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RIIO NIC NETWORK INNOVATION COMPETITION

Innovation in networks – Ofgem's Electricity Network Innovation Competition

Decision on first year competition

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Overview:

We run an annual Electricity Network Innovation Competition (NIC) to help stimulate innovation in electricity transmission. Through the NIC, Network Licensees[1] can apply for up to £27m to fund innovative projects that could deliver benefits to customers. This document explains which projects have been selected for funding this year.

This is the first year of the electricity NIC and there were three applications. We have selected two projects for funding. This decision is consistent with the recommendation of our independent expert panel. We propose to award £17.82m of the available £27m to these projects. The Network Licensees' and their partners will invest £2.08m in funding and in kind contributions to the projects.

The winning projects trial innovative practices and new technologies. They have been selected because they will help Network Licensees understand how to meet customers' changing requirements as Great Britain moves towards a low-carbon economy.

[1] A Network Licensee is the holder of an Electricity Transmission Licence, ie the National Electricity Transmission System Operator (NETSO), a Transmission Owner (TO) or an Offshore Transmission Owner (OFTO).

Context

The National Electricity Transmission System (NETS) is facing a number of challenges over the coming years. These include -

- Managing the technical challenges associated with an increasing level of intermittent generation connecting to the NETS.
- New sources of generation connecting to the network in areas far from consumption centres.
- New technologies being used to manage and operate the network.

These challenges will directly affect transmission networks and the way transmission companies plan and manage their businesses. Network Licensees will need to innovate in the way they design, plan, build and operate their networks.

The Electricity NIC is designed to help stimulate this innovation. It provides up to £27m of funding each year to encourage Network Licensees to undertake trials to address these challenges in the most cost-effective way. Network operators will gain understanding from these trials, which they will then be able to apply to the specific challenges they face. This could potentially bring benefits and cost savings to customers in the future.

Associated documents

Electricity NIC Governance Document

T1 Strategy Decision

Decision on funding the cost of preparing submissions for the Network Innovation Competition and the Governance of the Network Innovation Allowance

Decisions on the Network Innovation Competition and timing and next steps for implementing the Innovation Stimulus

Decision and further consultation on the design of the Network Innovation Competition

Contents

Executive Summary

The Electricity NIC is an annual competition which helps to encourage Network Licensees to innovate in the design, build and operation of their networks.

It provides funding to a small number of large-scale innovation projects. Network Licensees compete against each other for an allocation of up to £27m of available funding. Trials financed through the NIC will generate learning for all licensees and will be made available to all interested parties. This learning brings potential benefits and cost savings for current and future customers.

The competition was run for the first time this year. This document announces our decisions.

The three submissions we have received requested total funding of £26.22m. From these, we have selected two projects for funding. We will approve £17.82m, of the available £27m of funding for these two projects. The project proposals were assessed against published criteria, which we summarise in the introduction.

Successful projects

In reaching the decision to select two projects for funding, we were advised by our independent expert panel, which reviews the project submissions and recommends which projects should be awarded funding.

Following consideration, we have accepted the expert panel's recommendation. We have summarised the successful projects in the table below. We plan to place additional requirements on one project, in order to ensure it delivers good value to customers.

Project (Location)	**Funding requested**
Visualisation of Real Time System Dynamics using Enhanced Monitoring (Anglo-Scottish Border) This project would use new sources of data and methods of analysis to optimise use of capacity on the Anglo-Scottish interconnector. *Submitted by SP Transmission Limited (SPTL)*	£6.49m
Multi-Terminal Test Environment for high voltage direct current (HVDC) Systems (Scottish Hydro Electric Transmission Licence Area) This project would establish a collaborative test and development facility for HVDC systems. Submitted by Scottish Hydro Electric Plc (SHE Transmission)	£11.33m

Unsuccessful project

We received a further application for one project which will not be awarded funding.

National Grid's **Mobile Extra High Voltage Substation Bay (MSB)** is a potentially useful project that may provide TOs with greater flexibility in managing the operation and maintenance of their networks. However, we are not convinced that the project would provide sufficient benefits to electricity transmission customers to make it suitable for funding. Our concerns centre on the fact that we consider that there would be limited opportunity to use MSBs as part of licensees' business as usual activities.

Bid preparation costs

The NIC is currently open to all holders of a transmission network licence, who accept the NIC licence condition, this includes offshore transmission owners (OFTOs). RIIO Network Licensees recover bid preparation costs (BPCs) through their Network Innovation Allowance (NIA) up to a cap of £175k or 5% of the outstanding funding requested. However, non-RIIO Licensees do not have a NIA. They must request this amount from the funds available for NIC projects each year.

We received one request from a non-RIIO Network Licensee to fund preparation costs which we accepted this request. The request revealed an anomaly in the Governance Document. Non-RIIO Network Licensees are required to request BPCs as part of the full submission. However, the request for BPCs was made by a licensee whose projects were successful at the initial screening process (ISP) stage but were not developed in to full submissions. This meant that there was not a full submission proforma.

TC Ormonde OFTO Limited (TCO) made three submissions to the Initial Screening Process (ISP) for which they are eligible to receive BPCs. TCO has requested £24,303 to cover BPCs. None of these proposals were taken by the proponent through to the full submission stage. However, we will provide these funds. We have explained the reasons for our decision later in this document.

