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Grid Code Modification Proposal Form

GC0181:

Enhance the Effectiveness of System Incidents Reporting

Overview: Reports are available for industry and the Grid Code Panel to monitor the effectiveness of technical requirements in the Grid Code and Distribution Code – resulting from GC0105 and GC0151 System Performance Reports. The data and the reports are not effectively serving their purpose due to the way the system incidents are being reported. This modification aims to be a further improvement of GC0105.

Modification process & timetable

1. **Proposal Form**
   12 August 2025
2. **Workgroup Consultation**
   05 January 2026 - 26 January 2026
3. **Workgroup Report**
   18 March 2026
4. **Code Administrator Consultation**
   01 April 2026 - 01 May 2026
5. **Draft SG Final Modification Report**
   17 June 2026
6. **Final SG Modification Report Appeals Window**
   07 July 2026 to 28 July 2026
7. **Implementation**
   11 August 2026

Status summary: The Proposer has raised a modification and is seeking a decision from the Panel on the governance route to be taken.

This modification is expected to have a: **Low impact** on Transmission System Owners

Modification drivers: System Operability, System Security, Transparency

Proposer's recommendation of governance route	Self-Governance modification with assessment by a Workgroup	
Who can I talk to about the change?	**Proposer:** Sabiha Farzana Sabiha.Farzana@statkraft.com	**Code Administrator Contact:** Jess Rivalland Jessica.rivalland@neso.energy

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What is the defect you are trying to resolve?

The existing reporting process has three defects that need to be resolved to allow efficient and effective analysis of incidents/trips. The defects include late reporting of incidents with insufficiently low data sampling rate and lack of regional data from the place of incident. Due to these defects, the industry and relevant parties are unable to carry out effective analysis in a timely manner which further prevents understanding the cause of Grid disturbance events.

The existing reporting process has room for improvement to increase its effectiveness.
Here are some key areas the Proposer believes need improvement:

1. Reports are made available to the industry quite late, often three months after the events have occurred.
2. In the Proposer view, the data sampling rate is insufficient for thorough analysis.
3. Reports do not incorporate data from various locations across Great Britain (GB).

Why change?

1. This situation hinders timely analysis, and the lack of information leads to doubt and confusion regarding the background of the incident. The Iberian blackout serves as a prime example of the consequences of not having timely data. When the Iberian blackout happened on 28 April 2025, industry, society and other bodies wanted to know the details of the incident the day after its occurrence and not three months later. Since the data is published long after the event, it becomes less useful, as industry are not receiving up-to-date information.

   Moreover, the additional data that Users may have from their sites that would support the investigation of the incident, is not stored indefinitely as it requires a lot of storage. Thus, this data is less likely to be available.

Hence, the sooner the industry gets to know about an incident, the easier it is to find the data from the sites and investigate it. Referring again to the Iberian blackout, when industry see the reports, it is easy to see that there was a voltage control problem. If this data had been published before the event, then there is a good chance that these issues would have been spotted and corrected before a blackout. The same principle applies here to GC0105 and GC0181. On 22 December 2023, an event occurred where one of the interconnectors between France and the UK (IFA2) tripped, causing a 49.2Hz frequency event and leading to a loss of 2GW on the UK grid and NESO was able to publish the incident data on 17 January 2024, during the Operational Transparency Forum.

This happened in less than a month's time, despite the Christmas and New Year holiday period. This demonstrates that NESO can release data in under a month. If they were routinely publishing data, they should be well-equipped to do so.

2. The frequency data that the users are receiving is not accurate enough. The sampling rate of the frequency data published by NESO on the System Performance Reports is 1 second which is very low. For the 22 December 2023 event, the Proposer has done a Rate of Change of Frequency (RoCoF) calculations in two ways as can be seen below:

RoCoF calculation in 2 ways

Method 1 (based on MW loss and Inertia)

$$\text{RoCoF}=\frac{P(\text{loss of generation in MW})\times Fi(\text{initial frequency in Hz})}{2Eo(\text{Inertia in MWs})}$$

- RoCoF of the Interconnector trip $=\frac{1000\times49.826}{2\times161\times1000}=-0.155\text{Hz/s}$
- RoCoF of the CDCL unit trip $=\frac{440\times49.666}{2\times161\times1000}=-0.068\ \text{Hz/s}$
- RoCoF of the HVDC link trip $=\frac{260\times49.564}{2\times161\times1000}=-0.04\ \text{Hz/s}$

