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National Grid Electricity System Operator, Electricity Transmission Licensees and other interested parties

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Date: 23 June 2022

Dear Colleague,

Frequency Risk and Control Report – April 2022: the Authority's decision

This letter comprises the Authority's[1] decision to approve[2] the Frequency Risk and Control Report 2022[3] (FRCR 2022) and its recommendations. The FRCR 2022 was submitted to us by the Electricity System Operator (ESO) on 1 April 2022.

Background

On 9 August 2019, there was a near-simultaneous loss of two large generators and consequential losses of Distributed Energy Resources (DER). These combined power losses went beyond the back-up power generation arrangements that the ESO had in place to keep the system stable, resulting in a significant frequency event. This triggered the disconnection, loss of power and disruption to more than one million customers.

Both our[4] and the government's Energy Emergencies Executive Committee[5] investigations into the incident required the ESO, in consultation with industry, to undertake a review of the Security and Quality of Supply Standard (SQSS) requirements for holding reserve, response and system inertia. On 10 December 2020, we approved SQSS modification GSR027[6]. GSR027

[1] References to the "Authority", "Ofgem", "we" and "our" are used interchangeably in this document. The Authority refers to GEMA, the Gas and Electricity Markets Authority. The Office of Gas and Electricity Markets (Ofgem) supports GEMA in its day to day work. This decision is made by or on behalf of GEMA.
[2] This document is notice of the reasons for this decision as required by section 49A of the Electricity Act 1989.
[3] The FRCR is available on the ESO's website: https://www.nationalgrideso.com/industry-information/codes/security-and-quality-supply-standards/frequency-risk-control-report
[4] Our report of the 9 August 2019 power outage can be viewed here: https://www.ofgem.gov.uk/publications-and-updates/investigation-9-august-2019-power-outage
[5] The government's Energy Emergencies Executive Committee report on the 9 August 2019 power outage can be viewed here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/855767/e3c-gb-power-disruption-9-august-2019-final-report.pdf
[6] Our decision to approve SQSS modification GSR027 can be found on our website: https://www.ofgem.gov.uk/publications-and-updates/gsr027-review-nets-sqss-criteria-frequency-control-drive-reserve-response-and-inertia-holding-gb-electricity-system

made changes to sections of the SQSS governing how the ESO secures against frequency deviations, introducing the requirement for an FRCR governing the ESO policies on securing against frequency deviations. The initial FRCR was submitted to us by the ESO on 1 April 2021, and we issued our decision to approve this on 12 May 2021[7]. GSR027 requires the ESO to review and update the FRCR at least annually.

The FRCR 2021

The implementation of FRCR 2021 was staged into two phases. Phase 1 relaxed the normal infeed loss constraint, and recategorized some loss risks which meant that no additional actions are taken to secure these risks. Phase 2 built from phase 1 and meant that the ESO no longer secured loss risks based on Rate of Change of Frequency (RoCoF) if the total loss could be secured to 49.2Hz with the total response holding (including Dynamic Containment). This resulted in reduced market actions, and reduced RoCoF curtailment actions when compared to 2020.

There were 12 occasions where the ESO secured events outside of the implemented policy. These were due to extreme weather conditions or the commissioning of new Balancing Mechanism Units (BMUs).

The FRCR 2022

This second edition of the FRCR reassesses the approved recommendations of the FRCR 2021, and includes simultaneous events in its assessment. The events considered remain the same as those considered in the FRCR 2021, with simultaneous events considered as two BMU-only[8] losses at the same instant in time, alongside any consequential RoCoF losses. The controls to mitigate transient frequency deviations also remains the same as those considered in the FRCR 2021, however increased availability of new faster-acting frequency response products like Dynamic Containment offer the capability to secure larger losses (such as simultaneous losses).

The FRCR 2022 analysis uses the same methodology as that of the FRCR 2021, adapted to incorporate simultaneous events. The FRCR 2022 assessment found that existing ESO policy (based on the FRCR 2021) remains good value, and that taking additional measures to secure against BMU+VS[9] losses remain poor value with respect to the corresponding risk reduction of a frequency event. It therefore recommends continuing with existing policy.

[7] Our decision to approve the initial FRCR 2021 can be found on our website; https://www.ofgem.gov.uk/publications/authority-decision-approve-frequency-risk-and-control-report-april-2021
[8] The term 'BMU-only' is a defined event category within the FRCR 2022.
[9] The term 'BMU+VS' is a defined event category within the FRCR 2022.

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Due to the computational complexity of assessing all simultaneous events for each settlement period across the study year, a statistical summary of simultaneous events was considered. This considered the median, upper quantile and maximum simultaneous event loss size. Current ESO policy (based on the FRCR 2021) secures 74% of all simultaneous events considered. The FRCR 2022 assessment found that securing against all simultaneous events (i.e. those not covered by current policy) would cost an additional £370m per year, which the ESO considers represents poor value for consumers. The ESO notes that a simultaneous event would need to occur at a rate of 1-in-2.5 years in order for the additional cost of securing against them to be comparable to the cost of securing against BMU+VS events, for which the FRCR 2021 recommended not to pursue. Based on operational experience only 3 unsecured simultaneous events have occurred in the last 30 years, therefore securing against them represents poor value for consumers.

