*Electricity Network Innovation Competition Full Submission*

# *Supplementary Answer Form*

# Project: REVISE

Tick if this answer has been provided verbally: ☒

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| Project code | WPD/EN/NIC/05 | Question Number | 42 |
| Question date | 02 October 2018 | Answer date | 04 October 2018 |
| Submission section question relates to | | | |
| Topic | | | |
| Question | Please explain the needs case for each method– including the circumstances in which each method would be used rather than the base method. As part of the explanation please explain the proportion of the WPD and GB networks each method would be applied to in 2030 and 2050. | | |
| Notes on question | None | | |
| Answer | This response builds upon the answers to the 'Big Questions' which were presented to the Expert Panel as part of the Second Bilateral Meeting on 2nd October 2018. In addition, this answer builds on Section 2 of the FSP.<br><br>The needs case for each Method is specified below:<br><br>**ACS**<br>Both our Shaping Subtransmission to 2030 and National Grid's Future Energy Scenarios Report forecast that DG capacity will at least double on the distribution network by 2030. The current Method (Base Case) for connecting DG on the 33kV network is a lowest cost solution that disconnects DG for any outage on the main network. If we keep this approach for the predicted numbers of DG that will connect in the future, then there will be large amounts of renewable energy, due to these outages, that is lost. The ACS proposes an alternative connection Method, which for the first time, prioritises low carbon design. This device will ensure that DG is not disconnected for outages on the main network thus harnessing more energy from DG that is connected. | | |

**DPS**

Existing protection schemes are static systems that do not have the facility to reconfigure themselves. This is because:

1. The networks that they protect are usually configured to operate in a fixed operating arrangement; and
2. In the past, distribution networks were predictable i.e. there were low quantities of distributed generation and customer loads were predictable.

This can no longer be assumed as we have large volumes of DG, more forecast to connect and network flexibility is a key requisite of the transition to a DSO. The distribution network will reconfigure on a daily basis to balance load and generation and facilitate more efficient, low carbon, networks. The DPS proposes an alternative, advanced protection system that will protect the network of the future and facilitate the automation of network reconfiguration that is proposed in the INR Method. The DPS will monitor the network in real time, identify changes in load, generation, fault level and network configuration and use this information to carry out automatic protection studies to determine the optimal protection for the application.

**INR**

As described above, the levels of DG on the distribution network are forecast to at least double from now to 2030; in addition, there will be large new electrical demands on our distribution network to cater for the large scale electrification of heat and transport that is a key element of the UK's Carbon Plan to move towards a low carbon economy. The Base Case Solution to accommodate the large extra demand and generation that is forecast to connect is traditional reinforcement i.e. installing new transformers, overhead lines and cables. Traditional reinforcement often requires long durations to complete and can be expensive. Alternative Methods are required considering the issues identified above. INR proposes an alternative Method which will unlock the existing latent capacity of the network by introducing more network flexibility. INR will analyse the network in real time and determine the optimum network configuration based on these inputs. The system will then autonomously reconfigure the system into its optimal state to release network capacity. INR will introduce significant flexibility on the 33kV network which will facilitate the connection of DG and also promote the supply of LCTs from clean power sources.

Table 1 shows the proportion of the WPD and GB 33kV distribution networks that each Method would be applied to in 2030 and 2050. For the ACS Method, the network coverage relates to the percentage of installed DG capacity that is connected with an ACS over the time period that is quoted. For DPS and INR, the network coverage relates to the proportion of the total number of WPD and GB Bulk Supply Points (BSP) that have been installed with DPS/INR over the quoted timescale.

*Table 1 – Proportion of WPD & GB networks for each Method in 2030 & 2050*

| Method | WPD 2030 (Units) | % WPD Network 2030 | WPD 2050 (Units) | % WPD Network 2050 | GB 2030 (Units) | % GB Network 2030 | GB 2050 (Units) | % GB Network 2050 |
|---|---|---|---|---|---|---|---|---|
| ACS | 115 | 22%* | 215 | 24%* | 260 | 23%* | 575 | 30%* |
| DPS | 110 | 13%* | 310 | 36%* | 400 | 11%* | 1420 | 37%* |
| INR | 22 | 13%* | 62 | 36%* | 80 | 11%* | 284 | 37%* |

*Note – The figures in Table 1 are cumulative and based on the medium roll-out projection

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| Attachments | |