

Code Administrator Consultation

GSR032: Implementation of the Electricity System Restoration Standard

Overview: This Modification is proposing a number of changes to the SQSS to facilitate the direction issued by BEIS¹ in accordance with Special Condition 2.2 of National Grid's Electricity System Operator's Transmission Licence. Implementing an Electricity System Restoration Standard (ESRS) which requires 60% of electricity demand to be restored within 24 hours in all regions, and 100% of electricity demand to be restored within 5 days nationally.

Modification process & timetable



Have 5 minutes? Read our [Executive summary](#)

Have 20 minutes? Read the full [Code Administrator Consultation](#)

Have 120 minutes? Read the full Code Administrator Consultation and Annexes.

Status summary: The Workgroup have finalised the proposer's solution. We are now consulting on this proposed change.

This modification is expected to have a: High Impact on Onshore Transmission Owners and Offshore Transmission Owners (**No Impact** on existing OFTO network).

Governance route Standard Governance modification with assessment by a Workgroup.

Who can I talk to about the change?	Proposer: Sade Adenola Sade.adenola@nationalgrideso.com	Code Administrator Chair: Milly Lewis milly.lewis@nationalgrideso.com
	Phone: 07748180789	Phone: 07811036380

How do I respond? Send your response proforma to box.sqss@nationalgrideso.com by **5pm on 29 August 2023**

¹ BEIS is now referred to as Department for Energy Security and Net-Zero (DESNZ)

Contents

Contents	2
Executive summary	3
What is the issue?	4
Why change?	4
What is the solution?	4
Proposer’s solution.....	4
Workgroup considerations	5
Legal text.....	10
What is the impact of this change?	11
Proposer’s assessment against SQSS Objectives	11
When will this change take place?	12
Implementation date	12
Date decision required by	12
Implementation approach	12
Interactions	12
How to respond	12
Code Administrator consultation questions	12
Acronyms, key terms, and reference material	13
Reference material	13
Annexes	13

Executive summary

This Modification is proposing a number of changes to the National Electricity Transmission System Security and Quality of Supply Standard (SQSS) to facilitate the direction issued by BEIS¹ in accordance with Special Condition 2.2 of National Grid's Electricity System Operator's Transmission Licence to implement an Electricity System Restoration Standard (ESRS) which requires 60% of electricity demand to be restored within 24 hours in all regions, and 100% of electricity demand to be restored within 5 days nationally.

What is the issue?

The modification is necessary to implement the Electricity System Restoration Standard (ESRS) issued by BEIS. The date by which BEIS¹ require the ESO to be compliant with the ESRS is 31 December 2026.

What is the solution and when will it come into effect?

Proposer's solution: The Proposer suggested that the SQSS may need to be changed to reflect the requirements of the ESRS. The issue was discussed at the SQSS Panel, and it was agreed a Workgroup should be established to consider if the SQSS needed to be changed. The Proposer has suggested minor changes to the SQSS through the introduction of an Appendix I which specifically addresses the requirements for System Restoration. These changes compliment other changes being introduced to the Grid Code and STC to implement ESRS.

Implementation date: 10 working days following a decision by The Authority.

This would provide clear obligations on parties so the requirements of the ESRS can be met by 31 December 2026.

Workgroup conclusions: The Workgroup concluded by majority that the Original Proposal better facilitated the Applicable Objectives than the Baseline.

What is the impact if this change is made?

This modification is as a consequence of the [GC0156 Facilitating the Implementation of the Electricity System Restoration Standard](#) and as such will impact Transmission Networks including future Offshore Transmission Networks (existing OFTO Networks are exempt from retrospective GSR032 changes and corresponding CM089/PM0128 changes which are being implemented into the STC).

Interactions

There are a suite of modifications related to the implementation of the Electricity System Restoration Standard; Grid Code [GC0156](#); CUSC [CMP398](#) and [CMP412](#); BSC [P451](#); STC-P changes [PM0128](#) and STC [CM089](#).

What is the issue?

In April 2021, the Department for Business, Energy and Industrial Strategy (BEIS¹) released a [policy statement](#) setting out the need to introduce a legally binding target for the restoration of electricity supplies in the event of a total or partial shutdown of the National Electricity Transmission System (NETS).

