
4. *Notwithstanding paragraph 1, those SGUs identified in accordance with Article 23(4) that are type B power generating modules and those restoration service providers that are type A or B power generating modules, shall have the possibility to have only a data communication system, instead of a voice communication system, if agreed upon with the TSO. This data communication system shall fulfil the requirements laid down in paragraphs 1 and 2.*
5. *Member States may require that, in addition to the voice communication system, a complementary communication system be used to support the restoration plan; in that case, the complementary communication system shall fulfil the requirements laid down in paragraph 1.*

Article 42 (1), (2) and (5)

1. *Each TSO shall make available critical tools and facilities referred to in Article 24 of Regulation (EU) 2017/1485 for at least 24 hours in case of loss of primary power supply.*
2. *Each DSO and SGU identified pursuant to Article 23(4) as well as restoration service provider shall make available critical tools and facilities referred to in Article 24 of Regulation (EU) 2017/1485 and used in the restoration plan for at least 24 hours in case of loss of primary power supply, as defined by the TSO.*
5. *Substations identified as essential for the restoration plan procedures pursuant to Article 23(4) shall be operational in case of loss of primary power supply for at least 24 hours. For substations in the synchronous area Ireland and Latvia, the duration of operation in case of loss of primary power supply may be lower than 24 hours and shall be approved by the regulatory authority or other competent authority of the Member State, on proposal of the TSO.*

Article 48(3)

3. *By 18 December 2024 each TSO, in consultation with other TSOs, shall define a test plan for testing the inter-TSO communication.*

Article 50

1. *Each DSO concerned by the implementation of the low frequency demand disconnection on its installations shall update once a year the communication to the notifying system operator provided for in point (b) of Article 12(6). This communication shall include the frequency settings at which netted demand disconnection is initiated and the percentage of netted demand disconnected at every such setting.*
2. *Each TSO shall monitor the proper implementation of the low frequency demand disconnection on the basis of the yearly written communication referred to in paragraph 1 and on the basis of implementation details of TSOs' installations where applicable.*
3. *Each TSO shall review, at least every five years, its complete system defence plan to assess its effectiveness. The TSO shall in this review take into account at least: (a) the development and evolution of its network since the last review or first design; (b) the capabilities of new equipment installed on the transmission and distribution systems since the last review or first design; (c) the SGUs commissioned since the last review or first design, their capabilities and relevant services offered; (d) the tests carried out and the analysis of system incidents pursuant to Article 56(5) of Regulation (EU) 2017/1485; and (e) the operational data collected during normal operation and after disturbance.*
4. *Each TSO shall review the relevant measures of its system defence plan in accordance with paragraph 3 before any substantial change in the configuration of the grid.*
5. *When the TSO identifies the need to adapt the system defence plan, it shall amend its system defence plan and implement these amendments in accordance with points (c) and (d) of Article 4(2) and Articles 11 and 12.*