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| Network Innovation Competition 2020 Supplementary Answer form | | |

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| Project Name | Constellation | | |
| Question number | #6 | Pro forma section | Section 3.1 |
| Question date | 27/08/20 | Answer date | 01/09/2020 |
| Question summary | Please explain precisely how “Constellation will enhance a network’s ability to withstand transient instability….” | | |

## 

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

The Accelerated Loss of Mains Change Programme and changes to the Distribution Code enable greater capacity for fault ride through but increase the risk of islanded networks on the distribution network[[1]](#footnote-1). Therefore, there is still scope for meaningful improvement as LoM settings are a compromise to prevent unsafe islanded operation. More comprehensive protection schemes deployed across the network can reduce the unnecessary disconnection of embedded generation with less risk of island operation. As more DG is connected to facilitate the transition to Net Zero, it is increasingly important protection does not disconnect large volumes of embedded generation unnecessarily as that could reduce system stability and potentially result in brown outs or black outs.

To achieve this we want to use the Constellation system to change the principle behind how network protection is designed within distribution networks. We intend to shift our protection philosophy from one that trips the generator off when may be necessary, to one that keeps generation on if at all possible. We see this project as the foundation for other future innovation initiatives which can be integrated into Constellation to enable safe island operation to support the network.

We believe we can improve on the status quo by applying the algorithms developed by ABB discussed in section 10.4.2 (including the documents referenced in the footnotes) virtualised on hardware by a different manufacturers for the first time globally. This will allow measurements from DER sites to be transferred to grid or primary substations equipped with the Constellation system. Those measurements can be combined with grid or primary substation measurements to build more sophisticated algorithms for blocking DER disconnection (transfer trip) during network instabilities. Additionally, when we approach the market for a second provider for the wide area protection element of Method 2 within the project, the supplier is incentivised to present additional innovative solutions.

We are aware that synchro-phasor based solutions may be viable on the Constellation platform, including those developed by our partner GE Grid Solutions. Additionally using routable sampled value streams is a real option. This allows “raw” current and voltage measurements (in sample form) from DER sites to be available for more sophisticated algorithms in grid and primary substations. This approach requires greater communication capabilities, however we expect this to be possible as 5G technology continues to evolve. We have included an academic work programme in this area with University of Strathclyde, and we will work with all our partners, to push the frontier within this project.

During the detail design stage of the project, the consortium of partners will collectively design in detail each element in preventing DER disconnection. This will include the detailed design of the phasor based local ANM and the wide area generation protection scheme.

1. Distribution Code: DC0079 Frequency Changes during Large Disturbances and their Impact on the Total System, Ofgem, 2019 [↑](#footnote-ref-1)