

# *Electricity Network Innovation Competition Full Submission*

## *Supplementary Answer Form*

### **Project: REVISE**

Tick if this answer has been provided verbally: ☒

Project code	WPD/EN/NIC/05	Question Number	40
Question date	02 October 2018	Answer date	04 October 2018
Submission section question relates to			
Topic			
Question	Please provide an explanation of the criteria you believe can be used to prove the effectiveness of INR and how INR will be exercised in the project to prove its effectiveness against the criteria.		
Notes on question	None		
Answer	<p>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 2<sup>nd</sup> October 2018.</p> <p>We have gained significant experience of designing and delivering distribution network control systems through our Network Equilibrium LCNF project. This experience has led to the development of a robust methodology that we will apply to REVISE to ensure that the effectiveness of INR can be measured. The methodology is represented in the flow chart in Figure 1.</p> <div style="text-align: center;"> <pre> graph LR     subgraph Planning         A[Research and Studies WPD (FSP)]     end     subgraph Scope_Design_Build [Scope, Design and Build]         B[Detail Scope &amp; Tender WPD and Supplier] --&gt; C[Detailed Design WPD and Supplier] --&gt; D[Build &amp; Factory Test WPD and Supplier]     end     subgraph Integration_and_Trials [Integration and Trials]         E[System &amp; Site Integration WPD and Supplier] --&gt; F[Conduct Trials WPD and Supplier]     end     A --&gt; B     D --&gt; E             </pre> <p><i>Figure 1 - Methodology to determine INR effectiveness</i></p> </div>		

	<p>We have already carried out substantial research and studies into the INR Method as part of the FSP process. We spent significant time researching existing projects and academic papers to understand the methodology and benefits of an automated network using Artificial Intelligence (AI) and Machine Learning (ML). The volume of power system studies required scripting to mimic the operation of INR in a desktop environment. These studies have informed us that there are considerable financial, carbon and capacity benefits associated with a trial and subsequent roll-out of INR.</p> <p>The first project deliverable will involve selecting the trial area and performing further work to confirm the benefits for INR for that area. This will set a benchmark for the physical trials of INR which are described later within this response. The first stage of developing INR will be a detailed scoping, design and build process which builds upon our initial research and studies. The scoping exercise will incorporate learning from our past experience with control systems to develop detailed technical specifications to progress to tender stage. The tender will be fully specified with explicit assignment of tasks and testing responsibilities to meet the criteria of INR. Following tender award we will work with the manufacturer at all points to ensure the system meets the criteria. A key element that will ensure success of the build process is the implementation of a detail design review with the manufacturer. After the design is approved and the system is built, the manufacturer will carry out a Factory Acceptance Test (FAT) of the INR system before it is integrated with our Network Management System (NMS). We will be actively involved in developing a robust test plan and to ensure that all possible tests are carried out in the factory to de-risk the integration activities.</p> <p>After the INR system has been built and tested in the factory, we will begin the work required to integrate the system into our own NMS. A key element of successful integration is the inclusion of System Integration Testing (SIT). The role of this testing is threefold:</p> <ol style="list-style-type: none"> <li>1. To test the signals to/from INR and NMS to ensure they are aligned, in the correct format and received correctly by the respective systems;</li> <li>2. To test that the INR system responds correctly to its various inputs; and</li> <li>3. To test that the NMS responds correctly to its various inputs.</li> </ol> <p>The SIT testing specification will be developed by the manufacturer with significant input from our engineers to ensure a rigorous approach.</p> <p>After the integration testing is completed the INR trialling will commence on the live distribution system. We will seek to connect new customers in the INR trial area to demonstrate the effectiveness of the system directly. If this is not possible in the trial duration we will simulate inputs to the INR system which will force the INR system to take action and then measure the benefits that action provides. This methodology has been successfully implemented on previous projects with control system elements.</p> <p>The final stage in measuring the effectiveness of INR is to compare the measured benefits of INR from the trial with the benefits we calculated in the research and studies stage of the project. This will determine and conclude the effectiveness of the INR Method.</p>
Attachments	