Making a positive difference
for energy consumers

Company Secretary
SP Transmission Limited
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Date: 19 December 2013

Dear Company Secretary,

**Project Direction ref: SPTL / Visualisation of Real Time System Dynamics using Enhanced Monitoring / 19-12-13**

SP Transmission Limited (SPTL) submitted the project Visualisation of Real Time System Dynamics using Enhanced Monitoring (VISOR) on 9 August 2013 to be considered for funding through the Electricity Network Innovation Competition (NIC). In this year's decision[1], we selected the project for funding.

We have issued this Project Direction to SPTL. It contains the terms to be followed by SPTL as a condition of VISOR receiving funding through the Electricity NIC. It must comply with these terms, which can be found in the schedule to this direction.

**Project direction**

Paragraph 5.66 of the Electricity NIC Governance Document states that a Project Direction must:

- set out the Project-specific conditions that the Network Licensee is committing to in accepting funding;
- require the Network Licensee to undertake the Project in accordance with the commitments it has made in the Full Submission. Where appropriate, the Project Direction may therefore include extracts from the Full Submission or refer to specific sections of the Full Submission;
- set out the Approved Amount for the Project, that will form part of the calculation contained in the funding direction issued by the Authority under chapter 7 of the Governance Document;
- set out the Project budget that the Network Licensee must report against and how variances against the Project budget will be reported and approved; and
- the mechanism for the Network Licensee receiving the Approved Amount is set out in the Funding Direction.

[1] https://www.ofgem.gov.uk/publications-and-updates/decision-first-year-electricity-network-innovation-competition

These are described for VISOR in the schedule to this condition.

**Decision**

Provided SPTL complies with the NIC Governance Document and the schedule to this Project Direction, VISOR is deemed to be an Eligible NIC Project[2].

This Project Direction constitutes notice pursuant to section 49A (Reasons for decisions) of the Electricity Act 1989.

**Dora Guzeleva**
Head Networks Policy: Local Grids
**For and on behalf of the Authority**

[2] Eligible NIC Project has the meaning given in definitions of the Electricity Transmission licence.



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## Schedule to Project Direction

### 1. TITLE

Project Direction ref: SPTL / VISOR / 19-12-13

### 2. PREAMBLE

This Project Direction issued by the Gas and Electricity Markets Authority (the "Authority") to SP Transmission Limited (the "Funding Licensee") pursuant to the Electricity NIC Governance Document issued pursuant to Part E of Special Condition 3I (Network Innovation Competition) of the Electricity Transmission Licence (the "Licence") sets out the terms to be followed in relation to VISOR (the "Project") as a condition of it being funded under the NIC and the Funding Return Mechanisms[3].

Unless otherwise specified, defined terms in this Project Direction are defined in Appendix 1 of the Electricity NIC Governance Document.

References to specific sections of the Funding Licensee's Full Submission in this Project Direction are, for ease of reference, made by referring to the section number in the Funding Licensee's Full Submission pro-forma.

### 3. Condition Precedent

The Funding Licensee will not access any funds from the Project Bank Account until it has signed contracts with the Project Partners named in Table 1.

**Table 1 Condition Precedent**

| |
|---|
| National Grid Electricity Transmission Plc |
| Scottish Hydro Electric Transmission Limited |
| The University of Manchester |

### 4. COMPLIANCE

The Funding Licensee must comply with Special Condition 3I and the NIC Governance Document (as may be modified from time to time in accordance with Special Condition 3I and as modified and/or augmented in respect of the Project by this Project Direction) and the Project Direction.

Any part of the Approved Amounts that the Authority determines not to have been spent in accordance with this Project Direction (or the Electricity NIC Governance Document) is deemed to be Disallowed Expenditure.

Pursuant to Special Condition 3I.8. Disallowed Expenditure is revenue received (whether by the Funding Licensee or another Licensee) under the NIC and Funding Return Mechanisms that the Authority determines not to have been spent in accordance with the provisions of the Electricity NIC Governance Document or those of the relevant Project Direction.

Pursuant to paragraph 8.48 of the Electricity NIC Governance Document, Disallowed Expenditure includes any funds that must be returned if the Project is halted without Ofgem's[4] permission, any funds that have not been spent in line with the approved Project Budget contained within the Project Direction, and any unspent funds on the completion of the Project.