Method 2 (based on Frequency measurements)

$$\text{RoCoF}=\frac{F2-F1\ (in\ Hz)}{T2-T1\ (in\ s)}$$

- RoCoF of Interconnector trip $=\frac{49.724-49.826}{13:09:53-13:09:52}$ = -0.102 Hz/s
- RoCoF of the CDCL unit trip $=\frac{49.615-49.666}{13:10:00-13:09:59}$ = -0.051 Hz/s
- RoCoF of the HVDC link trip $=\frac{49.498-49.564}{13:10:03-13:10:02}=-0.066\ \text{Hz/s}$

Comparison:

Name of Trip	Ratio Calculation	Comment
Interconnector	{(155-102)/102}*100= 52%	Method 1 is 52% higher than method 2
CDCL unit	{(68-51)/51}*100= 33%	Method 1 is 33% higher than method 2
HVDC link	{(40-66)/40}*100= -65%	Method 1 is 65% lower than method 2.

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Using the first method that is based on MW loss and inertia, the RoCoF of interconnector trip is -0.155Hz/s and using the second method based on frequency measurements, the RoCoF is -0.102 Hz/s. So, the method 1 value is 52% higher than method 2 value. In the same manner, for the Cottam Development Centre Limited (CDCL) unit trip, the method 1 value is 33% higher than the method 2 value. Therefore, there is an average of ~40% error in RoCoF value from frequency measurements versus RoCoF based on MW loss and inertia.

If more granular frequency could have been used, the RoCoF values calculated using the two methods above would have been much closer and the error being much less. Hence, a shorter sampling period is required to get more accurate RoCoF. With the current sampling rate of 1 second, the frequency data is too averaged so it's masking the real RoCoF. Moreover, if accurate frequency data is not available, then the loss cannot be calculated properly as it was needed for the High Voltage Direct Current (HVDC) link trip during the 22 December 2023 event. There was no knowledge of what was lost in the HVDC link trip so inertia data could not be used either to calculate the loss. Hence, the data had to be interpolated to find out the loss as shown below:

Calculating the power loss for the HVDC Link incident

Applying the ratios 52% and 33% to 3rd incident (HVDC Link) means the ROCOF could be:

i. 0.066*1.52=0.100 Hz/s

ii. 0.066*1.33=0.088 Hz/s

Based on these ROCOFs what would the MW loss have been?

i. For 0.100 Hz/s

$$P\ (loss\ of\ generation\ in\ MW) = \frac{RoCoF \times 2Eo(Inertia\ in\ MWs)}{Fi(initial\ frequency\ in\ Hz)}$$

= (0.1*2*161*1000)/49.564 = 649 MW

i. For 0.088 Hz/s

$$P\ (loss\ of\ generation\ in\ MW) = \frac{RoCoF \times 2Eo(Inertia\ in\ MWs)}{Fi(initial\ frequency\ in\ Hz)}$$

= (0.088*2*161*1000)/49.564 = 571 MW

Thus, it shows the kind of errors that can occur when industry don't have the right data.

3. It is important because some areas might experience RoCoF values significantly higher than the national average. The frequency in a Synchronous Grid is generally treated as a parameter consistent across the entire system. However, over short durations, phase differences throughout the Grid can cause minor variations in the actual frequency at different points. This results in differing rate of RoCoF across the network which can be found in the Project REV WP2 report for reference. Moreover, the Spanish investigations into the Iberian blackout show that there are regional variations and oscillations in frequency which can be found in the ENTSOE Iberian blackout report. This further proves the need and significance of regional data in analysing incidents.

What is the Proposer's solution?

NESO should analyse the data and publish an annual report to track trends in system stability compared to previous years. This is essential for monitoring any

adverse trends in system stability. The report should contain generic analysis that is done by aggregating the data of all the incidents that have occurred in that year. The analysis should be done in several categories including:

- analysis done against the time of the day,
- analysis done against the days of the week,
- analysis done on a quarterly basis,
- the type of Balancing Mechanism Units (BMU) responsible for causing each trips/incidents,
- the extent of the trips such as the total number of trips caused by the BMUs,
- the total MW loss associated with the trips; and
- the average loss(MW) per event.

The Proposer recommends the following requirements for NESO in its capacity as the GB System Operator in the Grid Code Operating Code (OC)3.4:

- OC3.4.3 - Reduce the reporting time from the current three months to one week.
- OC3.4.1(b)(iii) - Increase the sampling rate from the existing 1 second to 100 milliseconds.
- Gather frequency measurements from at least five different regions across Great Britain.

