**Workgroup Consultation Response Proforma**

# GC0154:
# Incorporation of interconnector ramping requirements into the Grid Code as per SOGL Article 119

Industry parties are invited to respond to this consultation expressing their views and supplying the rationale for those views, particularly in respect of any specific questions detailed below.

Please send your responses to grid.code@nationalgrideso.com by **5pm** on **03 August 2023**. Please note that any responses received after the deadline or sent to a different email address may not receive due consideration.

If you have any queries on the content of this consultation, please contact Catia Gomes catia.gomes@nationalgrideso.com or grid.code@nationalgrideso.com

| Respondent details | Please enter your details | |
|---|---|---|
| **Respondent name:** | Louise Trodden | |
| **Company name:** | ESO | |
| **Email address:** | Louise.trodden@nationalgrideso.com | |
| **Phone number:** | 07866 165538 | |
| **Which best describes your organisation?** | ☐Consumer body<br>☐Demand<br>☐Distribution Network Operator<br>☐Generator<br>☐Industry body | ☐Interconnector<br>☐Storage<br>☐Supplier<br>☐Transmission Owner<br>☐Virtual Lead Party<br>☒Other |

**I wish my response to be:**
(Please mark the relevant box) ☒Non-Confidential ☐Confidential

*Note: A confidential response 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.*

**For reference the Applicable Grid Code Objectives are:**

a) *To permit the development, maintenance and operation of an efficient, coordinated and economical system for the transmission of electricity*
b) *Facilitating effective competition in the generation and supply of electricity (and without limiting the 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);*

c) *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;*
d) *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*
e) *To promote efficiency in the implementation and administration of the Grid Code arrangements*

## For reference, (for consultation questions 5 & 6) the Electricity Balancing Regulation (EBR) Article 3 Objectives and regulatory aspects are:

a) *fostering effective competition, non-discrimination and transparency in balancing markets;*
b) *enhancing efficiency of balancing as well as efficiency of national balancing markets;*
c) *integrating balancing markets and promoting the possibilities for exchanges of balancing services while contributing to operational security;*
d) *contributing to the efficient long-term operation and development of the electricity transmission system and electricity sector while facilitating the efficient and consistent functioning of day-ahead, intraday and balancing markets;*
e) *ensuring that the procurement of balancing services is fair, objective, transparent and market-based, avoids undue barriers to entry for new entrants, fosters the liquidity of balancing markets while preventing undue market distortions;*
f) *facilitating the participation of demand response including aggregation facilities and energy storage while ensuring they compete with other balancing services at a level playing field and, where necessary, act independently when serving a single demand facility;*
g) *facilitating the participation of renewable energy sources and supporting the achievement of any target specified in an enactment for the share of energy from renewable sources.*

**What is the EBR?**

The Electricity Balancing Regulation (EBR) is a European Network Code introduced by the Third Energy Package European legislation in late 2017.

The EBR regulation lays down the rules for the integration of balancing markets in Europe, with the objectives of enhancing Europe's security of supply. The EBR aims to do this through harmonisation of electricity balancing rules and facilitating the exchange of balancing resources between European Transmission System Operators (TSOs). Article 18 of the EBR states that TSOs such as the ESO should have terms and conditions developed for balancing services, which are submitted and approved by Ofgem.

**Please express your views in the right-hand side of the table below, including your rationale.**

| Standard Workgroup Consultation questions | | |
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| 1 | Do you believe that the Original Proposal and/or any potential alternatives better facilitate the Applicable Objectives? | Mark the Objectives which you believe each solution better facilitates:<br>Original: ☒A ☒B ☒C ☒D ☒E ~~☒F~~ ~~☐G~~<br>WA(G)CM1: ☐A ☐B ☐C ☒D ☐E ~~☐F~~ ~~☐G~~<br>Please see comments relating to the original<br>a- Reducing the speed at which interconnectors ramp allows the ESO to better fulfil its licence obligations to operate the transmission system in an economical and efficient manner. The current interconnector ramp rates (100MW/min) often result in the ESO having to reposition units in the Balancing Mechanism (BM) at a cost to the GB consumer.<br>Work completed by Baringa quantified this reduction in speed/need to reposition with a saving over 7 years of £865m to balancing costs (reducing to 50MW/min). This repositioning of units frequently extends the run of reserve providing units that need to be available to manage fast ramping. When this occurs close to real time, this requires the use of fast reserves that are typically more expensive to instruct.<br>Baringa concluded that as the number of interconnectors increases, the likelihood of actions taken to manage fast ramping will also increase. Extra frequency response units will also be required to manage these frequency deviations, again at a cost to the GB consumer.<br>b- Reduction of the ramping arrangements that are currently in place brings the interconnectors more in line with the current ramping arrangements in place for generators.<br>c- Security of supply is high priority for the ESO. With increased interconnection connecting to the grid in the near future, a slower ramp rate means that there is more control over actions which impact system security. Reducing ramp rates reduces the number of instructions and individual actions required on units to manage the change in flows across the interconnectors. Having to take less actions reduces the complexity of manging the |