[3] the Funding Return Mechanism is defined in part C of Special Condition 3I.
[4] Ofgem is the offices of the Gas and Electricity Markets Authority. The terms 'Ofgem' and 'Authority' are used interchangeably in this Project Direction.



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## 5. APPROVED AMOUNT FOR THE PROJECT

The Approved Amount is £6,492,110

## 6. PROJECT BUDGET

The Project Budget is set out in Annex 1. The Funding Licensee must not spend more than 110% of any category total (e.g. "Labour") in Annex 1 without the Authority's prior consent (such consent is not to be unreasonably withheld).

The Funding Licensee will report on expenditure against each line under the category total in the Project Budget, and explain any projected variance against each line total in excess of 5% as part of its detailed report which will be provided at least every six months, in accordance with paragraph 8.17 of the Electricity NIC Governance Document. Ofgem will use the reported expenditure and explanation to assess whether the funding has been spent in accordance with the Electricity NIC Governance Document or with this Project Direction.

For the avoidance of doubt this reporting requirement does not change or remove any obligations on the Funding Licensee with respect to reporting that are set out in the Electricity NIC Governance Document.

## 7. PROJECT IMPLEMENTATION

The Funding Licensee must undertake the Project in accordance with the commitments it has made in the Full Submission approved by the Authority pursuant to the Electricity NIC Governance Document and the terms of this Project Direction. These include (but are not limited to) the following:

(i) undertake the Project in accordance with the description set out in Section 2 (Project Description);
(ii) provide a Network Licensee Compulsory Contribution of £736,982;
(iii) complete the Project on or before the Project completion date of March 2017; and
(iv) disseminate the learning from the Project at least to the level described in Section 5 (Knowledge Dissemination).

## 8. REPORTING

Ofgem will issue guidance (as amended from time to time) about the structure and content of the reports required by paragraph 8.17 of the Electricity NIC Governance Document. The Funding Licensee must follow this guidance in preparing the reports required by paragraph 8.17 of the Electricity NIC Governance Document.

As required by paragraph 8.22 of the Electricity NIC Governance Document, the Funding Licensee must inform the Authority promptly in writing of any event or circumstance likely to affect its ability to deliver the Project as set out in its Full Submission.

## 9. COST OVERUNS

The maximum amount of Discretionary Funding that the Funding Licensee can request as additional funding for cost overruns on the Project is 5%[5].

[5] This is the amount requested by the Funding Licensee in its Full Submission.



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## 10. INTELLECTUAL PROPERTY RIGHTS (IPR)

In Section 5 (Knowledge Dissemination) the Funding Licensee has stated that the Project does conform to the default IPR arrangements set out in Section Nine of the Electricity NIC Governance Document and must therefore undertake the Project in accordance with the default IPR arrangements.

## 11. SUCCESSFUL DELIVERY REWARD CRITERIA

The Project will be judged by the Authority for the purposes of the NIC Successful Delivery Reward against the Successful Delivery Reward Criteria set out in Table 3[6] below (that comply with paragraphs 5.26 – 5.29 of the Electricity NIC Governance Document).

