

# **GC0181 – Enhance the Effectiveness of System Incidents Reporting**

Workgroup Number 5 – 25 March 2026

Online Meeting via Teams

# WELCOME

# Agenda

Topics to be discussed	Lead
Welcome	Chair
Timeline and objectives	Chair
Actions	Chair
Legal Text	All
AOB	Chair
Next Steps	Chair

## Expectations of a Workgroup Member

Contribute to the discussion

Be respectful of each other's opinions

Language and Conduct to be consistent with the values of equality and diversity

Do not share commercially sensitive information

Be prepared – Review Papers and Reports ahead of meetings

Complete actions in a timely manner

Keep to agreed scope

Email communications to/cc'ing the .box email

## Your Roles

Help refine/develop the solution(s)

Bring forward alternatives as early as possible

Vote on whether or not to proceed with requests for Alternatives

Vote on whether the solution(s) better facilitate the Code Objectives



## CM0181 Objectives and Timeline

Timeline	Workgroups	Objectives
Workgroup 5	25 March 2026	Review actions and legal text
Workgroup 6	28 April 2026	Review Workgroup Consultation and legal text
Workgroup 7	28 May 2026	Approve Workgroup Consultation and legal text
<b>Workgroup Consultation</b>	<b>05 June 2026 to 26 June 2026</b>	
Workgroup 8	14 July 2026	Review Consultation feedback and legal text
Workgroup 9	11 August 2026	Finalise Report
Workgroup 10	01 September 2026	Agree ToR met /Workgroup Vote
<b>Workgroup Report to Panel</b>	<b>16 September 2026</b>	<b>Panel sign off ToR</b>
<b>Post Workgroups</b>		
Code Administrator Consultation	01 October 2026 to 02 November 2026	
Draft Final Modification to Panel	<b>18 November 2026</b>	
Final Modification to Ofgem	<b>26 November 2026</b>	
Implementation Date	<b>10 Business Days after Authority Decision</b>	

# GC0181 Actions

Action Number	Workgroup Raised	Owner	Action	Comments	Due by	Status
4	WG1	GW	Assess cost and workload implications for Transmission Owners (TOs) providing additional data.		WG 2	Open
11	WG2	AL	Prepare a short presentation on phase jumps.		WG 3	Open
12	WG2	All	Review the GC0181 defect description to determine if phase jump data can be included.		WG 3	Open
16	WG3	FK	Provide the data guidelines and check if the direct policy documents can be shared with the Workgroup.	Material presented at WG4 and discussion can be found <a href="#">here</a> .	WG4	Propose to Close
17	WG3	FK	Provide more information regarding confidentiality, costs, and data sharing with the TOs.	See slide 10	WG4	Propose to Close
18	WG3	JAK	Provide information on PMUs being installed are of the same technology or specification and to clarify their technical capabilities.	See slide 11-12	WG4	Propose to Close