This new policy is called the Electricity System Restoration Standard (ESRS). As a consequence of BEIS's policy statement, Ofgem performed an [initial consultation](#) in April 2021 followed by a [statutory consultation](#) in July 2021 on licence amendments to facilitate the introduction of an ESRS, and to align the regulatory framework for procurement of restoration services with that of other balancing services.

On 24th August 2021, Ofgem published a [decision letter](#) stating that they made the decision to make the licence modifications². The modification decisions are publicly available and were implemented on 19th October 2021.

These licence modifications include but are not limited to:

- Introducing the definition of “restoration services” in Standard Condition C1 and amending the definition of balancing services to include “restoration services”.
- Replacing all references to “black start” with “Electricity System Restoration” in the Electricity Transmission Licence, including in the ESO's Special Licence Conditions, to align the licence terminology with BEIS's policy.
- Introduction of updated Special Condition 2.2 of National Grid's Electricity System Operator's Transmission Licence requiring the introduction of an ESRS which requires 60% of electricity demand to be restored within 24 hours in all regions and 100% of electricity demand to be restored within 5 days nationally.

This modification is therefore necessary following a direction issued by BEIS. The date by which BEIS require the ESO to be compliant with the ESRS is 31 December 2026.

Why change?

This Modification is proposing changes to the SQSS to facilitate the direction issued by BEIS in accordance with Special Condition 2.2 of National Grid's Electricity System Operator's Transmission Licence to implement an ESRS which requires 60% of electricity demand to be restored within 24 hours in all regions, and 100% of electricity demand to be restored within 5 days nationally³.

The SQSS requires further review to ensure it is consistent with the changes being introduced to the Grid Code and STC to facilitate the implementation of the ESRS.

What is the solution?

Proposer's solution

It is proposed to establish a SQSS modification Workgroup to determine how implementation of the ESRS can be facilitated by code modifications.

² Which can be found via this link: [Decision on Licence modifications to facilitate the introduction of an Electricity System Restoration Standard | Ofgem](#)

³ BEIS later specified that “electricity Demand” should be calculated as the forecast peak “Transmission Demand” in the 24 hours after a Shutdown.

This modification will build on the work completed through the implementation of the EU Emergency and Restoration Code⁴ ([EU 2017/2196](#)) which was in part introduced to the Grid Code through Grid Code modifications [GC0125](#), [GC0127](#) and [GC0128](#) and further being implemented through Grid Code modification [GC0148 \(Implementation of EU Emergency and Restoration Code Phase II\)](#) and [GC0156 \(Facilitating the Implementation of the Electricity System Restoration Standard\)](#).

This modification includes the following proposals for Transmission Owners to consider the following requirements when designing their networks.

- I.1 *These key requirements apply to onshore transmission systems. In the case of offshore transmission systems, the requirements of this Appendix I would only apply to those offshore transmission systems where the design contracts for those assets had been concluded on or after XXXX (12 months after approval of CM089 for example if Ofgem approve CM089 on 01/12/2023 then XXXX would become 01/12/2024).*
- I.1.1 *Each transmission system shall be designed to facilitate participation in a restoration plan as appropriate including but not limited to the assessment of reactive gain and the ability for generation to energise sections of the transmission system.*
- I.1.2 *In addition to the requirements of I1.1, each transmission system shall be designed to permit power stations to be subsequently synchronised to the transmission system and operated within their normal operational capability limits.*
- I.1.3 *The no load gain between adjacent substations shall be designed to prevent system collapse during restoration.*

Workgroup considerations

The Workgroup convened 6 times to discuss the perceived issue, detail the scope of the proposed defect, devise potential solutions, and assess the proposal in terms of the Applicable Code Objectives.

The Workgroup held their Workgroup Consultation between 31 May 2023 – 20 June 2023 and received 2 non confidential responses (and no confidential responses). The full responses can be found in Annex 9. Key points are summarised below, explanations as to why no changes were made to the solution based on concerns raised are within the main body of the document:

- One of the respondents (the Proposer) was supportive of the implementation approach and felt that it would better facilitate the Applicable Objectives i, ii and iv with being neutral to Applicable Objective iii.
- One of the respondents was not supportive of the implementation approach and felt that the modification would not better facilitate any of the Applicable Objectives.

