

Network Innovation Competition Full Submission

Supplementary Answer Form

Tick if this answer is Confidential: ☐

Tick if this answer has been provided verbally: ☐

Project code:	SPT EN 01	Question Number	29
Question date	05/09/2013	Answer date	09/09/2013
Submission section question relates to	Section 2.5		
Topic	Technical Description of project		
Question	Please clarify the extent of the GB system for which transient stability and SSO assessment will be possible after the deployment of the proposed additional PMUs, and indicate the scale of any further deployment that may be necessary to give system wide coverage		
Notes on question			
Answer	<p><u>Background</u></p> <p>The VISOR project will be able to effectively base-line the characteristics of the existing transmission network, and demonstrate the methodology proposed in assessing the transient stability and SSO monitoring on one platform. At this moment, <u>VISOR is providing an appropriate scale of industrial trial, and focuses on the England-Scotland transmission boundary.</u></p> <p>The existing, separate SPT and NGET PMU networks <u>only provide partial coverage and limited functionality.</u> There is currently no PMU WAMS in SHE-T.</p> <p>The proposed SSO monitoring is new to all the Transmission Licensees.</p> <p><u>The Proposed Deployment</u></p> <p>Work package 4 provides the supporting infrastructure for the method work-streams, as well as <u>developing an effective future roll-out strategy</u> in line with the roll-out business case. The proposed installation within VISOR can be found in Table 2.1 in the main proforma (opposite).</p> <p>This deployment has been designed to be sufficient to demonstrate the Methods of VISOR and provide the necessary input data for the study components of the project, whilst minimising the need for new deployments and making use of existing installations where possible – this is in order to reduce</p>		

both cost and project risk.

	New		Existing		WAM Data Concentrator
	PMU	SSO	PMU	SSO	
SPT	5	5	8	0	Existing
NGET	2	2	8	0	Existing
SHE Transmission	4	2	0	0	New
Reserve	2	2	0	0	---
VISOR	---	---	---	---	New

Table 1: PMU requirements for VISOR

From the VISOR prospective, SSO monitoring is to be fitted at transmission nodes associated with Series Compensation and HVDC links. This is predominantly in the SPT area and across the Anglo-Scottish Interconnector circuits.

The PMU's being assimilated into the Hybrid State Estimator cover the SPT area, representative selections from the SHETL area and the NGET network in the north of England. This will allow a detail study on the benefits of a Hybrid State Estimator for the Anglo-Scottish stability constrained transmission boundary; This is part of Work package 3.2. The same PMU data will also be used for the other demonstrations, described below.

What is achieved with VISOR PMU & SSO Deployments

This monitoring is designed to provide the following:

- Visibility of SSO and system dynamic behaviour at the new series compensation installations (due 2015) and the nearby long-shaft generators considered likely to interact with them, as well as the Western HVDC link (due 2016), including monitoring of the existing system performance prior to the series compensation installations.
- Increased observability of the key dynamic behaviours of the B6 boundary, sufficient for the model validation, state estimation and transient stability margin aspects of the project. This includes minimal deployments in SHE-T (where there is no existing monitoring), and some new or extended monitoring in the Merseyside-Humber region – both key contributors to the dynamic behaviours of B6.
- High-level observability of synchronous generator oscillations across the country, and demonstration of source identification approach.

Following the completion of VISOR, this deployed infrastructure will provide minimal monitoring of SSO and dynamic behaviour in the region surrounding the Scotland-England interface, focussed on the plant highlighted above. The new deployment in SHE-T will combine with existing NGET and SPT installations to give a high-level GB visibility of system oscillatory, transient and steady-state behaviour, as well as drive future studies.

The limitations of the VISOR Deployments

Following VISOR, the monitoring in place should also serve to provide

	<p>continued visibility of SSO interactions, where those interactions involve (either actively or passively) the monitored locations. In other words, <u>a sub-synchronous oscillation either involving or passing through B6 would be detected, but an interaction restricted to the South of England would not</u>. Furthermore, new equipment with potential for forms of SSO (e.g. windfarms at key locations susceptible to Sub-Synchronous Control Interaction, SSTI) would merit SSO monitoring.</p> <p>The high-level PMU visibility of GB provided by the new SHE-T and augmented SPT and NGET installations should be sufficient to <u>highlight the presence of 0.002-4Hz (electromechanical) oscillatory issues, but will lack the granularity to localise them to specific participating corridors and generators</u>. Similarly GB system transient events and disturbances will be visible and so will speed up event analysis, but only to the granularity available – e.g. the triggering point of an event can only be traced back to the closest PMU.</p> <p><u>From a transient stability viewpoint, the southern half of England will be relatively un-monitored</u>. – the application of similar model validation, state estimation and transient stability approaches to southern boundaries such as the North-Wales region will require deployment of further monitoring.</p> <p><u>Provision for future deployments</u></p> <p><i>The VISOR project will deliver a business-case for</i> <u>the future role-out and</u> optimum location for GB wide PMU & SSO coverage, based on transmission boundary characteristics, the deployment of new technologies, and the learning from the project. This will include learning from the project including the SSO and Dynamic baselining reports. For example, locations will be suggested to provide additional granularity and to cover network changes such as a new East Coast HVDC link.</p> <p>The supporting infrastructure of this project will also be assessed in terms of <u>the availability and data quality over a three year period</u>. During this time, performance statistics will be gathered, and assessed, dealing with system availability, PMU data availability and data quality issues such as loss of GPS synchronism. This will help to inform the appropriate level of redundancy and reliability required for the subsequent IT and Comms systems as well as the PMU and SSO installations. It will also inform whether dis-continuous monitoring using existing transient loggers will be a possible means by which to reduce deployment, data storage and communication costs in a wide-scale roll-out.</p>
Attachments	
Verbal Clarifications (Consultants)	