# GC0181 Actions

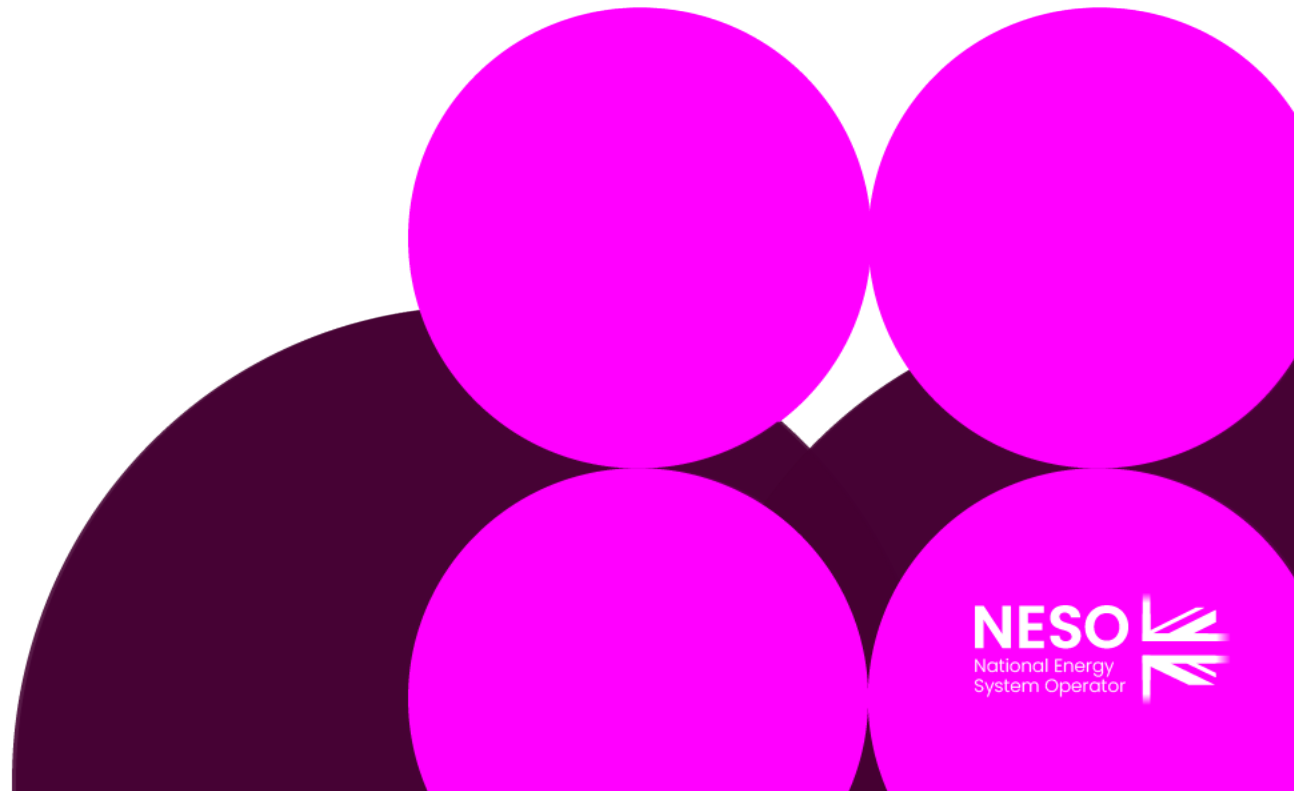
Action Number	Workgroup Raised	Owner	Action	Comments	Due by	Status
19	WG3	GN	Review and improve the framing of the cost-benefit analysis for blackout prevention, specifically by comparing the expected probability of a blackout event to the calculated benefit of enhanced reporting.		WG4	Open
21	WG3	All	Review legal text when circulated with updated wording.		WG4	Ongoing
23	WG3	GW	Provide map showing where future and current PMUs are installed and the identification of zones/regions these PMUs fall into.	See slide 13.	WG4	Propose to Close
24	WG3	FK/MD/JAK	Contact EU TSOs to look at the frequency data resolution and see if they do more than the legislative standard.	See slide 14-15	WG4	Propose to Close
25	WG4	JSC	Provide more detailed cost data from NESO to confirm whether the placeholder figure of £50,000 per annum for weekly reporting is sensible	See slide 16-17	WG5	Propose to Close