Introduction

Chapter Summary

This chapter describes the purpose of this document and the background to, and structure of, the Electricity Network Innovation Competition (NIC). It explains how we and the expert panel have evaluated the submissions made to the competition.

Purpose

1.1. The purpose of this document is to explain our decisions on the applications that were made to the first Electricity NIC. We evaluated the projects against the evaluation criteria set out in the Electricity Network Innovation Governance Document[2]. These are summarised at 1.12 below.

1.2. We have published a number of other documents alongside this decision. These are -

- The full submissions for the projects which provide the information we used to evaluate them against the evaluation criteria.
- The independent expert panel's recommendation on which projects should be awarded funding.
- Reports by our consultant, PPA Energy, on each project. These scrutinise the information provided by the licensees and provide the consultant's detailed assessment of each project to aid the expert panel's recommendation and our decision.
- The Licensee's answers to questions that PPA Energy, the expert panel and Ofgem raised on aspects of each project.

1.3. We use a number of terms in this document that are defined in the Electricity NIC Governance Document.

1.4. This decision document constitutes both notice of and reasons for our decision as required under section 49A of the Electricity Act (1989).

The Electricity NIC

1.5. Network companies need to consider how they can play a full role in tackling climate change while maintaining security of supply and value for money to customers. Significant investment in the Great Britain (GB) energy market is needed

[2] https://www.ofgem.gov.uk/publications-and-updates/electricity-network-innovation-competition-governance-document

to ensure security of supply.[3] Of this, around £32 billion will need to be spent on pipes and wires.

1.6. The Electricity NIC helps to encourage Network Licensees to innovate in the way they design, build, develop and operate their networks. It is an annual competition which provides funding to a small number of large-scale innovation projects. Network Licensees compete against each other for an allocation of up to £27 million of available funding.

1.7. The Electricity NIC is open for applications from Electricity Transmission Licensees only. From April 2015 (the start of the RIIO – ED1 price control period) the Electricity NIC will also be open for applications from the Electricity Distribution Network Operators (DNOs) and Independent Electricity Distribution Network Operators (IDNOs).

1.8. Customers of the electricity network fund the electricity NIC projects. Therefore a key feature of the NIC is the requirement that learning gained through projects is disseminated. This is to ensure that customers gain significant return on their funding through the broad roll-out of successful projects and the delivery of network savings and/or carbon and environmental benefits. Even where projects are deemed unsuccessful, Network Licensees will gain valuable knowledge that could result in future savings.

Structure of the Network Innovation Competition

1.9. The Governance Document prescribes the governance and administration of the Electricity NIC.

1.10. The annual competition starts when Network Licensees submit outline project proposals in the Initial Screening Process (ISP). During the ISP, we consider whether these proposals are eligible for funding. Only eligible projects are allowed to progress to the full submission stage.

1.11. After the ISP, Network Licensees are invited to develop the eligible projects into full submissions. An independent panel of experts advises us, and we make the eventual decision. The Panel consists of individuals with specific knowledge and expertise in the energy networks, environmental policy, technical and engineering issues, economics and finance, and customer issues. The expert panel assesses each project against a set of evaluation criteria.

1.12. Table 1.1 summarises the current full submission evaluation criteria. The full detail of the evaluation criteria is contained in the Governance Document.

[3] Project Discovery - Energy Market Scenarios

Table 1.1: Summary of evaluation criteria

Degree to which the solution being trialled:	**Degree to which the project:**
• Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing customers. • Provides value for money to electricity transmission customers. • Generates knowledge that can be shared amongst all Network Licensees.	• Is innovative (ie not 'business as usual') and has an unproven business case where the innovation risk warrants a limited Development or Demonstration project to demonstrate its effectiveness. • demonstrates a robust methodology and readiness of the project. • involves other partners and external funding. • is relevant and timely.

The 2013 Competition

1.13. This year's competition began with the ISP in April 2013. We received eight submissions and were satisfied that they all met the ISP eligibility requirements of the Governance Document. Network Licensees submitted full submissions for three projects by the deadline of 9 August 2013. A brief summary of each project is provided in Chapter 2 and all the ISPs and full submissions are available on our website. [4]

1.14. This year, the combined funding requested was £26.22m (excluding bid preparation costs).

1.15. The expert panel conducted a thorough evaluation. It reviewed the Network Licensees' submissions and PPA Energy's reports and met all the Network Licensees and project partners twice. It then evaluated the projects against the criteria set out in the Electricity NIC Governance document v.1. It was assisted in its review by our external consultants, PPA Energy, who assessed the feasibility of the projects, validated the information supplied and presented this information on a comparative basis. PPA Energy's reports are published on our website.[5]

1.16. We, PPA Energy, and the expert panel asked questions of the companies throughout the process. Where answers to questions clarified aspects of the licensees' submissions, the licensees made necessary changes to their submissions. All of the questions and answers that were raised through the written Q&A process have been published on the Ofgem website. In addition, licensees had an opportunity to respond to feedback they received throughout the process. PPA Energy has also

[4] https://www.ofgem.gov.uk/network-regulation-%E2%80%93-riio-model/network-innovation/electricity-network-innovation-competition

[5] The consultants' reports and questions and answers are available as sub documents to each project submission.

provided addenda to its reports that reflect these amendments. The Panel made its recommendations based on the final submissions.

1.17. The expert panel's recommendation report was submitted to us in October 2013. We assessed the projects taking the expert panel's recommendations into account in order to decide which projects should receive funding based on their performance against the evaluation criteria. This assessment is included in Appendix 1.

