Making a positive difference
for energy consumers

All interested parties,

stakeholders in GB and beyond,

and other regulatory bodies

Email: Alastair.Owen@ofgem.gov.uk

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Dear colleagues,

**Decision to grant an exemption to NGESO from requirement to implement an automatic Frequency Restoration Process in the GB synchronous area.**

This letter sets out our[1] decision to grant an exemption to the Electricity System Operator ("ESO") from the requirement to implement an automatic Frequency Restoration Process ("aFRP") in the Great Britain ("GB") synchronous area, in accordance with Article 145 of the Commission Regulation (EU) 2017/1485[2] as amended by UK SI 2019 No.533, Schedule 1[3] (the "SOGL Regulation").

**Background**

The SOGL Regulation defines Frequency Restoration Process ("FRP") as a process that aims to restore frequency to the nominal frequency and, for synchronous areas consisting of more than one LFC area, a process that aims to restore the power balance to the scheduled value. aFRP means Frequency Restoration Reserves ("FRR")[4] that can be activated by an automatic control device.

In accordance with Article 145(1) of the SOGL Regulation, each Transmission System Operator ("TSO") of each Load Frequency Control ("LFC") area shall implement an aFRP.

[1] The terms "we", "us", "our", "Ofgem" and "the "Authority" are used interchangeably in this document and refer to the Gas and Electricity Markets Authority. Ofgem is the office of the Authority.
[2] Commission Regulation (EU) 2017/1485 of 2nd August 2017 establishing a guideline on electricity transmission system operation, available here: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R1485
[3] Statutory Instruments 2019 No. 533, Exiting the European Union, Electricity. The Electricity Network Codes and Guidelines (System Operation and Connection) (Amendment etc.) (EU Exit) Regulations 2019, available here: https://www.legislation.gov.uk/uksi/2019/533/made
[4] The active power reserves available to restore system frequency to the nominal frequency and, for a synchronous area consisting of more than one LFC area, to restore power balance to the scheduled value.

Nevertheless, Article 145(2) of the SOGL Regulation states that by 2 years after entry into force of this regulation, the TSO of the GB synchronous area can submit a proposal to the Authority requesting not to implement an aFRP. It also states that any such proposal shall include a Cost Benefit Analysis ("CBA") demonstrating that an aFRP would lead to higher costs than benefits.

At the moment, there is not an aFRP in use in the GB synchronous area. The ESO currently uses a combination of bid-offer acceptances ("BOAs") and dynamic response to keep the frequency within limits. Whilst dynamic response, static response, and low frequency demand disconnection ("LFDD") are used in the event of a large loss on the system.[5]

On 14 September 2019, in accordance with Article 145(2) of the SOGL Regulation, the ESO submitted a request, and supporting CBA, to us to not implement an aFRP.[6] On 3 November 2020, we requested further information, and this was submitted to Ofgem on 19 March 2021. In summary, the ESO's CBA provided the following information:

- **The ESO's frequency quality data for the period 2014-2020 compared to the limits stated in Annex III of the SOGL Regulation.**

  The ESO provided us with frequency data over the period 2014 to 2020 and compared it to the limits set out in Annex III of the SOGL Regulation. The ESO's analysis showed that between 2014 and 2020 the ESO was within the standard frequency range[7] limits and restored frequency to within the frequency restoration range[8] for every event within the statutory time to restore frequency.[9]

  The ESO also provided evidence that the power outage on 9 August 2019 was the only occasion where frequency was outside the limits for maximum instantaneous

[5] Further information about the current frequency response services used by the ESO is available here: https://www.nationalgrideso.com/industry-information/balancing-services/frequency-response-services
[6] The SOGL came into force on the 14th September 2017: https://www.nationalgrideso.com/document/103511/download
[7] 'Standard frequency range' means a defined symmetrical interval around the nominal frequency within which the system frequency of a synchronous area is supposed to be operated (GB is ±200mHz).
[8] 'Frequency restoration range' means the system frequency range to which the system frequency is expected to return in the GB synchronous area, after the occurrence of an imbalance equal to or smaller than the reference incident within the time to restore frequency (GB is ±200mHz).
[9] 'Time to restore frequency' means the maximum expected time after the occurrence of an instantaneous power imbalance smaller than or equal to the reference incident in which the system frequency returns to the frequency restoration range for synchronous areas with only one LFC area and in the case of synchronous areas with more than one LFC area, the maximum expected time after the occurrence of an instantaneous power imbalance of an LFC area within which the imbalance is compensated (GB is 15 minutes).

deviation[10] and maximum steady state deviation[11]. The ESO also stated that an aFRP would not have mitigated the 9 August 2019 power outage.[12]

- **Ability to exchange aFRR with other connected systems**.