# GC0181 Actions

Action Number	Workgroup Raised	Owner	Action	Comments	Due by	Status
26	WG4	JSC	Provide an example of a previous incident with attached PMU data to demonstrate how PMU data could be used in system incident reporting, once operational PMU data is available.	Initial work has commenced	WG5	Open
27	WG4	JSC	Update the incident reporting tables for weekly and monthly incidents to include a complete record from 2022 to 2025, using available public data.	See slide 18	WG5	Propose to Close
28	WG4	MD	Create a process flowchart for the incident reporting process and a Gantt chart clarifying the steps and time allocations, including separation of working and waiting times.	See Slide 19 and emailed material.	WG5	Propose to Close
29	WG4	MD	Explore whether there is a record of the total number of events initially investigated each month and obtain this data if possible.	See slide 20	WG5	Propose to Close
30	WG4	AG	Consult with SMEs to clarify how phase jump angles, which are location specific, should be handled and reported in the legal text.	See slide 21	WG5	Propose to Close
31	WG4	FK/JSC	Define the degree or extent of the phase jump angle that qualifies as a significant event for inclusion in the legal text.	Consultations Ongoing. See slide 22-23	WG5	Open
32	WG4	AG	Check whether auto-reclosures are reported in GC0151 and establish the teams and tools responsible for capturing this information	See slide 25	WG5	Propose to Close



# Actions



# Confidentiality, Cost & Data Sharing

## Action 17 – FK

### **Confidentiality:**

- 2 TOs are generally happy to make data available, however, have concerns surrounding commercial sensitivity due to the location of monitoring units and associated liability risks.

### **Cost:**

- None provided, but some TOs have indicated likely to be expensive and require significant resource.
- 1 TO is consulting internally on cost estimates for changing system architecture to allow live streaming for users but unsure on how long that may take.
- Another TO would prefer to be in a more mature position with PMU rollout before consulting on infrastructure changes.

### **Data Sharing:**

- Possible, but limited by system architecture.
- No clear view on what would be best for users (i.e., live streaming PMU data or shared through NESO)
- TOs Currently provide data to NESO, no current arrangement to provide information beyond STCP27/1 requirements.

# PMU Specification

## Action 18 – JAK/MD

Conversations with TOs highlighted differences in the technical capabilities across their network depending on manufacturers. All installed (and planned) PMUs must meet specifications; these are summarised below.

- [Electrical Standards:](#)
  - Does not list any specific requirements (ie sampling rate, phase angle, etc...) but pointed towards IEEE standard (see below).
- [IEEE Standard for Synchrophasors for Power Systems](#), 2005:
  - Required PMU reporting rate,  $F_s$ , is 10fps for a system frequency of 50Hz (Section 5.1.1, Table 1)
  - ‘...the reporting time shall be evenly spaced through each second...’ (Section 5.1.2)
  - Signal frequency, phase angle and harmonic distortion allowable errors shown in Table 5.3 (next slide)
- [IEEE Guide for Synchronization, Calibration, Testing and Installation of Phasor Measurement Units \(PMUs\)](#), 2021:
  - No concrete requirements but contains useful information for maintaining data quality.