2. Decision

Chapter Summary

This chapter explains which projects will receive Electricity NIC funding and provides an overview of the reasons behind our decisions. We reviewed each project submission against each of the evaluation criteria set out in the Governance Document. Our full assessments are in Appendix 1 of this document.

Overview of full submissions

2.1. This was the first year of the Electricity NIC and we were pleased that each of the Transmission Owners (TOs) and an OFTO submitted project proposals to the competition. However, we were disappointed that while we received eight projects at ISP five of these were not taken forward to the full submission stage.

2.2. This year's proposals were generally of a satisfactory quality, given that this was the first year of the competition. However, we consider that ideas and relationships could, in some cases, have been developed further before the full submission stage. We consider that the transmission companies will need to look further and try harder to put forward well developed project proposals in future competitions. The table below summarises the full submission applications.

Table 2.1: Summary of project submissions

Project - Location	Funding request
Visualisation of Real Time System Dynamics using Enhanced Monitoring - VISOR (Anglo-Scottish Border) A project aiming to improve Transmission Owners' (TO) and the System Operator's (SO) visibility of the Anglo-Scottish Interconnector. SPTL would partner with SHE Transmission as well as NGET. *Submitted by SPTL.*	£6.49m
Multi-Terminal Test Environment for HVDC Systems – MTTE (SHE Transmission Licence Area) A project aiming to establish a test facility for furthering TO understanding of the impact of HVDC systems on the transmission network. As well as partnering with the TOs the project would also involve key HVDC vendors, OFTOs and offshore renewable developers. *Submitted by SHE Transmission.*	£11.33m
Mobile Extra High Voltage Substation Bays – MSB (England and Wales) A project aimed at developing, testing and deploying a mobile substation bay on the 400kv transmission network. NGET would partner with original equipment manufacturers. *Submitted by NGET.*	£8.40m

Our decision

2.3. Following consideration of the project submissions, the expert panel's recommendations and consultants' reports, we have selected two of the three projects for funding. We plan to place additional specific conditions on one of the projects – MTTE. We consider that these conditions are needed to ensure that customers' money is being spent efficiently and that customers will receive good value for money from this project.

2.4. Therefore we have -

- Selected one project that can be funded as it was submitted (Table 2.2).
- Identified one project that will require additional conditions to be agreed by the Funding Licensee before funding can be provided (Table 2.3). We explain the additional conditions for this project below in the "Reasons for our decision" section.
- Decided that one project will not be selected for funding (Table 2.4).

Table 2.2: Project selected for funding as submitted

Project (location)	Funding Licensee	Funding requested
VISOR (Anglo-Scottish Border)	SPTL	£6.49m

Table 2.3: Project selected for funding with additional conditions

Project (location)	Funding Licensee	Funding requested
MTTE (SHE Transmission licence area)	SHE Transmission	£11.33m

Table 2.4: Project not selected for funding

Project (location)	Funding Licensee	Funding requested
MSB (England and Wales)	NGET	£8.40m

Reasons for our decisions

2.5. We reviewed each project submission against each of the evaluation criteria in the Governance Document. These assessments are in Appendix 1 of this decision. Below we provide a summary of the key reasons for each of our decisions.

2.6. The total funding we have approved this year is significantly below the £27m annual funding limit. It would have therefore been possible for us to fund the third project proposal. However, funding can only be provided to those projects that we consider have performed strongly against the evaluation criteria. While we consider that the MSB project involved innovative ideas and may have had the potential to deliver benefits, we do not consider NGET demonstrated that the project performed sufficiently strongly against all of the evaluation criteria. We therefore do not consider that funding NGET's project would be in customers' best interests.

Project selected for funding as submitted

Visualisation of Real Time System Dynamics using Enhanced Monitoring (SPTL)

Overview

2.7. This project aims to improve the visibility and operability of the transmission system. Using data from Phasor Measurement Units (PMUs) to improve ways to see what is happening on the transmission system in real time. This will allow network planners to create more accurate models and network operators to operate the network more dynamically. It will also allow the TOs and National Electricity Transmission System Operator (NETSO) to make better use of existing network capacity without the need to invest in new assets.

Summary of assessment

2.8. We consider that, if successful, this project would release capacity on the Anglo-Scottish interconnector which would be likely to facilitate delivery of the Carbon Plan,[6] given the potential amount of renewable generation forecast to connect in Scotland. The project would deliver significant financial benefits by reducing the amount of network reinforcement required - because of the increased capacity released.

2.9. There were some initial concerns about project management costs, but SPTL reduced these in its final submission. Overall, we consider that this project has demonstrated value for money for electricity transmission customers.

[6] The Carbon Plan: Delivering Our Low Carbon Future December 2011. Where this document is amended or replaced by Government, Ofgem will notify the Licensees of any changes in writing.

2.10. Some aspects of the project use existing technology, such as phasor measurement units (PMUs). These would be used in new ways, and we considered the project to be innovative as a result. It will give TOs and the NETSO the ability to understand the impact of increased renewable generation. Licensees will have enhanced visibility of how HVDC and series compensation work in parallel. With the expected growth of such technology, this project is timely.

