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| Network Innovation Competition 2020 Supplementary Answer form | | |

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| Project Name | Constellation | | |
| Question number | #14 | Pro forma section | Section 10.3.2/3 |
| Question date | 08/09/2020 | Answer date | 10/09/2020 |
| Question summary | Please provide more information on the method used to forecast protected capacity. Please explain, for instance, how your own data on curtailment (page 63, 10.3.2 pt 1 and 10.3.3 pt 1) has been used in the calculation of capacity protected; is 15% a measure of capacity or power? Were the same assumptions used to provide the equivalent forecast for GB? Further, please confirm that Figure 29 (page 59) illustrates protected and released capacity. | | |

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## Answer (please retain document formatting and do not exceed 2 pages unless otherwise agreed with Ofgem)

We have interpreted this question (SQ14) to be focused on the methodology used to calculate the protected capacity benefits for both Methods. For more context on how Method 2: Wide area protection enhances the benefits that the Accelerated Loss of Mains Change Programme (ALoMCP) delivers please refer to the answer to SQ15.

As described in the answer to SQ5, Constellation aims to facilitate the benefits from smart services. For flexibility services provided by DER specifically, the Methods provide resilience against:

* Loss of communication with central network management systems resulting in curtailment of the DER (local ANM operation with limited dependence on central systems within Method 1); and
* Unnecessary disconnection of the DER halting its operation (wide area protection via scalable, low latency site-to-site communication within Method 2).

There are considerable challenges in forecasting network benefits on a national scale far into the future beyond the current and upcoming price control periods. To ensure a consistent and robust methodology, the protected capacity benefit (for both Methods) was calculated based on established forecasts, historic performance and key assumptions. For Method 1 specifically:

* We analysed historic ANM curtailment data between 2017 and 2019 and identified that on average 15% (14.7%) of all annually curtailed DER capacity is due to communication issues. To manage the uncertainty with this benefit forecast we included this percentage curtailment in the sensitivity analysis: Low 10% and High 20%.
* We used the same assumptions (above) for UK Power Networks and GB scale benefits and applied them to the forecasted DER uptake in our DFES and National Grid’s FES respectively. We acknowledge there are limitations to this approach but it is a compromise due to the lack of available data.

The approach for Method 2 is similar to that used for Method 1, but relies on more assumptions due to data limitations that prevent a full assessment of existing generator protection performance. We could not verify if the DER events (described below) were on sites with vector shift protection or with outdated RoCoF settings so we leveraged our breadth of operational expertise and sought advice from experts within University of Strathclyde to verify our approach. For Method 2 protected capacity:

* We analysed historic generation protection events in 2019 and 2020 and identified annual DER capacity impacted by faults on adjacent feeders:
  + On average 423 faults annually affect generation operation. We included the entire range of annual faults in the sensitivity analysis: Low 257 faults and High 588 faults.
  + To identify how many of these faults have resulted in unnecessary disconnection of DER, we assumed that any fault duration longer than three hours was likely a valid fault and not a nuisance disconnection as the circuit the DER is connected to required repairs. Consequently, any DER interruptions shorter than three hours of duration (35.38% of all faults which impact generators) were assumed to be nuisance DER disconnections. We included this percentage in the sensitivity analysis: Low 10% and no High as we did not expect this to higher.
* We used the same assumptions (above) for UK Power Networks and GB scale benefits and applied them to the forecasted DER uptake in our DFES and National Grid’s FES respectively. We acknowledge there are limitations to this approach but it is a compromise due to the lack of available data.

As part of the delivery of the project, we will gain significant learning about generator protection that will allow us to overcome some of the data gaps we have described above.

Our extremely low case analysis, which includes all sensitivity parameters being set to Low, shows the project delivers significant benefits (£134m by 2030 and £353m by 2050, compared to £200m by 2030 and £826m by 2050 in the central case) even when the impact of comms issues and network faults on DER operation is minimised. Ultimately, we are confident that Constellation will enable us to operate a full top-to-bottom smart, scalable, flexible and future proof network to enable Net Zero at the lowest cost to our customers. Further information on the entire business case can be provided if required as we were mindful of the two page/two day time limit to turn around the SQ.

We confirm Figure 29 contains the capacity benefit consisting of protected and released capacity. The protected capacity is through Method 1 Local ANM and Method 2 Wide area protection and the released capacity is through the adaptive load blinding in Method 2 Adaptive protection. We will correct the chart title and caption in the resubmission and apologise for any confusion caused.