*Electricity Network Innovation Competition Full Submission*

# *Supplementary Answer Form*

## **Project: Black Start from Distributed Energy Resources**

Tick if this answer has been provided verbally: ☐

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| Project code | ESOEN01 | Question Number | 56 |
| Question date | 13 Sep 2018 | Answer date | 17 Sep 2018 |
| Submission section question relates to | Appendix G | | |
| Topic | | | |
| Question | Further to Q17 and the discussion on this point at the Expert Panel meeting on 5 September, please elaborate on the research that should be done (as part of this project) to establish how the temporal behaviour of the demand comprising block loading should be characterized. This needs to be done in a meaningful way so that both simulations and physical tests present loading patterns that are reflective of real world conditions. In particular explain how the stability of DER will be established and demonstrated in the face of block loading profiles for which there does not appear to be any empirical GB data, and which can be expected to be volatile. | | |
| Notes on question | | | |
| Answer | This question of demand behaviour highlights something that is really quite challenging and a good example of how the project is genuinely innovative as it is unknown, at this time, whether existing DER will be capable of handling the volatility or whether resources like flywheels or batteries will have to form a part of any DER-based Black Start.<br><br>This NIC project does not include any new research or deep analysis of the temporal behaviour of demand post-blackout. The emphasis will be on taking the best information already available, including whatever emerges from the smart meter rollout in the next couple of years, and learning from what research has been, or is being done, elsewhere. The composition and behaviour of modern demands, including the effect of small embedded generation, is the subject of research and industrial collaboration in a number of countries around the world. For example, the project team is already in conversation with the Technical University Kaiserslautern about their research on advanced control centre tools to support restoration, which | | |

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| | includes tools that forecast the demand when closing individual circuit breakers. A visit to Germany by SPEN engineers is planned for December 2018.<br><br>Research and demonstration of microgrids will be another source of information. These projects typically involve even smaller blocks of load than evisaged in our DER-based Black Start and have had to derive mechanisms to deal with the associated volatility. At SPEN we have access to the global research activities of Iberdrola, which includes microgrid projects.<br><br>Within the project, when we examine the case studies in detail, we believe that simulations and analysis in collaboration with DER owners/operators and equipment manufacturers can go a long way in determining the capability of DER and building confidence that stable power islands can be established and maintained. In the physical tests we plan to use adjustable, programmable load banks or temporary batteries to emulate the dynamic behaviour of demand, although we recognise that this will be limited by the practical size of this temporary equipment. Although ten case study locations have been proposed, these are not final. When we come to selecting the cases studies within the project we will prioritise those that offer the best opportunities for testing. For example, a battery in the 10-30 MW range might be used to emulate block loading, or we know of at least one generator that supplies a neighbouring demand via a private network and it has been proposed that their load might be used as part of the Black Start testing.<br><br>Thus, we do not under-estimate the challenge in this aspect of the project but we think our proposed approach is sensible. Furthermore, this issue highlights the need for innovation funding to explore and test what is feasible in terms of Black Start from DER. |
| Attachments | |