2.11. VISOR performed well across the evaluation criteria and we plan to fund this project.

Project selected for funding with additional conditions

Multi-Terminal Test Environment for HVDC Systems (SHE Transmisson)

Overview

2.12. This project will establish a testing facility to allow the TOs to study, test and understand the impact of HVDC systems on the wider transmission system. Replica HVDC control panels will connect to a Real Time Digital Simulator (RTDS) to do this. We consider that this particular use of replica panels and a RTDS is innovative and will benefit transmission companies and their customers.

Summary of assessment

2.13. MTTE performed well across most of the evaluation criteria. We believe it could significantly reduce the cost of future HVDC schemes in a number of ways: accelerating the optimisation of HVDC links; increasing competition between vendors; demonstrating multi-terminal HVDC schemes; and demonstrating multivendor HVDC links. In addition, the project's collaborative nature and capacity for learning were also welcomed.

2.14. The expert panel was concerned about the cost of the MTTE building. We recognise that SHE Transmission has committed to consider converting an existing building instead of building a new one (if this reduced the cost of the project). We also note that SHE Transmission will carry out a review towards the end of the NIC-funded period to understand the options for the future use of the facility. It committed to seeking our approval of the facility's future use and we may consult on its proposal. Revenue from selling the facility must be returned to customers, and the funds they receive must be proportionate to the funds they put in to the project. The Project Direction will reflect this requirement.

2.15. We consider that OFTOs and renewable generation developers of offshore transmission assets will be key users of the facility. Throughout the evaluation we, the expert panel and PPA Energy have asked questions about the participation of OFTOs and other interested parties such as interconnector developers or renewable generators in the project. We note the commitment SHE Transmission has made to

engage with these parties and market to them the opportunity provided by the facility.

2.16. A key reason for deciding to provide funding for this project is that we recognise fully the challenges of integrating multi terminal HVDC systems into the transmission system. This is reflected in our assessment of the project against several of the criteria. The added complications of inter-operability between equipment of different vendors further enhance the need for this project. However, because this is a stand-alone project that will be physically distant from the parties which plan and operate the whole system there is some risk that the transfer of knowledge and learning from the project is not as effective as it should be. We explored this concern with SHE Transmission and they secured a letter of support from NGET committing to use learning from their project in their business. It will be important for SHE Transmission to include updates on its work with the NETSO in its six monthly reports.

2.17. Finally, we have concerns regarding the level of vendor support and participation required for the project to be successful (this is discussed later in this appendix under criteria (e) and (f)). These concerns may mean the MTTE would not be able to deliver the benefits claimed. Therefore before SHE Transmission can access funding we will require it to secure contractual commitments to participate in the project from at least two of the three large European equipment manufacturers (i.e. ABB, Alstom or Siemens).

2.18. In addition we will require SHE Transmission to agree contractual commitments, or put in place agreements - deemed appropriate by Ofgem - with parties involved in prospective multi terminal HVDC schemes (i.e. developers of Crown Estates Round 3 offshore wind farms, interconnector developers, the NETSO, OFTOs and TOs). The aim of these arrangements must be to ensure, with the highest level of certainty, that a multi terminal scheme that is certain to be constructed, is tested within the MTTE facility.

2.19. The inclusion of these additional conditions is to ensure that the project meets the requirements set out in the competition’s evaluation criteria and to mitigate our concerns regarding the participation of HVDC vendors.

Project not selected for funding

Mobile Extra High Voltage Substation Bays (NGET)

Overview

2.20. This project aimed to develop a portable and quickly deployable mobile substation bay for use on the high voltage transmission network. The MSB would have been used to create temporary capacity on the transmission network. This project was not selected for funding

Summary of assessment

2.21. The expert panel had a number of concerns about how this project would meet some of the criteria. We do not consider that the concerns raised during the evaluation process were adequately addressed in the final submission. We consider that these shortcomings were material to the assessment of the project against the criteria. We do not consider that our concerns would be mitigated even if we were to grant funding for this project with additional conditions.

2.22. We were principally concerned about whether the benefits claimed for the project could be delivered. This view was shared by the expert panel. NGET stated that an MSB could be used to accelerate the connection of renewable generation. We do not expect the building of a new substation bay to be on the critical path for the connection of renewable generators. NGET also stated that the MSB could be used to avoid installing gas insulated switchgear (GIS) when refurbishing substations. However, it has acknowledged that the use of GIS is currently only considered when other options, such as diverting load to other parts of the network, have already been discounted.

2.23. We consider that NGET carried out insufficient feasibility studies. We would have expected NGET to have done further work to understand whether the desired functionality of the MSB was possible within the project budget.

2.24. We consider that funding this project would not represent good value for money for customers for the reasons set out above. We do not consider that NGET has shown this project to have performed sufficiently strongly against the criteria: "accelerates the development of a low carbon energy sector";"value for money;" or "demonstrates a robust methodology".

2.25. We are concerned that if the project is successful there may be few opportunities to use MSBs on the network. We do not consider that including extra conditions in a Project Direction would have mitigated these concerns.

Customer issues

2.26. We do not expect the either of the projects selected for funding to have any significant direct customer impact and no direct customer interaction was stated in either of the submissions.

Bid preparation costs

2.27. A Network Licensee Group can use up to a maximum of £175,000 or 5 per cent of the amount of funding they requested, whichever is smaller, in any year to cover expenditure it incurs in submitting bids to the NIC. Licensees can only recover these costs if their proposed project passes the ISP stage of the competition and is, therefore, eligible to be developed into a full submission application to the NIC. RIIO Network Licensees can recover this money through their Network Innovation Allowance. Non-RIIO Network Licensees must request BPCs as part of their full submission and - if deemed efficient - these are provided to the licensee through the NIC Funding Direction.