The FRCR 2022 recommendation is to continue with existing policy:

1. Continue with the ESO's current internal operational policy of maintaining minimum system inertia (encompassing all system-wide frequency response and inertia controls) at 140GVA.s.
2. Continue to apply individual loss risk controls to BMU-only (and consequential RoCoF losses) to prevent frequency decreasing below 49.2Hz (returning to 49.5Hz or above within 60s), or above 50.5Hz.
3. Continue to not apply individual loss risk controls to BMU+VS events (intact or outage).
4. Not to apply additional system-wide controls to secure simultaneous events.

Applying the FRCR recommended policies results in indicative costs for 2022/23 of £330m (£190m of which is for Dynamic Containment), and residual likelihood of frequency deviations as listed in Table 1, below. We note that the likelihood of low frequency deviations below 49.5Hz has increased from the FRCR 2021. This is due to simultaneous events being considered within the analysis, and therefore cannot be compared directly to the FRCR 2021 figures.

Frequency Deviation	Duration	Likelihood
Greater than 50.5Hz	Any	1-in-1100 years
Between 49.2Hz and 49.5Hz	Up to 60s	2.5 times per year
Between 48.8Hz and 49.2Hz	Any	1-in-14 years
Less than 48.8Hz	Any	1-in-28 years

Table 1 – frequency risk after applying FRCR recommendations[10]

[10] We note that this table was not included in the FRCR 2022, however its content aligns with the FRCR 2022 findings and has been verified by the ESO.

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Industry Consultation

The ESO consulted on the FRCR 2022 from 21 February 2022 to 4 March 2022, receiving four responses generally supportive of the proposed FRCR 2022. One respondent considered that this is a complex area and further clarity on the derivation of the findings would be beneficial. They also considered that whilst Low Frequency Demand Disconnection (LFDD) is considered, the duration of this and number of customers impacted are not included in the assessment, and which may alter the acceptance of LFDD. This has been included in the FRCR 2022 list of future considerations. One respondent agreed with the recommendation that securing against all simultaneous events was not economical, however questioned what the optimum level of security would be. We note that as mentioned earlier, this was not possible due to the computational complexity of assessing all simultaneous events.

SQSS Panel recommendation

The SQSS Panel unanimously recommended the FRCR 2022 and methodology be submitted to the Authority for approval on 22 March 2022.

Decision notice

This letter sets out the Authority's decision on the implementation of the FRCR 2022 (referenced in the SQSS) and its proposals, and the reasons for that decision. We have considered the issues raised by the FRCR 2022 and its proposals dated 1 April 2022, including taking into account the responses to industry consultation, the SQSS Panel vote and the SQSS Panel recommendation, and conclude that:

- implementation of the FRCR 2022 and its proposals will better facilitate the achievement of objective (i) and (ii) of the NETS SQSS;[11] and
- approving the FRCR 2022 and its proposals is consistent with our principal objective and statutory duties.[12]

Reasons for our decision

We consider the FRCR has made the criteria by which the ESO balances cost and risk of frequency deviations (above 50.5Hz, or below 49.5Hz, 49.2Hz and 48.8Hz) more transparent.

[11] The NETS SQSS objectives are set out in chapter 3 of the NETS SQSS Industry Governance Framework: https://www.nationalgrideso.com/sites/eso/files/documents/NETS%20SQSS%20Industry%20Governance%20Framework%20v1.0%20%2830-03-12%29.pdf

[12] In making its decision, the Authority must act in accordance with its principal objective to protect the interests of existing and future consumers, and its statutory duties. The Authority's statutory duties are detailed mainly in the Electricity Act 1989 (in particular, but not limited to section 3A) as amended.

It assesses the risk of a discrete list of single events, and a statistical summary of simultaneous events, leading to frequency deviations, and the cost of a mix of options available to the ESO to prevent, or reduce the likelihood of, such frequency deviations from occurring. In so doing, it is explicit in considering the consequential impacts on distributed generation resulting from such events. The analysis therefore quantitatively demonstrates why the FRCR 2022 proposals represent an appropriate balance between the cost and residual likelihood of frequency deviations. We therefore consider that the implementation of FRCR 2022 and its proposals is in the interest of consumers.

We further note that the FRCR 2022 gives the ESO latitude in managing system risk when events occur that are outwith the scenarios considered in the FRCR 2022, such as severe weather etc. We expect transparency in ESO policy, to that end we expect the ESO to keep records of when they deviate from the FRCR 2022 and why. We expect an annual report to be provided by the ESO to us detailing the situations where they deviations occurred and that such instances feed into future iterations of the FRCR.

We consider the FRCR 2022 to better facilitate NETS SQSS objective (i) and (ii), and have a neutral impact on the other objectives.

(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;

The FRCR 2022 increases transparency in the criteria by which the ESO balances cost and risk to control system frequency by making explicit the events that will and will not be secured for. We note that the FRCR 2022 assessed the cost and benefit of securing against simultaneous events, concluding that the additional cost of £370m does not represent good value for consumers due to the low likelihood of occurrence. The FRCR 2022 therefore recommends continuing with the existing policies. We therefore consider it better facilitates this SQSS objective.

(ii) ensure an appropriate level of security and quality of supply and safe operation of the National Electricity Transmission System;

The FRCR 2022 assessed variations in ESO policy in securing against frequency diversions with respect to the cost and residual likelihood of frequency diversions. In doing so it demonstrates that the appropriate balance between cost and risk is achieved. We therefore consider it better facilitates this SQSS objective.

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Implementation

In this letter we have set out our decision to approve the FRCR 2022. This decision takes effect immediately. We note that as the FRCR 2022 recommends continuing with existing policy, there is no change to system operation and hence no implementation required.

Martin Queen
Head of Engineering Systems and Policy
Signed for and on behalf of the Authority

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