**Table 3. Successful Delivery Reward Criteria**

| Successful Delivery Reward criterion | Evidence |
|---|---|
| *9.1. Successful delivery of Sub-Synchrononous Oscillation (SSO) monitoring prior to start of Series Compensation commissioning.*<br>It is important that the project delivers an SSO monitoring capability in time to capture a baseline of the SSO frequency range performance before the series compensation is commissioned. The changes in behaviour can then be assessed against known historic behaviour. The components that should be delivered for success in this domain are:<br>• Validation of SSO substation equipment<br>• Installation, commissioning of SSO substation equipment & communication to central location<br>• Integration to visualisation of SSO geographically | 9.1.1<br>• SSO Device qualification report (WP 4C, Dec 2014)<br>• Visualisation of multiple SSO information sources at data centre (WP 1A, prior to the commissioning of series compensation reinforcement)<br>• Baseline and comparator report for SSO behaviour (WP 1, March 2015, March 2016, March 2017) |
| *9.2 Enhanced stability tools delivered, including Oscillation Source Location and Disturbance Impact*<br>The applications to analyse and present stability information to real-time and analysis users is a key part of the project. The applications should be delivered and the necessary enhancements made to fulfil this criterion. Also, the test cases to prove and demonstrate the applications to end users are important for knowledge dissemination. The delivery includes:<br>• Oscillation tools delivered to display wide area oscillations, including oscillation frequency, damping and mode shape<br>• Source location tools for identifying contributions to oscillations<br>• Disturbance detection, location, sequence and impact measures in application to manage high impact / low probability events<br>• Review of the implications for future roll- | 9.2.1<br>• Applications delivered and configured to include (WP 1.2, 2.3, March 2016)<br>  ○ Geographic oscillation alert presentation<br>  ○ Oscillation source location presentation for analysis & real-time<br>  ○ Disturbance detection, location identification and impact measures<br>• Report on PMU roll-out requirements for the applications (WP 4B, March 2017)<br>• Simulation cases for presentation & training (WP 5.2, March 2017) |

[6] These are the Successful Delivery Reward Criteria set out in the Funding Licensees Full Submission



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| | |
|---|---|
| out of PMUs for full GB-wide use of the applications | |
| *9.3 Successful model validation activity completion*<br>The definition of transient stability limits in particular is highly dependent on the quality of the static and dynamic equipment models, the design of control systems, and interpretation and resolution of problems occurring in the grid. It is essential therefore that the models and their associated parameters can be demonstrated to be sufficiently accurate to be fit for purpose. The components of the model validation activities will include:<br>• Line parameter estimation for key circuits using PMU data<br>• Oscillation analysis validation to quantify observed damping against simulated<br>• Transient stability simulations to reconstruct observed disturbances | 9.3.1<br>• Report on PMU based line parameter estimation and variability (WP 2.1, March 2015)<br>• Report on accuracy of simulation models for small-signal and large-signal against naturally occurring events (WP 2.2-2.3, Dec 2016) |
| *9.4 Successful improvement options for management of transient stability constraints*<br>The demonstration and evaluation of a PMU-based presentation of a transient stability limit, and the assessment of the applicability to the B6 boundary constraint is an important outcome for the project. The project delivery includes:<br>• Quantification of the uncertainty in transient stability calculations<br>• Improvement in model initial conditions using hybrid state estimation<br>• Consultation on visualisation approach for transient stability limit<br>• Trial reliability of area angle measurements | 9.4.1<br>• Report on quantification of uncertainty in stability calculations (WP 3.1, Dec 2016)<br>• Display incorporating power, angle and associated thresholds (WP 3.3, Dec 2015)<br>• Report on findings from benefits of hybrid state estimator (WP 3.2, Dec 2016)<br>• Report on long-term monitoring of area angle measurements (WP 3.4, Dec 2016) |
| *9.5 Successful deployment of the supporting infrastructure of the VISOR project.*<br>The base infrastructure required to collect, store, display and communicate phasor data is critical for the success of the project. This infrastructure should be installed and proven, with adequate performance, and the data linkages between the TO/TSOs implemented to confirm that this part of the project has been delivered. The criteria for delivery are:<br>• Data centres running in SPT, NGET, SHE Transmission, collecting PMU data from own network, including real-time visualisation, storage, and communications (Dec, 2015)<br>• Central VISOR server and inter-TO data exchanges running<br>• Optimal GB roll-out investigation | 9.5.1<br>• System specification and PMU supplier contracts awarded (April, 2014)<br>• System commissioning report (WP 4A, Dec 2015)<br>• Visualisation of data in SPT, NGET, SHE Transmission including real-time and historic (WP 4A, Dec 2015)<br>• Roll-out report (WP 4A, Dec 2016 - March 2017) |