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| | | system, increases system security and reduces GB balancing costs by a significant amount.<br>d- This change allows the ESO to be compliant with the ramping requirements within SOGL.<br>e- Including ramping arrangements in the Grid Code aids transparency of operations for all parties, eliminates the need for this requirement to be specified in bilateral agreements, delivers consistency in approach and responds to the requirements from both retained EU law (SOGL) and Ofgem who requested that these arrangements are included in the relevant code.<br>Please see comments relating to the **alternate**:<br>*a)* and c) **Negative** The current arrangements, as proposed by the alternate, do not promote an efficient, coordinated or economical system. The study completed by Baringa shows that the current arrangements contribute to an increase in balancing costs, which in turn incurs a cost to the GB consumer. The original proposes to save £865m against the alternate. It is not clear where the benefit is to consumers with the alternate.<br>*b)* **Neutral**<br>*d)* **Positive**- This change allows the ESO to be fully compliant with the retained EU Law and relevant SOGL articles.<br>*e)* **Neutral** As with the original, including ramping arrangements in the Grid Code aids transparency of operations for all parties, eliminates bilateral agreements and responds to the requirements from both retained EU law (SOGL) and Ofgem who requested that these arrangements are included in the relevant code. However, the alternate suggests that further work will be undertaken, after 100MW/min is added to the Grid Code. This does not promote efficiency of the process as these discussions have already taken place over 14 workgroups and other possibilities have not been worked up into an alternate solution to date. The first workgroup was held in January 2022 and previous engagement was conducted in late 2021 at JESG and GCDF before the mod was raised in December 2021. |

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| 2 | Do you support the proposed implementation approach? | ☒Yes<br>☐No |
| | | We support a 10-day implementation period from the date of a decision by Ofgem to implement this proposal. Should additional system requirements be identified through the consultation process, this may require further consideration. |
| 3 | Do you have any other comments? | The workgroup was keen to complete a Cost Benefit Analysis (CBA) to understand what solutions could solve the defect with this modification. The workgroup expressed that they would prefer this be completed by a third party, rather than the ESO. The ESO ran a tender to employ a consultant, and the CBA was completed by Baringa (independently). This CBA used publicly available data to allow for transparency. The purpose of the CBA was to review a set of options against the status quo and allow the group to make a recommendation based on the outputs as to how it should proceed.<br><br>All of the options assessed in the CBA presented a cost saving to the GB Consumer (against the status quo). The costs of these were varied (depending on the option this ranged between £428m and £865m). The alternate proposal (100MW/min and status quo) was the base line for comparison on cost savings for the options in the CBA. To propose this as the alternate is no better than we are today as this presents no costs savings to the consumer and does not solve the issues that ESO faces in managing fast ramp rates in real time operation. There have been conversations regarding the options modelled in the CBA, and others during the 14 workgroups to date.<br><br>The interconnector owners do not believe the costs highlighted in the CBA are accurate. There is the suggestion that the large cost savings for reducing ramping to 50MW/min is not as high as Baringa reported in the outputs of the CBA. There were questions raised in the workgroup regarding compensation for imbalance and the ask that interconnectors were kept whole in the process. The interconnectors suggest that they are exposed to imbalance costs. To understand this, the ESO and Baringa asked the interconnectors to provide imbalance data to support the CBA. This imbalance data was not provided so could not be included in the CBA. The group has asked many questions of Baringa following the playback of the CBA, to which they have |