  The ESO highlighted two potential barriers that GB would face if an aFRP was to be implemented that could affect its economic benefit:

  1) The ESO stated that since GB is no longer a member of the European Union, GB cannot currently participate in markets that exchange aFRR (i.e. the PICASSO platform[13]) with connected countries as this may derive benefits for GB consumers; and
  2) As the GB system is only connected to Europe via High Voltage Direct Current ("HVDC") links, there would be several technical issues that would prevent the exchange of aFRR. The ESO highlights the key points from the explanatory document for the implementation framework for aFRR[14] which is part of the PICASSO and Imbalance Netting platforms.
     i. Exchange on HVDC must be explicitly defined and controlled, unlike AC where the flow is governed by the grid configuration. If there are any mismatches between the HVDC link and the generating units there will be large frequency deviations. As a result a specialised control interface to the HVDC would be needed, and in order to obey operational security limits, the capacity for aFRR on HVDC would need to be limited;
     ii. HVDC cables have losses, and these cannot be handled by the PICASSO algorithm. PICASSO is also not capable of dealing with technical issues such as maximum ramp rates and dead zones.

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[10] 'Maximum instantaneous frequency deviation' means the maximum expected absolute value of an instantaneous frequency deviation after the occurrence of an imbalance equal to or smaller than the reference incident, beyond which emergency measures are activated (GB is 800mHz).
[11] 'Maximum steady-state frequency deviation' means the maximum expected frequency deviation after the occurrence of an imbalance equal to or less than the reference incident at which the system frequency is designed to be stabilised (GB is 500mHz).
[12] The 9 August 2019 outage power outage occurred due to a large generation loss on the system that caused system frequency to fall rapidly. This caused interruptions to over 1 million consumers electricity supply. Further information about the 9 August 2019 power outage is available here: https://www.ofgem.gov.uk/publications/investigation-9-august-2019-power-outage
[13] Further information about the PICASSO platform is available here: https://www.entsoe.eu/network_codes/eb/picasso/
[14] Explanatory document to all TSOs' proposal for the implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation in accordance with Article 21 of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing is available here: https://www.nationalgrideso.com/document/188491/download

- **Potential economic costs/benefits from implementing an aFRP**

  The ESO provided a cost estimate of £1m per provider with a need to procure aFRR from 25 providers (i.e. £25m total) to implement an aFRP in GB. The ESO states that the reason for this is that it currently does not have the IT capability to send control messages directly to load controllers[15] and would need to develop the necessary IT and infrastructure.

  The ESO provided evidence on the potential benefits of having fewer frequency deviations. The ESO believes that there could be a MW per MW trade-off between response and aFRR resulting in the volume currently being procured for response shifting to an aFRR market. However, the ESO also believe that MWs procured in an aFRR market could be more expensive than procuring the existing response products. This is because the aFRR market will only be available to a limited set of providers and hence won't be as liquid as the already mature response market. This is due to the ESO estimating that they only need 25 providers of aFRR in GB.

  The ESO also states that implementing an aFRP could provide economic benefits as it would reduce the number of manual actions taken by the ESO and create smaller frequency deviations. Conversely the ESO states that if an aFRP were to be implemented there would be costs associated with developing new processes to determine which Balancing Mechanism Units are equipped with aFRR. In addition, the ESO is concerned that having tighter frequency could lead to over-engineering solutions that may be expensive. This coupled with the GB system already being within the SOGL Regulation limits, results in the ESO stating that there is no added economic benefit to consumers.

**Reasons for our Decision**

We have reviewed the CBA submitted to us in line with the requirements of the SOGL Regulation. We have also engaged with the ESO to clarify our understanding of the proposal.

When assessing the ESO's request to not implement an aFRP, and supporting CBA, we considered the following aspects outlined in the background section:

[15] An electronic load controller or governor is a device which is designed to ensure that the electrical load on a generator remains constant.

- **The ESO's frequency quality data for the period 2014-2020 compared to the limits stated in Annex III of the SOGL Regulation.**

  We looked at whether the ESO's existing suite of balancing services were sufficient to control frequency within the limits set out in Annex III of the SOGL Regulation. From the frequency quality data presented, we concur that the current suite of products have kept the ESO well within these limits over the last 7 years.

