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	6
Question date	14 August 2018	Answer date	16 August 2018
Submission section question relates to	Proforma Section 2		
Topic	(b) Provides value for money to electricity customers (d) Is innovative (ie not business as usual)		
Question	Please explain how the ACS is innovative, and delivers something more than or distinct from what could be delivered by load air break switches or other similar pole mounted switches.		
Notes on question	None		
Answer	The answer to this question builds upon our response to Question 2 submitted previously. We have answered the question in two parts for clarity. **1. "How the ACS is innovative"** The aim of the ACS trial is to develop, test and implement a brand new Solution which accelerates the development of a low carbon network and supports the decarbonisation of the UK's energy supply chain. The ACS will be designed such that it offers a safe, forward-thinking and standardised Solution for customers and DNOs. The Problems detailed in Section 2.1.1 of the FSP require a new approach therefore, funding would be used to develop an ACS with innovation at the fore-front. Building upon Section 2.2.1 of the FSP, the ACS is innovative as detailed in the points below:		

	• **New Technologies**: The ACS design principles are that it shall be compact, smart and safe to operate, therefore combining BAU technology into an enclosure is not the right Solution. Instead, the development of ACS will investigate the new technologies that haven't be used together previously on the distribution network. We will focus on developing the ACS around new technologies and will continue to work with manufacturers who responded to our RFI to investigate and implement the best Solutions to achieve the design principles above. • **A Tailored Design**: The ACS will be specially designed to solve the Problems identified in the FSP. The level of redundancy and specification of equipment will be tailored for this application, significantly reducing costs and time by eliminating unnecessary duplication of equipment or the use of components that are designed for a different purpose. • **Network Ready Upon Delivery**: Two key innovative features of the ACS will be the ultra-compact enclosure delivered as a pre-commissioned package. The tailored equipment for the ACS will mean that the enclosure can be designed so that is only a fraction of the size of 33kV "containerised" Solutions currently found on the network. The ACS will developed so that it can be procured by DNOs in a pre-commissioned state with all equipment connected and tested before it is delivered to site. This will vastly reduce time required to connect and commission equipment compared with BAU practices. • **Major Step for Digital Substations**: DG and LCT technologies connecting to the network are developing rapidly and therefore investigating and trialling new technologies to connect and manage these are imperative to ensuring the network is future-ready. The ACS will trial the latest advances in equipment communications and system components to improve the accuracy and speed of data management and processing. This closely aligns with the following themes in the ENA Joint Innovation Strategy; "Network Improvements and System Operability" and "New Technologies and Commercial Evolution". • **Providing a Standard for all DNOs**: We believe the ACS will become the standardised connection solution for DG on the 33kV network and could be rolled-out across all DNO licence areas. This standardised approach will greatly reduce the unnecessary duplication of procurement and design work. The development of the ACS will be akin to the development of GRP package substations which have now become the standard design for the majority of new 11/0.415kV substations across GB. Prior to this standardisation there were a host of different bespoke solutions across the different network operators, however, now a standard solution exists for almost every connection on the LV network. **2. "Delivers something more than or distinct from what could be delivered by load air break switches or other similar pole mounted switches"** DG capacity is forecast to more than double on the distribution network by 2030. The majority of this DG will connect at the 33kV voltage level,

	however, there is currently no standard connection solution on the 33kV network that prioritises a low carbon design to maximise DG availability. Further building upon our response to Question 2, we evaluated the use of load air break switches or other similar pole mounted switches and concluded they do not provide a technically viable or sustainable connection Solution. An outline diagram and arrangement of the "pole mounted equivalent" is shown in Attachments 1 and 2 which show the level of complexity which is required to build the equivalent ACS. The following points also reinforce why a Solution using load air break switches or pole mounted switches is not suitable: • **Safety**: load air break switches are pole mounted which will require operatives to work at height for the installation and routine maintenance of the switches. The ACS will be a ground mounted Solution which will remove the risk attributed to operatives that work at height; • **Maintenance**: To maintain a load air break switch or other pole mounted switch, it is necessary to isolate and earth each side of the switch. This would mean that DG connected via a switch solution would have to be disconnected from the network for routine switch maintenance. The ACS will incorporate fixed pattern switchgear which is "maintenance free" i.e. it will not require intrusive maintenance like outdoor pole mounted switches. Maintenance will likely be a simple visual inspection of the equipment at regular intervals. This will mean that DG can remain connected to the network for routine maintenance of the ACS; • **Environment**: load air break switches or other similar pole mounted switches have exposed mechanical mechanisms which are subject to environmental degradation. This also increases the maintenance requirements of these devices. The ACS equipment will be installed in a suitable ground mounted enclosure with complete protection from the external environment; • **Non-standard**: a design that uses load air break switches or other similar pole-mounted switches will be bespoke for each application on the network and furthermore, different for each network operator. This will translate to unnecessary replication of procurement and design activities. The ACS will be a fully standardised 'one-size-fits-all' device that has been designed from the bottom-up for use on the 33kV network. It will be able to be rolled-out with minimum design and set-up time across all DNO licence areas; • **Fault interruption**: a Solution that uses load air break switches or other similar pole-mounted switches will not be able to interrupt fault current. Therefore, DG connected by this solution would be disconnected from the network by the upstream circuit breaker under fault conditions. The ACS is a fully flexible device that incorporates circuit breakers in a configuration to enable the ACS to interrupt and isolate a fault, whilst providing the ability to keep DG connected; • **Protection**: load air break switches or other pole mounted switches cannot be used to protect the network under fault conditions. The ACS will be equipped with protection schemes that can be deployed

	to increase the safety and security of the network and reduce customer interruptions. In addition, the ACS will be able to integrate with the DPS Method which would not be the case with pole mounted switches; • **Integration with other systems**: the ACS will be designed with state-of-the-art digital systems that will be able to integrate with the DPS and INR Methods to release additional network capacity and increase availability for generation which would not be possible through the use of pole mounted switches alone. • **Connection times**: a design that uses load air break switches or other similar pole-mounted switches will take significant time to install at the site. First the ground works will be required to install the poles followed by the secondary work of installing the required switches and auxiliary systems (LV auxiliary supply, mechanisms, communications, small wiring etc.). The installation will also include a lot of working from height for the site personnel. The ACS will be designed to be a "plug-and-play" device which is fully pre-assembled and commissioned in the factory requiring minimal installation and commissioning works at the site. The unit will be ground mounted reducing the working from height activities to a minimum; • **Visual amenity**: load air break switches are pole mounted and therefore there is a large visual impact on the surrounding environment. The ACS will be a contained in an ultra-compact ground mounted enclosure that will have a much lower visual impact than several pole mounted switches; • **Number of operations**: a load air break switch can sustain fewer operations on load current throughout its lifetime when compared to the switchgear used in the ACS; • **Urban environments**: the ACS could be developed to be installed in urban environments as it will be in an ultra-compact ground mounted unit with the capability to be cable connected. A Solution utilising pole mounted switches would not be able to be used in urban environments.
Attachments	WPD REVISE - NIC Question 6 - Attachment 1 (SLD) WPD REVISE - NIC Question 6 - Attachment 2 (Arrangement)