TC Ormonde OFTO Limited's (TCO) request for BPCs

2.28. TCO, an OFTO, submitted three projects[7,8,9] to the ISP stage of the competition. These projects were successful at the ISP stage and are therefore eligible to receive BPCs in accordance with paragraph 3.8 of the Governance Document. TCO has requested and justified BPCs of £24,393.

2.29. The amount requested is below £175k and below 5% of the funding that would have been requested to implement the project. In accordance with paragraph 7.2 of the Governance Document we will require the National Electricity Transmission System Operator to transfer these funds to TCO. This instruction will be made through the Funding Direction.

2.30. We note that the circumstances of TCO's request has revealed an anomaly in the Governance Document. The Governance Document requires a Non-RIIO Network Licensee to request BPCs through its full submission proforma. As TCO has chosen not to develop these projects beyond the ISP stage there is no full submission proforma. It has therefore requested this funding by writing to us. We have considered the request. In the interests of fairness we have decided that it would be reasonable to approve the request. In approving the request we note that RIIO licensees are able to access BPCs through their NIA automatically. Not providing these funds, or delaying their provision, and would mean treating TCO differently to

[7] https://www.ofgem.gov.uk/publications-and-updates/electricity-network-innovation-competition-year-one-screening-submission-developmenttesting-and-manufacture-universal-subsea-132kv-cable-joint
[8] https://www.ofgem.gov.uk/publications-and-updates/electricity-network-innovation-competition-year-one-screening-submission-trialdemonstration-innovative-seabed-scour-protection-method
[9] https://www.ofgem.gov.uk/publications-and-updates/electricity-network-innovation-competition-year-one-screening-submission-modification-telecommunications-repair-vessel-power-cable-repairs

the other participants in the NIC would have the effect of placing non-Network Licensees at a disadvantage relative to network bidders. We intend to consult on amending the Governance Document following this year's process and correct this anomaly.

3. Next Steps

Chapter Summary

This chapter explains the next steps for those projects that have been successful and provides details of next year's competitions.

Funding selected projects

3.1. Before projects are funded, we will issue a direction ('the Project Direction') to each successful licensee setting out the project specific terms that the Funding Licensee has to abide by as a condition of the funding. [10] We are currently preparing Project Directions for the successful projects and we will issue draft versions of these to Funding Licensees shortly. The Project Direction for MTTE will include the additional conditions outlined in chapter 2.

3.2. Following the acceptance of the Project Direction by the relevant Funding Licensees, we will issue a separate direction (the 'Funding Direction'). This will set out the amount of money which the NETSO will be allowed to recover from its customers over the course of the next regulatory year[11] to fund the successful NIC projects. The Funding Direction will require those funds to be transferred to the relevant Funding Licensees in order to fund the selected projects. We will issue the Funding Direction in time for the NETSO to prepare its indicative use of system tariffs at the end of December.

3.3. Although funding will not be raised until the next regulatory year, starting 1 April 2014, we expect the Funding Licensees to commence their projects as quickly as possible, according to the terms set out in their Project Direction and the Governance Document.

3.4. We will monitor projects to ensure they are being implemented in line with the full submissions. Each Funding Licensee implementing a project will be required to provide a detailed report, at least every six months, to allow us to evaluate the project's progress. We will publish these on the Ofgem website to make project learning available to all interested parties. Each of the implementing Funding Licensees should also be sharing what it is learning from its project according to the plan set out in its project submission. In addition, Funding Licensees are required to hold an annual conference, open to all interested parties, where Funding Licensees will be able to present the learning from their projects. Finally, the Energy Networks Association has developed a portal which holds learning from innovation projects, including LCN Fund and, from this year, the NIC.[12]

[10] The requirement for a Project Direction is set out in Special Condition 3I of the electricity transmission licence. Further details are set out in the Electricity NIC Governance Document.
[11] The requirement for a Funding Direction is set out in Special Condition 3I of the electricity transmission licence, and further details are provided in the Governance Document.
[12] Please see ENA portal here: http://www.ena-eng.org/smarter-networks/index.aspx

3.5. Funding Licensees are incentivised to deliver the projects to a high standard. They will be eligible to apply for a delivery reward if they meet the delivery criteria set out in the Project Direction.

Future competitions

As explained in Chapter 2, we had some concerns about certain areas of this year's submissions. We expect licensees to consider these concerns when developing submissions for future competitions.

The expert panel has also provided its views in section 4.4 of its recommendation report. We ask potential bidders in next year's competitions to take these points into account when developing their submissions.

We may also change the Governance Document to incorporate lessons learnt from this year's process and to make a number of housekeeping changes. The Electricity NIC Governance Document (v2) would then govern the second year of the Electricity NIC. This will be in place prior to the ISP deadline in 2014. We will confirm the ISP and full submission deadlines in the New Year. We expect that they will be similar to the deadlines in 2013.

Appendices

Appendix 1 – Project Evaluations (TO)

This appendix contains our detailed evaluation of each project against the Electricity NIC evaluation criteria. The Governance Document explains the evaluation criteria and our evaluation process in full, but we have summarised the process in the introduction and the criteria in the table below.