  With regards to the 9 August 2019 power outage. We understand that since this was a result of two faults that occurred near simultaneously which resulted in the total loss of generation being much greater than the volume of reserve kept for a securable event.[16] This volume would have been unchanged if an aFRP was implemented at that time. Therefore, it is unlikely that an aFRP would have had any impact on 9 August 2019. We also note that an aFRP would be a pre-fault service, it would have had limited ability to mitigate the incident given that frequency was at exactly 50.0Hz[17] before the power outage occurred.

  Nevertheless, we noticed that there is an increasing trend in the number of frequency events (i.e. occasions where frequency deviates outside of the standard frequency range), and the duration of low frequency events is also starting to increase. As a result, we believe that it is essential for the ESO to continue monitoring this and to continue developing cost-efficient balancing services that contribute to maintaining frequency within the limits set out in Annex III of the SOGL Regulation.

- **Ability to exchange aFRR with other connected systems**.

  We agree with the ESO's assessment that sharing aFRR across HVDC interconnectors has a number of technical obstacles that could be very challenging. Even if these obstacles were overcome, we note that GB is no longer a member of the European Union, meaning that GB currently would not be able to participate in the PICCASSO platform. Therefore, we do not believe that implementing an aFRP in GB will yield any benefits from exchanging aFRR with connected countries at this time.

[16] This is decided based on the single largest infeed loss on the system
[17] ESO Technical Report on the events of 9th August 2019 is available here: https://www.nationalgrideso.com/document/152346/download

- **Potential economic costs/benefits from implementing an aFRP**

  The ESO has estimated that it could cost approximately £25m to update its systems in order to implement an aFRP in GB, whilst providing little additional benefits.

  We consider the ESO's estimates of costs to be indicative, and that they do not factor in costs that may be incurred by market participants. Nevertheless, we agree that implementing an aFRP in GB would be unlikely to provide any material economic benefits associated with cross-border trade at this time. On a qualitative basis, we also understand that cost savings associated with a reduction in the amount of response procured could also be offset by a potentially illiquid market for aFRR. Therefore, we do not believe that implementing an aFRP in GB will provide consumers with net benefits at this time.

**Conclusion**

Overall, the ESO have identified benefits in implementing an aFRP, such as reducing the requirement for response, tightening frequency variation on the system, and reducing the number of manual actions required to bring frequency back to 50Hz. However there were several key areas that the ESO provided information where implementing an aFRP was not beneficial to the GB consumer. This is due to the GB system being well within the SOGL Regulation limits, aFRP being very difficult to share with other TSOs due to GB no longer being an EU member state and technical reasons, and the potential for an aFRR market having a low liquidity compared to response. Given that there is not a clear need to implement an aFRP from a frequency quality perspective, and that it is difficult to conclude that there will be an economic benefit, we do not believe that aFRP should be implemented in the GB synchronous area at this time.

**Decision and next steps**

We believe that an aFRP should not be implemented in the GB synchronous system at this time and we hereby:

- Grant the Electricity System Operator an exemption from the requirement to implement an automatic Frequency Restoration Process in the GB synchronous area, in accordance with Article 145 of the SOGL Regulation.

Whilst the ESO's current CBA suggests that an aFRP should not be implemented, it is important to monitor the needs case going forward. Article 145(2) of the SOGL Regulation requires this decision to be reviewed at least every four years. Therefore, we ask the ESO to re-evaluate the costs and benefits of implementing an aFRP in GB within 4 years from the date of this decision and submit its assessment to Ofgem for consideration. At a minimum, we expect the ESO to continue to monitor:

- The system frequency against the SOGL Regulation limits, and
- The impact of any proportional increase in renewable generation on system frequency deviations.

We expect the next CBA to include at least similar level of information to what was provided to us on the 19 March 2021. Additionally, if frequency data from the period 2021 to 2025 shows that the ESO is close to standard frequency range limits, we would expect the ESO to perform a more in-depth analysis of the potential costs and benefits to GB consumer from implementing an aFRP.

If you have any questions about the contents of this letter, please contact Luke McCartney (Luke.McCartney@ofgem.gov.uk) or James Hill (James.Hill@ofgem.gov.uk).

Yours sincerely,

**Alastair Owen**
Senior Manager – System and Networks