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| | | responded. All material that can be shared has been provided to the workgroup, acknowledging that intellectual property rights apply to some of the work completed by Baringa, such as the PLEXOS model output data (used as an input to the CBA) and the CBA tool.<br><br>Another solution that workgroup members favoured was a TSO-TSO service. This type of service needs to be designed and agreed with the respective TSO. It is also worth noting that TSO-TSO services are non-firm, so cannot be guaranteed. Nevertheless, the ESO added this solution as a modelled option to the CBA at the request of the interconnectors.<br><br>SOGL also requires these arrangements to be applied across synchronous areas so all respective TSO's would be required to implement the same service. There are some interconnectors who currently have a TSO-TSO service built into their operational agreements, however these are not fit for purpose. Not all interconnectors have the technical capability to offer this service, and some do not want to offer this service. There are also clauses in arrangements which require any ramping restrictions to be applied equitably on all interconnectors, however as not all interconnectors can provide this service, this is not a viable solution. Added to this, the connected TSO may not be able to facilitate the use of such service due to impacts to their system operation, thus not guaranteeing the required ramp-rate reduction. With the change to hourly gates, this also presents an issue as the notice period to request ramp management is longer than the notice to changes provided in the hourly reference programme. All of this leads to a proposal which provides a non-guaranteed, unreliable and, at times, unavailable service, which does not resolve the issues which the ESO are trying to address.<br><br>The interconnectors are proposing to raise another modification after including 100MW/min into the Grid Code. It is not clear in the alternate proposal for this new modification how the challenges (noted above) to utilise these services would be mitigated. There is also no detail to explain how any costs are likely to be recovered for any potential service and the impacts of these costs on balancing which ultimately impacts the GB consumer. Additionally, to continue these conversations by raising another modification to carry out further discussions and |

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<tr><td></td><td></td><td>work up a solution undermines the previously completed CBA and workgroup conversations to date. This is not a valuable use of the industry time.<br><br>TSOs are required to manage ramping arrangements to avoid any manual or automatic intervention which can impact another TSO system, therefore by imposing a maximum 50MW/min rate allows clarity for all parties. The interconnectors are considering completing their own CBA for this work which has the potential to delay the progress of the workgroup. The scope of this has not been shared to date. It is also not clear what benefit this will have at this stage, or why it was not done earlier in the process to support the development of a solution. Further detail of this is expected to be discussed after the workgroup consultation process is completed.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Do you wish to raise a Workgroup Consultation Alternative Request for the Workgroup to consider?</td><td>☐Yes<br>☒No</td></tr>
<tr><td>Click or tap here to enter text.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Do you agree with the Workgroup’s assessment that GC0154 does impact the Electricity Balancing Regulation (EBR) Article 18 terms and conditions held within the Grid Code?</td><td>☒Yes<br>☐No</td></tr>
<tr><td>This change has an impact on the balancing section of the grid code due to the positioning of ramping rates in the Grid Code.</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Do you have any comments on the impact of GC0154 on the EBR Objectives?</td><td>☒Yes<br>☐No</td></tr>
<tr><td>By including the original proposal into the Grid Code in BC1, this will impact the following EBR objectives<br><br>
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<tr><td>A</td><td>fostering effective competition, non-discrimination and transparency in balancing markets;</td><td>Positive – slower ramping arrangements means that the ESO has more time to react to changes in interconnector flows. This creates the</td></tr>
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| | | possibility that other BM units may be able to support any changes, rather than use fast response close to real time. |
| *B* | *enhancing efficiency of balancing as well as efficiency of national balancing markets;* | **Positive –** slower ramping arrangements means that the ESO has more time to react to changes in interconnector flows. This creates the possibility that other BM units may be able to support any changes, rather than use fast response close to real time. |
| *C* | *integrating balancing markets and promoting the possibilities for exchanges of balancing services while contributing to operational security;* | **Neutral** |
| *D* | *contributing to the efficient long-term operation and development of the electricity transmission system and electricity sector while facilitating the efficient and consistent functioning of day-ahead, intraday and balancing markets;* | **Positive** slower ramping arrangements means that the ESO has more time to react to changes in interconnector flows. This creates the possibility that other BM units may be able to support any changes, rather than use |