Additionally, the Proposer is keen to receive feedback from the Workgroup regarding other potential improvements and solutions.

What is in and out of scope?

OC3.4 is in scope

Draft legal text

OC3.4.1(b)(iii) the Frequency record from at least five different regions (in table and graphical format) at 100 millisecond intervals for 10 seconds before and 1 minute after the Significant Event.

OC3.4.3 The Company shall prepare and publish the System Incidents Report weekly in accordance with the following timescales:

(a) a data cut-off date of the end of each week for that reporting week;

(b) data is collated, reviewed and processed in the subsequent two weeks for each reporting week;

(c) System Incidents Report to be published at latest on the last working day of the second week after each reporting week (in other words the report for the first week in January would be published on the last working day of the second week in January, and so on) and submitted to the next regular Grid Code Review Panel. For the avoidance of doubt, if there are no incidents arising under OC3.4.1 (a)-(c), a System Incidents Report would nevertheless still be published stating that 'No System Incident occurred in month [X]

What is the impact of this change?

Proposer's assessment against Grid Code Objectives	
Relevant Objective	**Identified impact**
(i) To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity;	**Positive** This change means that the energy system can operate more safely and reliably now and in the future in a way that benefits end Consumers.
(ii) Facilitating effective competition in the generation and supply of electricity (and without limiting the	**Neutral**

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);	
(iii) 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** This change means that the energy system can operate more safely and reliably now and in the future in a way that benefits end Consumers.
(iv) 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	**Neutral**
(v) To promote efficiency in the implementation and administration of the Grid Code arrangements	**Neutral**

** See Electricity System Operator Licence*

Proposer's assessment of the impact of the modification on the stakeholder / consumer benefit categories	
Stakeholder / consumer benefit categories	**Identified impact**
Improved safety and reliability of the system	**Positive** This change mean that the energy system can operate more safely and reliably now and in the future in a way that benefits end Consumers
Lower bills than would otherwise be the case	**Neutral**
Benefits for society as a whole	**Positive**

	The recent Spanish Blackout around 12:35 on April 28, 2025 demonstrates the reliance of the society on a safe and secure electricity grid.
Reduced environmental damage	**Neutral**
Improved quality of service	**Neutral**

When will this change take place?

Implementation date:

11 August 2026

Proposer's justification of Implementation date:

The modification should be able to be developed quickly before consultation, as draft legal text has been provided. It should not take long to implement.

Date decision required by

25 June 2026

Implementation approach

The existing processes to operate OC3.4 to be updated.

Proposer's justification for governance route

Governance route: Self-Governance modification with assessment by a Workgroup.

The Proposer has recommended a Self-Governance Modification as the Proposer does not think that the proposed solution will have a material impact on industry parties. The Modification is unlikely to discriminate between different classes of Grid Code Parties and is unlikely to have a material effect on:

- Existing or future electricity customers; Competition in the generation, distribution, or supply of electricity
- Commercial activities connected with the generation, distribution or supply of electricity
- The operation of the National Electricity Transmission System Matters relating to sustainable development, safety or security of supply
- The management of market or network emergencies
- The Grid Code's governance procedures or the Grid Code's modification procedures.

The Proposer has recommended an assessment by a Workgroup, allowing the Workgroup to collaborate and assist the Proposer in finding potential solutions.

Interactions

☐CUSC	☐BSC	☐STC	☐SQSS
☐European Network Codes	☐ EBR Article 18 T&Cs[1]	☐Other modifications	☐Other

No interactions.

Industry engagement and feedback

To develop their solution, the Proposer had a meeting with Technical Codes NESO representatives post presentation to Grid Code Development Forum (GCDF) in November 2024.

Proposer engaged with the Head of Zero Carbon Grid Solutions at Statkraft. Proposer also engaged with the Director of Waters Wye Associates (WWA) to refine the solution.

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Acronyms, key terms and reference material

Acronym / key term	Meaning
BSC	Balancing and Settlement Code
CDCL	Cottam Development Centre Limited
CUSC	Connection and Use of System Code
EBR	Electricity Balancing Regulation
GC	Grid Code
GCDF	Grid Code Development Forum
HVDC	High Voltage Direct Current
OC	Operating Code
PC	Planning Code
RoCoF	Rate of Change of Frequency
STC	System Operator Transmission Owner Code
SQSS	Security and Quality of Supply Standards
T&Cs	Terms and Conditions

Reference material

- GCDF presentation slides
- Project REV WP2 report
- ENTSOE Iberian blackout report.
- IFA2 interconnector trip