Degree to which the solution being trialled:	**Degree to which the project:**
• Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing customers. • Provides value for money to electricity transmission customers. • generates knowledge that can be shared amongst all Network Licensees.	• Is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration project to demonstrate its effectiveness. • Demonstrates a robust methodology and readiness of the project. • Involves other partners and external funding. • Is relevant and timely.

The detailed evaluation criteria in the Governance Document use the defined terms 'project', 'method' and 'solution'. A project is the specific trial being proposed or undertaken. A solution is the outcome which the project is seeking to establish, prove or demonstrate. A method is the proposed way of reaching the outcome. We use the same terminology in this appendix.

Visualisation of Real Time System Dynamics using Enhanced Monitoring (SPTL)

Project overview

This project will (subject to the Project Direction being accepted) enhance the capability of TOs to monitor in real time the dynamic performance of the transmission system through the innovative use of data from Phasor Measurement Units (PMUs). The project will use existing PMUs as well as deploying new units on the network. While not innovative on their own, the new techniques applied by VISOR will provide valuable information from the data provided by the PMUs.

The project will improve the visibility of the operation of the transmission system by synchronising the measurements that are made on the network and in the way that they are presented in control rooms. This will allow control room staff to manage the network more efficiently by taking account of dynamic stability margins. Real time information derived from the PMUs is expected to allow specific network constraints to be reduced.

The project will take place in the area around the B6 Boundary (Anglo-Scottish Interconnector). The project will also involve the use of staff and equipment within NGET and SHE Transmission.

(a) Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing customers

If successful, the project will deliver significant financial savings by releasing capacity on constrained parts of the transmission system. This will deliver benefits in two ways: by avoiding the need to build new network assets; and by reducing the amount of constraint payments made, by the NETSO, to generators. The project could also deliver carbon benefits where the capacity released by this project is taken up by new sources of renewable generation.

Low Carbon and/or environmental benefits

SPTL has not specifically quantified the carbon benefits of this project. It has included generic figures associated with the carbon savings of using Scottish sources of renewable generation compared to the Longannet power station (coal fired power station). However, these numbers are not specific to the project. SPTL argues that the project will facilitate the Carbon Plan by releasing capacity on the transmission network that can be taken up by renewable generators. SPTL also state that the project will deliver a more reliable and safer network allowing increased future use of DC links and North Sea interconnection.

SPTL made no explicit claims of other environmental benefits for the project.

Net financial benefits

SPTL stated that the project could deliver significant financial benefits to customers compared to the cost of installing new physical assets. SPTL noted that VISOR will release 50MW of network capacity. It stated that the cost of building 50MW of HVDC capacity (an alternative solution to provide more network capacity) is £22.2m while the cost, to the customer, of the VISOR project will be £6.5m. We recognise that this is based on the method being successful. We also note that it is possible the method could release more capacity than SPTL has estimated resulting in larger savings for the customer. SPTL noted that this capacity will be in place 30 months earlier using the method being trialled than it would be by building an HVDC link. We also note that SPTL considers the same method could be applied to another two boundaries within GB. While we note the savings the method could deliver compared to HVDC links, we consider that it may have been useful to also have illustrated the potential savings in comparison to using traditional AC network reinforcement.

Associated with the release of existing capacity is the reduction in constraint payments. Currently the NETSO enters into contracts with generators to constrain their ability to export electricity at times when the network is congested. Generators are paid in return for agreeing to be constrained. Because VISOR will release capacity on the network, as discussed above, SPTL estimates that the method could deliver savings of £4m per annum through reduced constraint payments.

Finally, SPTL also noted that VISOR could result in a saving of £30bn through avoiding the possibility of a total system collapse resulting in a 'black start' situation. SPTL included a high level assessment showing the impact on GB of a three day system shut down.

In summary the project could deliver benefits in three ways: releasing network capacity, improving the ability to monitor the stability of the network and reducing constraint payments to generators who are not able to export electricity because the network is constrained. We note that the project has not quantified the carbon benefits it could deliver. However, we accept SPTL's argument that the release of new capacity will facilitate the Carbon Plan. We consider that this capacity is most likely to be used by renewable generators.

We consider that the project could deliver significant financial savings to customers, by reducing the volume of new physical assets that are required and minimising constraint payments to generators. We also note that the method being trialled will, if successful, release capacity significantly earlier than if it was being delivered through a new HVDC link.

The likelihood of total system shutdown is extremely low. We recognise that the project will improve understanding of sub synchronous oscillation (SSO) an issue that increases the likelihood of such an outcome. However, we consider the risk of a total system shutdown to be so low that, on the basis of this justification alone, the project would not have been selected for funding.

(b) Provides value for money to electricity transmission customers

If proved successful, the method being trialled will deliver financial benefits to transmission customers. It would also deliver significant new learning for all TOs and potentially change the way the NETSO operates the transmission system.

The majority of benefits this project could deliver will accrue to transmission network customers. These will take two forms: reduced constraint payments and reduced investment in new infrastructure. The project will deliver learning which could be directly applied by all TOs as well as the NETSO.

The project will have a direct impact on the operation of the transmission system. Enhanced monitoring will lead to the network being operated with visibility of dynamic stability margins. These are currently static and based on assumed characteristics rather than observed and measured characteristics.

We had some concerns regarding value for money that will be associated with the implementation of the project. In particular we were concerned with the level of project management costs involved in the project. However, we recognise the steps taken by SHE Transmission to rationalise these costs. We share the view of the expert panel that these have now been reduced to a reasonable level.