# PMU Specification

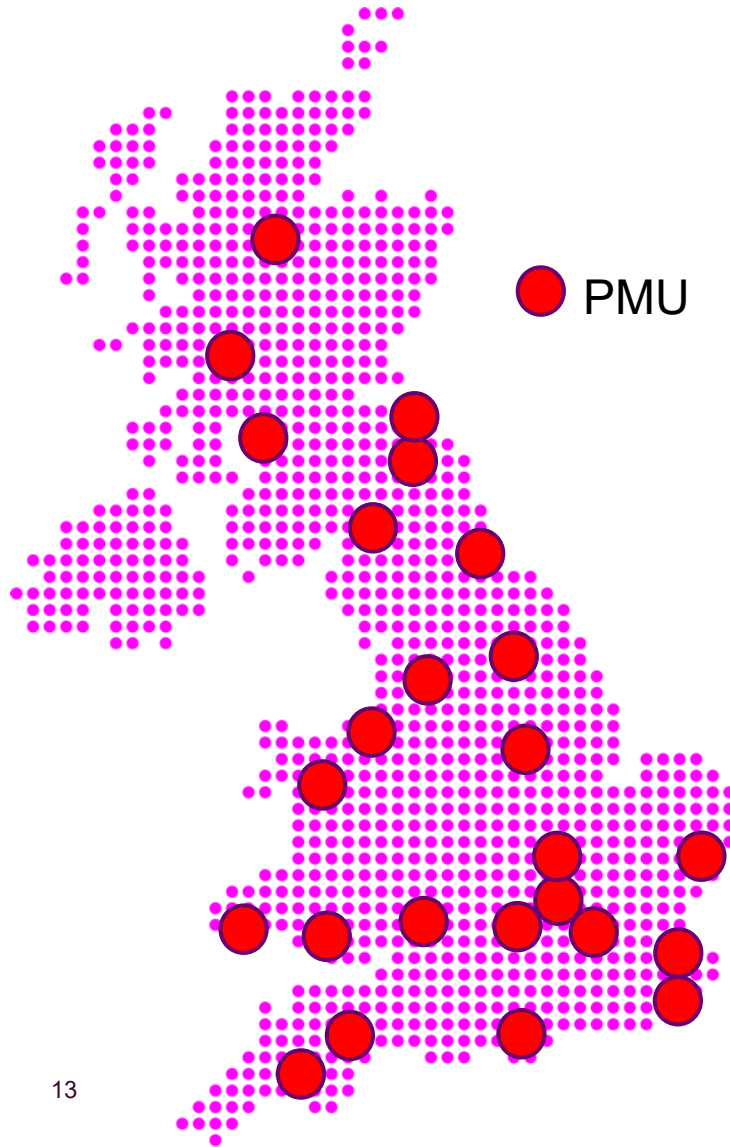
## Action 18 – JAK/MD

**Table 3—Influence quantities and allowable error limits for compliance levels 0–1**

Influence quantity	Reference condition	Range of influence quantity change with respect to reference and maximum allowable TVE in percent (%) for each compliance level			
		Level 0		Level 1	
		Range	TVE (%)	Range	TVE (%)
Signal frequency	$F_{\text{nominal}}$	$\pm 0.5$ Hz	1	$\pm 5$ Hz	1
Signal magnitude	100% rated	80% to 120% rated	1	10% to 120% rated	1
Phase angle	0 radians	$\pm \pi$ radians	1	$\pm \pi$ radians	1
Harmonic distortion	<0.2% (THD)	1%, any harmonic up to 50th	1	10%, any harmonic up to 50th	1
Out-of-band interfering signal, at frequency $f_i$ where $ f_i - f_0  > F_s/2$ , $F_s$ = phasor reporting rate, $f_0 = F_{\text{nominal}}$	<0.2% of input signal magnitude	1.0% of input signal magnitude	1	10% of input signal magnitude	1

[IEEE C37.118-2005](#), Section 5.3, Table 3

# Best Practice – Map with PMUs for Frequency Action 23 – JSC



PMU locations for FATE-R		
GSP	Region	
ENWL	Manchester South	Borders
NPG North East	Wearside	Borders
NPG York	North Humber	South Humber
SPEN	Cheshire	North Wales
SSE	London North West	Solent
UKPN East	Suffolk	West Anglia
UKPN London	London South	London Central
UKPN South East	Thames Estuary	East Kent
WPD East	Trent Valley	Trent Valley
WPD South Wales	South Wales West	South Wales West
WPD South West	Mendips and Westward	Tamar
WPD West Midlands	Chiltern	Severn
SSEN-SHEPD	Argyll and Bute	Argyll and Bute & Highland
SPD	East Lothian	Borders
SPD	Ayrshire	Dumfries and Galloway

PMU frequency measurements will be aggregated into 5 different regional frequencies.

Note: Only one PMU per GSP will be used for frequency monitoring, the one with best measurement quality.

# Best Practice – EU TSOs

## Action 24 – MD/FK

Contacted **EirGrid** (Ireland), **Energinet** (Denmark) and **ENTSO-E**. TSOs shared the following information:

### **EirGrid** (Ireland):

- Reports are currently published on an annual basis but moving to quarterly.
- Data Sampling Rate is not currently specified but is something they are looking into. Possibly trying to align with the ISO standards. Very much a WIP.
- Frequency monitoring is legally done by Synchronous Area Monitors.
- Generally aligned with System Operator Guidelines but occasionally report below scale events to capture more data.