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| | | fast response close to real time and increase system security |
| *E* | *ensuring that the procurement of balancing services is fair, objective, transparent and market-based, avoids undue barriers to entry for new entrants, fosters the liquidity of balancing markets while preventing undue market distortions;* | **Positive**<br><br>Reducing ramping means that there is less potential for instructing more costly BM units to manage fast ramping, which in turn could inadvertently result in undue market distortions that may then be passed to the end consumer |
| *F* | *facilitating the participation of demand response including aggregation facilities and energy storage while ensuring they compete with other balancing services at a level playing field and, where necessary, act independently when serving a single demand facility;* | **Neutral** |
| *G* | *facilitating the participation of renewable energy sources and supporting the achievement of any target specified in an enactment for the share of energy from renewable sources.* | **Positive**<br><br>Interconnectors can still provide energy from renewable sources and support the goal of net zero |

| Specific Workgroup Consultation questions | | |
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| 7 | Does the Original proposal or the alternative impact EU TSOs? | ☐Yes<br>☒No<br>Each TSO area is required to implement measures to ensure system security inside its LFC block area. To do this, GB requires a reduced ramping rate for HVDC interconnectors to ensure it is able to adhere to the frequency target parameters and to maintain its FRCR targets. ENTSOe has (in respect of the same SOGL requirements - Article 137,(3)) applied a 10-minute ramping window. This has impacted GB system operation as it means that all interconnectors ramp at the start of the hour, and with the current speed of ramping at 100MW/min this is not feasible for system security.<br><br>The original is seeking to reduce the speed of ramping on HVDC interconnectors and to bring interconnectors more in line with BM Units. The connected TSO will be aware of the arrangements of the GB interconnectors following this modification process. By operating with a static limit, this gives clarity to the connected TSO as the ramping arrangements will be known ahead of time and there will be less opportunity for changes closer to real time. It also means that the requirement of enhanced or emergency actions is reduced to manage the GB system should sufficient reserves in GB not be available. |
| 8 | Has there been sufficient effort taken to seek and obtain European engagement? Other- if other what else could have been done? | ☒Yes<br>☐No<br>As a result of BREXIT, the ESO is no longer a member of ENSTOe and formal engagement with EU TSO's was problematic, therefore it was not possible to undertake detailed engagement with the EU TSOs in the early stages of this work. The workgroup had concerns that there should be more conversations regarding this work, so the ESO took an action to update on this in each workgroup meeting. Whilst these updates were happening in the meetings, there were some members of the workgroup who were not convinced of the engagement to date, so the ESO shared a table in workgroup 10 to show when meetings with EU TSOs had taken place and what had been discussed. At the point of sharing, there had been four cross-industry conversations/discussions.<br><br>The impacts of BREXIT meant that the ESO has been reliant on sharing outputs of meetings with members of the Intra Synchronous Area group (ISA) to feed into the |

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| | | regular ISA workgroup meetings. All material has been shared to this group (including the request for proposal for the CBA, before being conducted), and the outputs of the CBA have also been shared.<br><br>There have been three more detailed conversations since and there will be on-going conversations with the ISA group regarding GB's recommendations, now we have the CBA results. To date, there have been seven conversations/discussions.<br><br>The ESO also invited the chair of the ISA group to attend workgroup 12 which was welcomed by the workgroup. The ESO has also asked if the chair may attend where required at future meetings too. |
| 9 | Does the Original proposal / alternative allow for GB to reach its net zero targets? | ☒Yes<br>☐No<br>The original still enables GB to utilise the flexibility that interconnectors bring to the energy landscape. The original solution continues to allow interconnectors to transfer energy to and from GB to connected countries. Therefore, supporting the net zero target with the goal to operate the system by using green energy. |
| 10 | Do you believe the Original proposal or alternative impacts the interconnector business model? (Please consider any commercial and operational impacts) | ☒Yes<br>☐No<br>Currently the interconnectors have the ability to ramp once per hour for 10 minutes to achieve their Physical Notification. By reducing the ramping rate to 50MW/min the interconnectors can still ramp in this way, just not at the same maximum speed as they do today.<br><br>In 2025, there is a change for EU TSO's to implement a 15min MTU. For GB, reducing ramping to 50MW/min for HVDC interconnectors creates a way to mitigate the impacts of large changes in flow on interconnectors. This is particularly important now, when interconnector ramping occurs once for 10 mins at 'the top of the hour' but even more so when the EU 15 min MTU is in place as the interconnectors will have the opportunity to ramp for 40 minutes per hour, instead of the 10 mins per hour as is the case now<br><br>The interconnectors have expressed a concern that they may not be able to ramp to final position in the ramping period and that there is a risk that this could result in them spilling into a subsequent settlement period. This has not been verified with any data to support this claim that the interconnector would then be subjected to |