⁴ [Commission Regulation \(EU\) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration \(Text with EEA relevance\) \(legislation.gov.uk\)](#) & [The Electricity Network Codes and Guidelines \(System Operation and Connection\) \(Amendment etc.\) \(EU Exit\) Regulations 2019](#)

- The respondent who was supportive of the implementation approach stated that the solution satisfies the requirements of the ESRS; that it includes OFTOs in future restoration strategies and overall makes the Transmission System more robust and resilient to potential disturbances from a weak network and achieves a much higher level of resilience compared to the current SQSS baseline.
- The respondent who was not supportive of the implementation approach stated that there should be a defined set of design criteria and that the proposed solution was oversimplified and qualitative. They did not feel that the proposed solution aided the clarity needed to design and fund transmission equipment for restoration within the regulatory regime.
- Both respondents agreed that it was appropriate to include clarification within the SQSS to define the system restoration capability requirements.
- Both respondents agreed that it was clear that Appendix I.1.2 applies only to the post restoration plan phase, including energisation of the next user on the network, restoration of auxiliary supplies or subsequent energisation of other parts of the transmission system. However, one respondent felt that in practice this would be needed for all connections including Restoration Contractors, due to the way restoration is procured.
- Both respondents agreed that clause Appendix I.1.3 (reference to no load gain) is required as part of the modification, however one respondent felt that it needed to be a discreet/ quantified requirement.

Consideration of the proposer's solution

Updates to the SQSS

The ESRS subgroups (sub-group reports in Annex 3) which were formerly established prior to the formal implementation of the Industry Codes (i.e., Grid Code, STC, CUSC, BSC, SQSS) identified potential changes to the SQSS. These were presented to the SQSS Panel in March 2023 and again in April 2023 where it was agreed the proposal should proceed to Workgroup.

A key point raised by the SQSS Panel was whether there needed to be a change to the SQSS to include System Restoration noting that Licence Standards do not apply during a System Restoration. However, it was felt that the SQSS should be updated to at least reflect the fact that that the System should be designed with a restoration capability in mind noting this is a design requirement and not an operational requirement.

The legal text developed by the Workgroup reflects the minimal requirements that are to be introduced into the SQSS to include a System Restoration capability and does not include specific references to relevant clauses/sections of the Grid Code and STC.

As previously outlined, one Workgroup Consultation respondent felt the proposal was too qualitative and did not provide sufficient detail to design the network. At the post Workgroup Consultation meeting held on 22 June 2023, the Workgroup reaffirmed that the decision to

remove the initially proposed quantitative detail (Annex 6) in favour of the minimalistic approach to provide an element of flexibility and judgement within the network design process, whilst still providing the necessary details for considering restoration early in the design phase. At the same meeting, the Workgroup and a colleague of the respondent who had raised these concerns agreed that the SQSS should be used in conjunction with the STC, STCPs (System Operator Transmission Owner Code Procedures) and Grid Code, as the detail of these requirements are being proposed through other code modifications.

The Workgroup had differing views on the inclusion of paragraph Appendix I.1.3. A Workgroup member suggested that the requirements of this paragraph were already covered by Appendix I.1.1 and Appendix I.1.2 and that it was therefore not required. The reasoning was that preventing a collapse of the partially restored system was implicit in Appendix I.1.1 and Appendix I.1.2.

Other Workgroup members asked if specific reference should be made to "voltage collapse" to capture the design requirement to match the reactive power demand of the network to the generator capability, rather than the more general "system collapse". It was agreed post Workgroup Consultation that the clause should remain as the detailed requirements are proposed to be included in STCP 16-1 (Investment Planning).

The Proposer clarified that for restoration purposes, Electricity Demand is based on the Grid Code definition of National Demand.