We note a concern expressed by our consultants and the expert panel that an issue associated with using PMUs is the large amount of data that they produce and the need to ensure that this is converted to useful information that network operators are able to use effectively. However, we welcome the fact that SPTL will tender competitively for the provider of a Wide Area Monitoring (WAM) system that will be used to facilitate the management, use and analysis of data gathered by the PMUs.

We welcome the competitive approach that will be used to procure a WAM provider. We note that there a similar approach is not being used to procure academic support. We consider that the University of Manchester is qualified to participate in the project. However, further value and learning may have been delivered through wider engagement with academic institutions.

(c) Generates knowledge that can be shared amongst all relevant Network Licensees

The project will collect phasor measurement data to validate and improve existing network modelling systems. The project has the potential to deliver learning that can be used by all TOs and the NETSO. The project will also develop new learning through the academic partner, the University of Manchester.

The project will deliver significant new learning associated with SSO. It will also deliver learning about the effective use of data from PMUs with a WAM system. This learning will benefit those who plan the system as well those who operate it. However, we note that the use of PMUs is not in itself novel. SPTL should therefore

ensure that dissemination activities of the project focus on those aspects which are genuinely novel.

Knowledge dissemination is recognised within the submission as a core aspect of the project. The project will include a full time Knowledge dissemination Coordinator. This role will include internal and external dissemination, amending policies and standards, and public engagement. The academic partner will also be responsible for aspects of external dissemination. We note that the project will conform to the default IPR arrangements.

(d) Is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration project to demonstrate its effectiveness

There are aspects of this project which are genuinely innovative. There are other parts of the project which are to a certain degree business as usual, eg the installation of PMUs on the network. The innovation in VISOR is primarily associated with the use of new techniques in conjunction with established technology on the GB system. New techniques will be used for assessing boundary capacities using PMU data and seeking to identify the location of SSO sources.

SPTL has explained, through the question and answer process, that until the project is implemented it is difficult to accurately assess the impacts of the project in GB. This means, according to SPTL, that NIC funding is required. We accept this argument.

SPTL has identified a number of project specific risks, the biggest being the interaction that will be required between the three TOs and the NETSO. SPTL has also drawn attention to the fact that certain dynamic modeling data of the GB system is not allowed to be used outside NGET facilities. However, this risk has been mitigated through a non-disclosure agreement between the University of Manchester and NGET and on the basis that work will be carried out at NGET.

(e) Involvement of other project partners and External Funding

The project will involve all three TOs and the NETSO. While we are concerned that these partners have not committed to provide an actual financial contribution, we recognise that these parties will provide contributions in kind. We also note that the project will not involve any other external funding. However, SPTL noted that some solutions providers may wish to fund aspects of the project to protect IPR specifically associated with their product(s) that might be further developed through the project.

Some concerns were expressed, throughout the process, regarding the commitment of the NETSO. In particular the expert panel was concerned regarding the level of support from senior management and its willingness to incorporate learning from the project into business as usual. We note that in its resubmission, SPTL has included a letter of support from Chris Train, NGET's Director responsible for both the electricity TO and SO functions.

The process SPTL used to procure an academic partner has not been successful in engaging with a range of possible academic partners. We understand that the University of Manchester was the only institution to respond to SPTL's attempt to engage on the possibility of partnering on this project. While we are confident the University of Manchester would be a qualified partner we feel that in future SPTL should adopt a more proactive process of engagement. SPTL advertised the existence of the project to potential academic partners and waited to be approached. It may have been more effective to approach universities directly and discuss the project with them.

(f) Relevance and timing

The project could enhance the transmission system's facilitation of a low carbon economy. This would happen by releasing additional capacity on the network. With increasing levels of renewable generation connecting to the network where there are not large amounts of spare capacity, the learning from this project is potentially very timely.

In addition to releasing network capacity, SPTL argued that the project is important now due to the utilisation of new technologies that are connected or due to be connected to the system such as the Western HVDC link and system capacitors (i.e. series compensation). It argued that it is important to understand how these technologies impact on the system. We accept this argument and consider that this project will deliver timely and relevant learning for the TOs and the NETSO.

The project will produce information that will be of use in future network modelling and planning activities. The project will also generate information that is applicable to the general operation of the transmission system irrespective of whether the future of the system involves the connection of a large volume of Low Carbon Technologies (LCTs).

(g) Demonstration of a robust methodology and that the project is ready to implement

This submission includes a project plan which is set out to a sufficient level of detail for a project of this type and scale. The plan identifies the resources that will be used to implement the project. As noted above, we considered the level of resource identified in the original full submission to be high in some areas of the project. We welcome the fact that SPTL amended aspects of the project, in its revised full submission, resulting in associated cost savings.

We consider that the full submission sets out a strong and clearly defined methodology. The successful implementation of the project should be viable within the project budget. A major risk for the project is that it may not develop dynamic stability margins. However, we recognize that whether this element of the project is successful or not it will deliver significant new learning and therefore we consider this should not prevent the project from being implemented.

The costs and benefits of implementing the project appear to have been reasonably estimated. We also note that some of the benefit calculations may have been conservative, in particular with respect to the reduction in the level of constraint payments the project could bring about. We also note that the project implementation would not impact on electricity customers.