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| | | increased imbalance costs. There is also the potential that the subsequent settlement period has a reduced associated cost, therefore there would not be an increase to the imbalance costs faced. |
| 11 | Does the Original proposal / alternative meet the requirements of Ofgem's August 2019 decision on the implementation of the SOGL? (Check if this is incorporated in grid code objectives) | ☒Yes<br>☐No<br>Within Ofgem's decision letter it states; *In addition, the intermediate methodology is designed so that obligations detailed within its articles will be incorporated within the Grid Code or the NETS SQSS. Our expectation is that the ESO will promptly incorporate these provisions within the Grid Code or NETS SQSS, thus providing an opportunity, if necessary, to add further details.*<br><br>The original proposal meets the requirements of this request to include ramping arrangements into the Grid Code. The ESO has also used this opportunity for additional detail to be considered to allow for a more efficient operation of the GB electricity system by proposing to reduce ramping arrangements and increase system security whilst seeking to reduce balancing costs. |
| 12 | Do you believe that the Original/alternative solves the operational challenges faced by the ESO as a result of fast simultaneous interconnector ramping? | ☒Yes<br>☐No<br>Within the licence conditions, the ESO has a responsibility to operate the system in an economic and efficient manner.<br><br>Reducing ramping to 50MW/min not only brings interconnectors more in line with parties who must comply with the current Grid Code arrangements, but this allows the control engineers to ensure that the system is operating in the most efficient way (as per the ESO licence conditions). As the level of interconnection increases, continuing to reposition units in response to interconnector ramping (by taking costly and close to real time actions in the BM) to manage interconnector flow changes will increase costs to the GB consumer. The costs of managing ramping by increasing reserves is passed to the end consumer and therefore does not present social economic welfare benefit. This also presents a risk to operational security should these reserves not be available, highlighting another operational challenge that would require management if there was no change made to the way we operate today.<br><br>During the initial scoping of this work, and prior to the CBA being conducted, over a 10 month period, there were 10 significant frequency events where system |

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| | | frequency was pushed outside operational boundaries for a period of time, creating a risk to security of supply. This initial study also highlighted 31 examples of further frequency deviations caused by fast interconnector ramping. The significant frequency events were avoided only as a result of the Control Room taking multiple frequency control actions. The work that Baringa completed has verified this, and Frequency events due to fast interconnector ramping are still occurring today.<br><br>The ESO also experiences voltage issues across the network because of fast interconnector ramping. The ESO often encounters issues because of fast changes in flows across the interconnectors. Whilst the majority of the interconnectors flow into and out of the South East coast, the changes in voltage have impacts across the country. For example, following large interconnector flow changes we have seen voltage suppression in the Yorkshire area. Whilst this is currently being 'managed' by the control engineers it is becoming more challenging and runs the risk of operability and security of supply issues with the increase in interconnection.<br><br>GB is an island connected to the following synchronous areas; Continental Europe (CE), Ireland and Norway. CE comprises of a larger network than GB, Ireland and Norway. Ireland has a much smaller ramping rate than the CE interconnectors at 5MW/min, as does Norway at 30MW/min (on the GB border). This demonstrates that a one size fits all ramping arrangement is not necessarily the right approach. All TSO's in the EU must comply with the SOGL requirements of A119 (c) and as such have developed and implemented their own proposals with ramping arrangements to suit their respective networks. Recently the Nordics have concluded similarly to GB that a slower ramp rate allows for increased system security and social economic welfare benefits, reducing the ramping arrangements it had in place for both HVDC interconnectors and generation.<br><br>For GB, reducing ramping to 50MW/min for HVDC interconnectors creates a way to mitigate the impacts of large changes in flow on interconnectors. This is particularly important now, when interconnector ramping occurs once for 10 mins at 'the top of the hour' but even more so when the EU 15 min MTU is in place as the interconnectors will have the opportunity to ramp for 40 |