National Demand	<p>The amount of electricity supplied from the Grid Supply Points plus:-</p> <ul style="list-style-type: none"> • that supplied by Embedded Large Power Stations, and • National Electricity Transmission System Losses, <p>minus:-</p> <ul style="list-style-type: none"> • the Demand taken by Station Transformers and, Pumped Storage Units and Electricity Storage Modules. <p>and, for the purposes of this definition, does not include:-</p> <ul style="list-style-type: none"> • any exports from the National Electricity Transmission System across External Interconnections.
------------------------	--

Obligation, representation, and retrospectivity

The Proposer confirmed that existing OFTOs are exempt from retrospective ESRS changes as the requirements of Appendix I would only apply for those offshore transmission licensees who had concluded contracts for their assets on or after XXXX (12 months after approval of CM089 for example if Ofgem approve CM089 on 01/12/2023 then XXXX would become 01/12/2024).

It was confirmed that all existing and future onshore transmission licensees would need to be compliant with the ESRS requirements.

The Workgroup suggested that OFTO developers were required to be part of this discussion as they will be involved in implementing any standards to future-proof infrastructure etc. The ESO rep outlined that onshore TOs, Generators and DNOs have been involved in ESRS discussions to date, OFTO Developers joined at Workgroup 3.

Consideration of other options

Loading capacity

The Workgroup queried what the expectations for restarting generation in the event of a significant outage event were— i.e., that restarting would need to be at the lowest output to avoid instability issues. It was confirmed that block loading capacity is covered in contracts and are not in scope for this Workgroup.

Impact on competition

During the Workgroup Consultation, one Respondent did not feel the proposed SQSS changes allowed effective competition, suggesting a significant gap in the ESRS process by not all Generators being contracted to offer the service. The Proposer highlighted that Generators do need to have 72 hours resilience due to the requirements if GC0148 is approved, with the assurance activities being introduced through the Original solution for GC0156 and the related CMP398 modification (where they are paid for that assurance). It is believed this is sufficient to support restoration.

The ESO ESRS team will have ongoing assigned resources after the decisions are made on the code modifications (e.g., Restoration testing, compliance checks, a regular assurance programme and a designated restoration team) which will be integrated into business as usual.

Impact assessments and cost considerations resulting from the modification

Some Workgroup members raised concerns about the cost implications of meeting the standards across the whole network (e.g., there is no cost recovery mechanism defined for OFTOs yet). The ESO ESRS team acknowledged that to meet the new standards, investments will be required across the industry, the ESO included and shared that Ofgem have been engaged on this point.

During the Workgroup Consultation, one respondent suggested that the wording of Appendix I.1.1 would require restoration plans and Restoration Contractors to be involved in Transmission Planning timescales to meet ESRS obligations. The Proposer explained that every Restoration Contractor would be contracted to be available 80% of the time including for planning timescales (the other 20% of time to be managed by the BAU team and this was not seen as an issue).

Workgroup members discussed the need to design the system sufficiently to support resilient generation, while not knowing what the end locations of Restoration Contractors will be. A Workgroup member raised that this would require Restoration Contractors to know network requirements years in advance, which could have cost implications for designing a system, especially against the background of the potentially shorter-term decisions made by Restoration Contractors.

Each Local Joint Restoration Plan is a co-signed document which when signed contains all requirements of the code to ensure compliance. When challenged that this would mean every connection would need to be planned to allow restoration, the Proposer clarified that TOs now need to be mindful that if a provider is appointed, the network should not be a barrier to a provider being a Restoration Contractor.

The Workgroup recognised that it is impractical to require all parts of the Transmission System to have a restoration capability or be part of a Local Joint Restoration Plan. However, System Restoration needs to be considered at the design stage, in particular

the ability to ensure i) parts of the Transmission System can be energised by appropriate Restoration Plans ii) Generators or Interconnectors or other parties who wish to offer a restoration capability can do so and iii) following the successful termination of Restoration Plans, the wider Transmission System can be successfully energised including the successful connection of other parties to the Transmission System. Therefore, the legal text has been very specific in defining the need for the Transmission System to facilitate System Restoration through Restoration Plans and the subsequent wider expansion of the System.

The Workgroup acknowledged that whilst ensuring that license standards do not apply during System Restoration, the conditions already in the Grid Code are such that plant and apparatus is not tripped because of the extreme operating conditions.