### **Energinet** (Denmark):

- Are not responsible for reporting frequency within the Nordic Grid region. Instead, research should be placed towards Svenska Krafnat (Sweden) and Fingrid (Finland)
- After research, it was found that Fingrid produce a frequency measurement report produced as a CSV file with the following specifications:
  - Data is published monthly with a 2 months delay (ie December 2025 was published in February 2026).
  - Publish a singular figure (based on measurements from various 400kV substations)
  - Sample rate of 10Hz (results in a measurement every 10ms).
  - [Available here](#)



# Best Practice – EU TSOs

## Action 24 – MD/FK

**ENTSO-E** publish annual reports (around 9 months after the end of the year containing monthly events reported by each TSO:

- Number of events listed for each TSO and European Region.
- [Available here](#)
- The Methodology each TSO must take is specified within a separate document:
  - Must send results to ENTSO-E every 3 months
  - Includes the classification of an 'incident'
  - [Available here](#)

# Detailed Cost Data

## Action 25 – JSC

The monetary cost of producing the GC0105 report can be broadly represented by the need to recruit an additional full-time employee (FTE), which is estimated to be in the range of £180k–£200k per year.

However, the feasibility of producing the report on a weekly, biweekly, or monthly basis is not solely driven by cost. The primary constraint is the practicality of meeting the proposed timelines.

A **weekly** reporting frequency is not achievable. Previous presentations have shown that, under ideal conditions, producing the report would take more than three days. In practice, such ideal conditions are rare, as factors such as adverse weather, resource constraints, bank holidays, sick leave, IT system availability, data availability, among other factors must be considered.

A **biweekly** frequency may only be achievable occasionally, given the constraints outlined above. Additionally, during system incident events, resources must be prioritised to support the control room. During such periods, post-event analysis is not the immediate priority and can be delayed for several days.

# Detailed Cost Data

## Action 25 – JSC

It is also important to highlight that the timelines referenced above are based on the current reporting process. The proposed modifications introduce additional requirements that will further increase the time needed to produce the report. In particular, some data must be requested from TOs, as PMUs are not fault recorders. The retrieval time for this data cannot be reduced, as TOs do not typically have personnel available on-site to provide data immediately upon request. This data must also be analysed.

Furthermore, the proposed modification removes the provision to “report an outline of progress towards reporting” and instead requires submission of the complete report. This change increases the overall production time, as partial reporting is no longer possible and all required data must be available before submission.

Taking all of the above into account, the minimum feasible reporting frequency that NESO can reliably meet is **monthly**.

# Missing GC0105 Reports

## Action 27 – JSC

WG4 highlighted missing GC0105 reports on the NESO portal after September 2025. The below image shows the dates of each publication:

Date	Version	Details
10/15/2025	1	This file only contains the indicative reporting associated with draft data for GC0151 for October 2025. This file will be updated in November 2025 to reflect the full data set.
11/14/2025	2	This file only contains the indicative reporting associated with data for GC0151 for October 2025. This file is updated in November 2025 to reflect the full data set.
11/30/2025	3	This file contains the indicative reporting associated with data for GC0105 & GC0151 for October 2025.

Date	Version	Details
11/14/2025	1	This file only contains the indicative reporting associated with draft data for GC0151 for November 2025. This file will be updated in December 2025 to reflect the full data set.
12/15/2025	2	This file only contains the indicative reporting associated with data for GC0151 for November 2025
1/20/2026	3	This file only contains the indicative reporting associated with data for GC0151 & GC0105 for November 2025.

The reports highlighted as missing can be found in the link below.

[System Performance Reports | National Energy System Operator](#)

# Clarity on current reporting timeline

## Action 28 – MD

A Gantt chart (which is a process flow chart) has been created for the current reporting flow and for the best possible reporting flow (ie Weekly with and Extra FTE, Clear Weather & PMU data). This includes details of actions that require waiting or tasks that can be completed by multiple individuals.