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| | |
|---|---|
| *9.6 Successful dissemination of knowledge generated from VISOR project.*<br>Knowledge dissemination within the transmission network owner is a key component to transfer experience for the pre-trial training and post–trial knowledge exchange. The key objectives of this work package are to successfully achieve the following:<br>• Internal knowledge dissemination<br>• External knowledge dissemination<br>• Influencing and updating policies and standards<br>• Public Engagement | 9.6.1<br>• Establish on-line portal and keep up to date throughout project (WP 5.2, Sep 2014)<br>• Timely delivery of project progress reports (WP 5.4, Sep 2014, Mar 2015, Sep 2015; Mar 2016, Sep 2016, Mar 2017)<br>• Academic partner delivery of knowledge capture and publications (WP 5.2, Dec 2016 - Mar 2017)<br>• Presentations and show-casing at the annual innovation conferences (WP 5.4, Dec 2014, Dec 2015, Dec 2016 and June 2017 for Close-down report dissemination) |

The maximum amount of the NIC Successful Delivery Reward (which will not exceed the Licensee Compulsory Contribution) that the Project will be eligible for is £736,982.

## 12. USE OF LOGO

The Funding Licensee and Project Partners, External Funders and Project Supporters[7] may use the NIC logo for purposes associated with the Project but not use the Ofgem or Ofgem E-Serve logos in any circumstances.

## 13. AMENDMENT OR REVOCATION

As set out in the Electricity NIC Governance Document and this Project Direction, this Project Direction may be amended or revoked under the following circumstances:

(i) if the Funding Licensee considers that there has been a material change in circumstance that requires a change to the Project Direction, and the Authority agrees (paragraph 8.23 of the Electricity NIC Governance Document); or

(ii) if Ofgem agrees to provide Contingency Funding, which requires the re-issue of the Project Direction (paragraph 8.42 of the Electricity NIC Governance Document); or

(iii) if the Funding Licensee applies for Discretionary Funding to cover a decrease in Direct Benefits and the Authority decides it would be in the best interest of customers to make changes to the Project Direction before the Discretionary Funding would be awarded (paragraph 8.42 of the Electricity NIC Governance Document).

## 14. HALTING OF PROJECTS

This Project Direction is subject to the provisions contained in paragraphs 8.30 to 8.34 of the Electricity NIC Governance Document relating to the halting of projects. By extension, this Project Direction is subject to any decision by the Authority to halt the Project to which this Project Direction relates and to any subsequent relevant Funding Direction issued by the Authority pursuant to Special Condition 3I.15.

In the event of the Authority deciding to halt the Project to which this Project Direction relates, the Authority may issue a statement to the Funding Licensee clarifying the effect of that halting decision as regards the status and legal force of the conditions contained in this Direction.

[7] As listed in Box 1.5 in Section 1 of the Full Submission pro-forma.



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**NOW THEREFORE:**

In accordance with the powers contained in the the Electricity NIC Governance Document issued pursuant to Part E of Special Condition 3I of the Licence, the Authority hereby issues this Project Direction to the Funding Licensee in relation to the Project.

This constitutes notice of reasons for the Authority's decision pursuant to section 49A (Reasons for decisions) of the Electricity Act 1989.



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**ANNEX 1: PROJECT BUDGET**

| NIC Funding Cost Category | Cost |
|---|---|
| **Labour** | **(£k)** |
| **WP1 - Enhanced System Oscillation Monitoring** | **£180.25** |
| **WP2 - System Model Validation** | **£110.73** |
| **WP3 - Improvements for Management of Stability Constraints** | **£260.08** |
| **WP4 - Supporting Infrastructure** | **£293.55** |
| **WP5 - Knowledge Dissemination** | **£368.23** |
| **Dedicated Resources** | **£1,845.40** |
| **Equipment** | **£437.50** |
| **Contractors** | |
| **WP1 - Enhanced System Oscillation Monitoring** | **£315.68** |
| **WP2 - System Model Validation** | **£368.69** |
| **WP3 - Improvements for Management of Stability Constraints** | **£667.97** |
| **WP4 - Supporting Infrastructure** | **£451.50** |
| **WP5 - Knowledge Dissemination** | **£173.88** |
| **Dedicated Resources** | **£271.00** |
| **IT** | **£979.60** |
| **IPR Costs** | **£0.00** |
| **Travel & Expenses** | **£313.33** |
| **Payments to users** | **£0.00** |
| | |
| **Contigency** | **£332.44** |
| | |
| **Decommissioning** | |
| | |
| **Other** | |
| | |
| **Total** | **£7,369.82** |



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