A question was raised as to whether the modification will result in a blanket change across the whole network or whether implementation of these requirements would be targeted (at first at least) – i.e., sections of the network targeted and tested prior to a blanket roll-out across the network. As a blanket implementation would have significant impacts on TOs and license holders, the group raised the importance of TOs understanding the implications of the ESRS changes and the duty of care to customers to balance against the changes needed. The ESO agreed that impacts would need to be scoped but the ESRS changes are required to meet a license obligation therefore, the need to implement the requirements remains unchanged.

In response to the request for more design specifications to help assess the impact of the changes across the network, the ESO did confirm that they had received a request to remove some specific details during earlier ESRS discussions.

The Workgroup raised a need for an impact assessment to understand the implications for compliance (including the network's current compliance status) and the impact to investment plans from this change. When the ESO asked whether the Workgroup could deliver such numbers to inform the discussion, the Workgroup suggested that impacts could be shared but not costs. Annex 7 illustrates the current and new requirements placed on TOs through the implementation of the ESRS.

Costs linked to retro fitting OFTOs

The Workgroup discussed that the likelihood of legacy OFTO retrofitting, in part due to the current lack of cost recovery provisions, would be very rare. It was agreed that due to the bespoke e.g., a possible need to replant, the addition of storage capabilities, the installation of Grid Forming capability and critical tools and facilities such as 72-hour resilience and back-up supplies would make cost estimation very complex but equally it would also be extremely unlikely to occur.

The Proposer agreed that it would be difficult to assess the costs for legacy OFTOs but suggested future, self-excited Generators (i.e., those with a Grid Forming Capability) would need to provide costs for building in restoration capability. As there is no retrospective application of OFTO networks within this of the proposal, any legacy

OFTOs who chose to repower or retrofit where technically feasible, would do so of their own volition.

If Ofgem were to require the specifics of the cost implications, it was suggested consultants would be best placed to analyse OFTO and Offshore Generator connections at different stages to assess the differing abilities to retrofit (as each is unique) and whether a useful estimate was possible.

Legal text

The legal text for this change can be found below and in Annex 5.

Page 68

Restoration Contractor

As defined in the Grid Code.

Restoration Plan

A plan produced, agreed and signed by NGENSO, network operators, restoration contractors and transmission licensees to restart the system in the event of a total or partial shutdown.

Page 99

Appendix I System Restoration Requirements

I.1 These key requirements apply to onshore transmission systems. In the case of offshore transmission systems, the requirements of this Appendix I would only be applied to those offshore transmission systems who had concluded design contracts for their assets on or after XXXX (12 months after approval of CM089 for example if Ofgem approve CM089 on 01/12/2023 then XXXX would become 01/12/2024).

I.1.1 Each transmission system shall be designed to facilitate participation in a restoration plan as appropriate including but not limited to the assessment of reactive gain and the ability for generation to energise sections of the transmission system.

I.1.2 In addition to the requirements of I.1.1, each transmission system shall be designed to permit power stations to be subsequently synchronised to the transmission system and operated within their normal operational capability limits.

I.1.3 The no load gain between adjacent substations shall be designed to prevent system collapse during restoration.

What is the impact of this change?

Proposer's assessment against SQSS Objectives	
Relevant Objective	Identified impact
(i) facilitate the planning, development, and maintenance of an efficient, coordinated, and economical system of electricity transmission, and the operation of that system in an efficient, economic, and coordinated manner;	Positive The SQSS is introducing robust network design to support the ability to restore the network following a total or partial shutdown.
(ii) ensure an appropriate level of security and quality of supply and safe operation of the National Electricity Transmission System;	Positive Proposed changes would ensure stability of Power Islands by restoring sufficient demand during system restoration.
(iii) facilitate effective competition in the generation and supply of electricity, and (so far as consistent therewith) facilitating such competition in the distribution of electricity; and	Neutral
(iv) facilitate electricity Transmission Licensees to comply with any relevant obligations under EU law	Positive Provide assurance of restoring the System following a total or partial national power outage.