This was shared with Workgroup 5 slides.

# Reportable Events Record

## Action 29 – MD

- Table shown on the right displays how many events are investigated each month.
- Numbers within the left column (for each year), represent the total number of events identified by the algorithm combined with those manually identified from internal reports.
- There were increased events in January and August 2024 due to storm 'Isha' and 'Lilian' respectively.
- Various macros within excel are used to gradually narrow down the total events identified to only those events that warranted a one-by-one analysis (shown in bold).
- For each event analysed, multiple sources are consulted including SCADA, Data Historian, Elexon BMRS, Elexon Remit, internal fault data bases, and the ENTSO-E portal.

Number of Events processed - GC0105						
Month/Year	2024		2025		2026	
Jan	9106	<b>140</b>	679	<b>47</b>	501	<b>84</b>
Feb	758	<b>33</b>	821	<b>44</b>		
Mar	791	<b>24</b>	895	<b>38</b>		
Apr	783	<b>33</b>	553	<b>25</b>		
May	688	<b>24</b>	580	<b>7</b>		
Jun	901	<b>29</b>	782	<b>39</b>		
Jul	820	<b>30</b>	408	<b>24</b>		
Aug	5601	<b>18</b>	342	<b>18</b>		
Sep	900	<b>38</b>	766	<b>18</b>		
Oct	839	<b>29</b>	928	<b>35</b>		
Nov	833	<b>44</b>	951	<b>35</b>		
Dec	788	<b>52</b>	537	<b>27</b>		



# Phase Jump Angle with Legal Text

## Action 30 – AG

- At present, phase angle jumps are not actively monitored. This capability is expected to be introduced as part of the WAMS platform once it becomes operational.
- Our understanding is that phase jump angle detection would be implemented as a configurable, event-based functionality rather than continuous system-wide monitoring. It would typically be enabled for selected buses of operational interest with defined thresholds to avoid spurious detections.
- In terms of handling, phase angle jumps could be classified based on severity by detecting abrupt changes in phase angles with validation logic to distinguish between genuine system events (sustained phase angle change) and spurious detections given that phase angle jumps not always mean a stability threat to the system, in many cases, they arise from switching events, measurement errors, etc.
- For reporting, an event-based approach would be more appropriate, where only thresholds exceedances are logged.
- Timelines are still unclear.

# Auto-Definition of phase angle jump as significant event Action 31 – FK/JSC

At present, phase angle jump is not a parameter that is actively monitored within the system, and the GB Grid Code does not define thresholds or classifications for what would constitute a “significant” phase angle jump event from a system monitoring perspective.

Within the Grid Code, phase angle jump is instead considered in the context of **plant performance and compliance**, where the requirement is on the connecting party (generator/user) to demonstrate that their plant can **withstand and appropriately respond to phase angle disturbances** (i.e. ride-through capability), rather than on NESO to detect or classify such events in real time.

In practice, this means that phase angle jumps are not currently treated as reportable system events. Where there is a need for post-event analysis, particularly in cases where a unit is suspected to have tripped or not responded as expected, relevant data would be requested from the generator to assess compliance against their ride-through capability.

# Auto-Definition of phase angle jump as significant event Action 31 – FK/JSC

We recognise that there may be a view that monitoring phase angle behaviour could support improved visibility of system dynamics and contribute to the management of system stability, particularly in light of recent large-scale disturbances internationally. However, the effectiveness of such monitoring would depend on a clearly defined operational use case, including how the data would be interpreted and acted upon in real-time.

Looking ahead, with the future implementation of WAMS, there is potential to introduce **targeted and configurable monitoring** of phase angle behaviour at selected buses. However, this would require:

- identification of buses of operational interest,
- definition of appropriate detection logic and thresholds, and
- alignment with real-time operational needs.