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| | | minutes per hour, instead of the 10 mins per hour as is the case now. |
| 13 | Do you believe the Original proposal or alternative proposal/s impacts or is impacted by the EU 15 MTU change? | ☒Yes<br>☐No<br>Both the original proposal and the alternate are impacted by the EU 15 min MTU change which is mandatory from 2025. Both of these options have an impact in that there will be 4 ramping periods per hour, not one as is today.<br><br>The additional ramping periods (together with the imposed 10 min ramping window from the EU TSO) mean that operationally the control room will be required to manage ramping x4 per hour, rather than once as it is today. By reducing ramping to 50MW/min, this means that the risk of four periods of ramping per hour at 100MW/min is reduced, meaning that the potential to have to reposition units four times per hour is less. This means that there is a lower risk to security of supply should fast reserves not be available.<br><br>The ESO has also shared some thoughts regarding this with the workgroup, including some graphs to depict how ramping arrangements look today, and how this could look with both the 50MW/min recommendation from the ESO and the 15 min MTU which will be implemented in the EU by 2025 |
| 14 | Do have any comments on the reliability of the CBA conducted by Baringa? If available, please provide any analysis supporting your response. | ☒Yes<br>☐No<br>The CBA was completed by Baringa (independently). This CBA used publicly available data to allow for transparency. The initial request for proposal was written by the ESO and shared to the workgroup for review and comment. All workgroup members had the opportunity to comment on the proposal if desired and therefore shape the scope of the work. The suggestions from the workgroup were used to finalise the proposal which was sent out for tender. When a consultant was appointed, the ESO shared all the feedback that it had received to that point and any feedback received whilst the CBA was being conducted was shared with and responded to by Baringa where appropriate and the ESO if required.<br><br>The workgroup took a much more active role in the CBA than had initially been anticipated and were keen to share views, of which Baringa took into consideration and acted on feedback. This included the ESO asking for an |

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| | | extension and obtaining further funding on the project to include consideration of options workgroup members specifically wanted to see in the CBA which had not made it through the initial Harvey Balls scoring process. The CBA evaluation process was therefore altered to accommodate the workgroup requests for specific options to be considered and the initial suggestion of shortlisting was superseded by suggestions from the workgroup.<br><br>Baringa subsequently attended 5 working groups to share the methodology they intended to use for the work, and the assumptions they would use to model the scenarios in the CBA and to understand requirements of options that the workgroup wanted to see within the CBA. All members of the workgroup were invited to share feedback on the approach that Baringa were taking and had opportunity to critique the assumptions for each option. The workgroup was actively involved in shaping the scope of the work and the options modelled. The only element they were not involved in was the development of the balancing costs methodology which required the use of operational experts to ensure that response, reserve and frequency control actions were considered correctly. This was qualified with the use of the 2022 balancing cost data. Baringa reported a strong non-linear correlation (0.98) between cumulative interconnector ramping and the volume of actions taken in the BM. The workgroup was also invited to share imbalance data to support the CBA - this data was not provided.<br><br>Whilst there are some workgroup members who do not agree that the cost savings suggested for reducing ramping to 50MW/min are reliable, it is worth emphasising that the CBA result shows that the status quo arrangements for 100MW/min attributes a cost to the end consumer. Therefore, a reduction in the speed of ramping on interconnectors decreases balancing costs. Baringa used the Pan- European Day Ahead PLEXOS model which is widely used and recognised by industry and uses a set of base assumptions (this can be found in Baringa's Appendix document). This model was used to determine interconnector flow and revenues, social economic welfare, wholesale prices and carbon impacts.<br><br>The CBA showed that all options modelled over the study period reduced balancing costs against the status quo. The balancing cost savings are between £428m-£865m over the study period (2023-2030). Therefore, this |

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| | | demonstrates that changing the current arrangements that are in place today is a benefit to the GB consumer. Additionally, Baringa also considered the social economic welfare (SEW) of the EU consumer in its modelling - there was not a high cost saving over the study period, and the impact was considered negligible over the study period.<br><br>Baringa also conducted a sensitivity test for the outputs of the CBA and reported that there would be a need for a significant change to impact the results.<br><br>The ESO thoroughly challenged Baringa in the playback session. This was in respect of the results, methodology and assumptions to determine the outputs of the CBA. The CBA has allowed further discussion in the workgroup and has provided the ESO the opportunity to use the outputs to suggest a recommendation to solve the operational drivers whilst respecting and adhering to the compliance requirements in SOGL. |
| 15 | Are there any considerations for implementation on the Original proposal /alternative proposals? (e.g., IT impacts or considerations) | ☐Yes<br>☒No<br>The original should not require any changes for the ESO to operate as the ramping arrangement are not hard coded into programmes. The alternate, if just to continue with 100MW/min does not require changes. |