Workgroup vote

The Workgroup met on 30 June 2023 to carry out their Workgroup vote. The full Workgroup vote can be found in Annex 10. The table below provides a summary of the Workgroup members view on the best option to implement this change.

The Applicable SQSS Objectives are:

SQSS

- i) facilitate the planning, development and maintenance of an efficient, coordinated and economical system of electricity transmission, and the operation of that system in an efficient, economic and coordinated manner;
- ii) ensure an appropriate level of security and quality of supply and safe operation of the National Electricity Transmission System;
- iii) facilitate effective competition in the generation and supply of electricity, and (so far as consistent therewith) facilitating such competition in the distribution of electricity; and
- iv) facilitate electricity Transmission Licensees to comply with any relevant obligations under EU law.

The Workgroup concluded by majority that the Original better facilitated the Applicable Objectives than the Baseline.

Option	Number of voters that voted this option as better than the Baseline
Original	5

Workgroup Member	Company	BEST Option?	Which objective(s) does the change better facilitate?
Llewellyn Hoenselaar	ESO	Original	i, ii, iv
Hooman Andami	Elmya Energy	Original	i, ii, iii, iv
Mark Ajal	SSE Renewables	Original	i, ii, iii, iv
Cornel Brozio	SP Energy Networks	Original	i,
Lewis Morgan	NGET	Baseline	NA
David Lyon	Frontier power	Original	i, ii, iii, iv

When will this change take place?

Implementation date

10 working days following a decision by The Authority.

This would provide clear obligations on parties so the requirements of the ESRS can be met by 31 December 2026.

Date decision required by

Q3 2023.

Implementation approach

New Restoration Decision Support Tool, Restoration Tool, Local Joint Restoration Plans, Distributed Restoration Zone Plans & Annual Restoration Strategy.

Interactions

- | | | | |
|--|---|---|--|
| <input checked="" type="checkbox"/> Grid Code | <input checked="" type="checkbox"/> BSC | <input checked="" type="checkbox"/> STC | <input checked="" type="checkbox"/> CUSC |
| <input checked="" type="checkbox"/> European Network Codes | <input checked="" type="checkbox"/> Other modifications | | |

How to respond

Code Administrator consultation questions

- Please provide your assessment for the proposed solution against the Applicable Objectives?
- Do you have a preferred proposed solution?
- Do you support the proposed implementation approach?
- Do you have any other comments?

Views are invited on the proposals outlined in this consultation, which should be received by 5pm on **29 August 2023**. Please send your response to box.sqss@nationalgrideso.com using the response pro-forma which can be found on the [modification page](#).

If you wish to submit a confidential response, mark the relevant box on your consultation proforma. Confidential responses will be disclosed to the Authority in full but, unless agreed otherwise, will not be shared with the Panel or the industry and may therefore not influence the debate to the same extent as a non-confidential response.

Acronyms, key terms, and reference material

Acronym / key term	Meaning
BEIS	Department for Business, Energy, and Industrial Strategy
BSC	Balancing and Settlement Code
CMP	CUSC Modification Proposal
CUSC	Connection and Use of System Code
DESNZ	Department for Energy Security and Net-Zero
EBR	Electricity Balancing Guideline
ESO	Electricity System Operator
ESRS	Electricity System Restoration Standard
EU	European Union
GC	Grid Code
NETS	National Electricity Transmission System
OFTO	Offshore Transmission System
SEL	Stable Export Limit
SQSS	Security and Quality of Supply Standards
STC	System Operator Transmission Owner Code
STCP	System Operator Transmission Owner Code Procedures
T&Cs	Terms and Conditions
TO	Transmissions Owner

Reference material

- [GC0156 Modification](#)

Annexes

Annex	Information
Annex 1	Proposal form
Annex 2	Terms of reference
Annex 3	ESRS Subgroup Reports
Annex 4	Workgroup assessment on assurance activity
Annex 5	Legal text
Annex 6	Initial quantitative draft legal text
Annex 7	Impact to TOs of ESRS
Annex 8	Subgroup report technical suggestion code mapping
Annex 9	Workgroup Consultation responses
Annex 10	Workgroup Vote
Annex 11	SQSS Workgroup Membership GSR032