As such, any definition of what constitutes a “significant” phase angle jump event would need to be developed in the context of this future capability.

# Auto-Reclosure

## Action 32 – AG

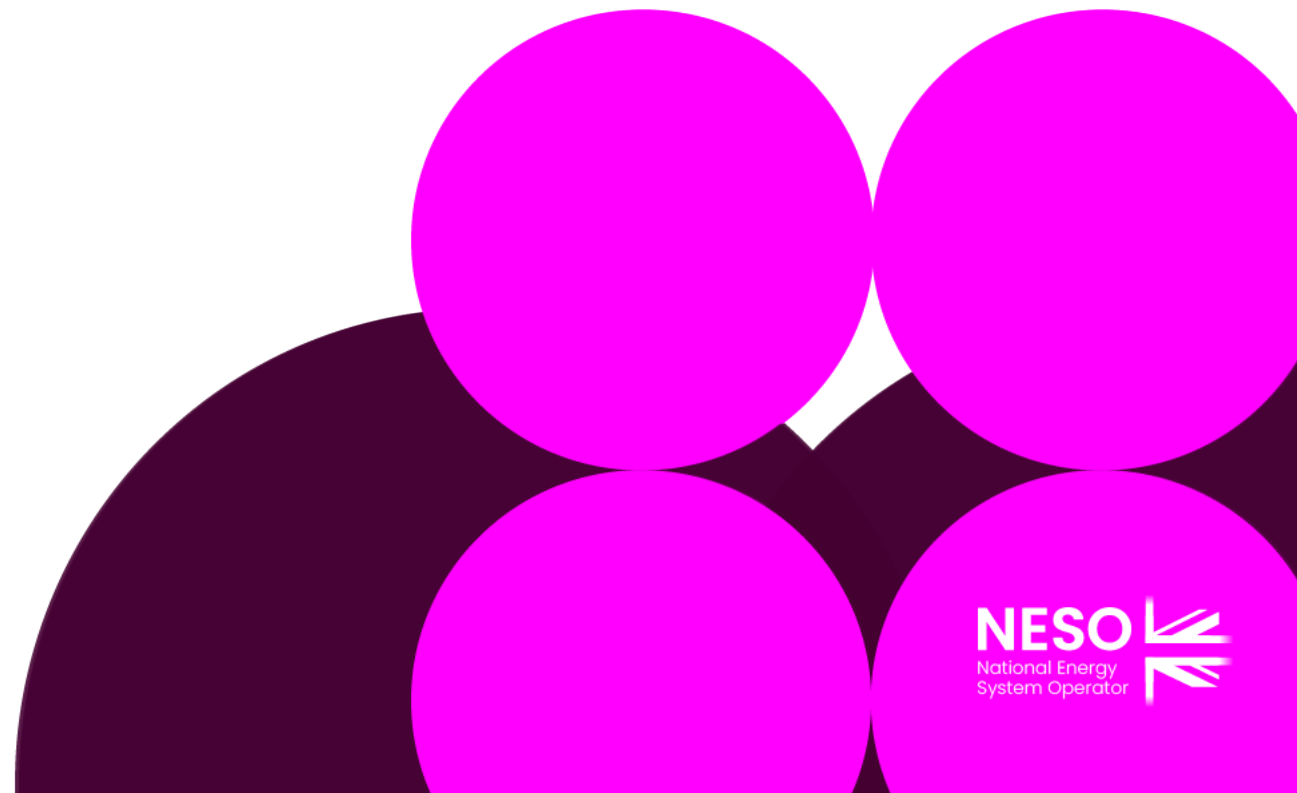
- Auto-reclosures triggered by power system trips are reported when fault current is detected. Maloperation of auto-reclosure is not reported.
- Data is collected from TOs, verified with iEMS (NESO Energy Management System), and incorporated into the GC0151 report.

# Legal Text

All

# Any Other Business

Jess Rivalland – NESO Code Administrator





# Next Steps

Jess Rivalland – NESO Code Administrator