The submission also explains the process by which SPTL would seek permission to change or halt the project. Any request to halt the project would be escalated within SPTL from the project management group to the project steering group. If this group agreed then a request would be addressed to the Authority.

We consider that the SDRCs proposed by SPTL are appropriate for the project. They are clear and concise and the evidence for each SDRC links to specific project work packages.

Mobile Extra High Voltage Substation Bays (NGET)

Project overview

Had this project been awarded funding it would have aimed to design, develop and demonstrate a 400kV mobile substation bay (MSB). The project would develop a quickly deployable and removable substation bay that could be used to provide temporary network capacity for a number of purposes, including to:

- Facilitate equipment maintenance or replacement.
- Allow the connection of new sources of generation.
- Provide temporary capacity to manage short-term changes in network conditions, such as in response to a piece of equipment failing.

The project would have sought to develop the solution at a scale to be deployed on the extra high voltage transmission system, working with an original equipment manufacturer (OEM). In the trial, the MSB would be deployed on the network for a period of time before being removed, serviced and then redeployed to another part of the network.

The project would have taken place in National Grid Electricity Transmission's (NGET's) licence area. The OEM and the trial sites would be identified during the implementation of the project.

(a) Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing customers

NGET has set out that, if proven successful, the solution developed and trialled in this project could deliver carbon, environmental and financial benefits. Those benefits are discussed below. However we do not consider this project fulfils this criterion.

Overall we are not convinced that all the claimed benefits would be realised. While we consider that MSBs may have the potential to deliver carbon, environmental and financial benefits to customers, the circumstances where the method could be deployed remain unclear and lack definition. In particular, we note the expert panel's concern about the clarity of the evidence underlying the calculation of low carbon and environmental benefits. NGET has been unable to allay concerns raised by the expert panel regarding the scale of the opportunities there might be to deploy MSBs and has consequently failed to convincingly support its case for funding.

Low Carbon and/or environmental benefits

In its full submission NGET has stated that the MSB would deliver carbon and financial benefits in three ways.

Firstly, NGET has set out that MSBs would facilitate the Carbon Plan through the provision of additional temporary network capacity while permanent solutions are built to accommodate new connections. NGET noted that MSBs could be used to connect new renewable generators up to a year earlier than is possible using a permanent substation bay. NGET estimated that deploying an MSB to connect a 100MW wind farm, with a load factor of 30%, 12 months earlier, would result in the advancement of energy delivery of 263GWh. It says that this would lead to 117,000 tonnes of carbon saving. We note that the expert panel expressed doubt as to whether the construction of a substation bay would be on the critical path of a renewable generation connection. We share this concern and consider that compared to the time required to obtain planning permission, build the low carbon generation, and a transmission circuit, the substation bay would not be on the critical path.

Secondly, NGET argued that the MSB method could be used to reduce the use of SF6 in substations. NGET explained that it could use MSBs to facilitate the servicing and replacement of Air Insulated Switchgear (AIS). AISs are large devices and constraints in the size of substation sites often mean that when an AIS needs to be replaced the only option is to use smaller Gas Insulated Switchgear (GIS). However, GIS uses SF6 as an insulator and so carries a higher environmental risk than AIS. NGET explained that if the project is successful, it would be able to use the MSB on a temporary basis while servicing or replacing existing AIS. This would avoid the need to install new GIS.

Finally, NGET explained that the MSB method would lead to a reduction in the amount of carbon embedded in the manufacture and installation of a MSB(compared to the installation of a normal substation bay). NGET drew particular attention to the fact it intends to reduce the amount of concrete in the civil works when an MSB is used rather than the traditional building method. Concrete has a large amount of embedded carbon. NGET did not specify what sort of deployment these benefits were associated with. However, they would only be realised if the use of the MSB altogether avoided building a permanent substation bay.

Net financial benefits

As noted above NGET stated that an MSB could be used to connect a wind farm up to a year earlier. As well as the carbon benefits, discussed above, NGET argues that this could result in a financial benefit of £5m-£8m per deployment.

NGET stated that significant cost savings would be achieved by using MSBs to facilitate a more efficient asset replacement programme. As noted above, GIS can be used to replace AIS because it is smaller. However, it is also more expensive than AIS. NGET noted that deploying an MSB could result in a financial saving of £1m-£3m per deployment. We note, however, that NGET accepted that there were other options available to it which would be used before considering the use of GIS. As such, it is not clear what scope NGET has to use the MSB for this purpose.

NGET estimated that the project could deliver £0.5m-£2m worth of financial savings due to reduced civil engineering requirements. In addition, it estimates, a further £0.5m-£1m of savings due to the accelerated build time associated with the use of MSBs and the reduced labour costs that would be required.

Finally, NGET also noted that the MSB would give them a tool to use to rapidly (compared to the business as usual method) restore power in the event of sudden

outages caused by equipment failures. However, it does not quantify the benefits of this deployment type.

(b) Provides value for money to electricity transmission customers

If successful, this project could have delivered some benefits to customers. The scale of funding requested to implement the project is not commensurate to the level of benefit customers are likely to receive. In particular, we note the expert panel's concern that OEMs have not previously offered MSBs for the 400 kV network and this might indicate a limited market for a standardised product. We do not consider that the full submission has fulfilled this criterion.

Learning regarding the deployment, recovery, servicing and redeployment of an MSB could be expected to have a direct impact on the GB transmission system. In addition, a significant portion of the benefits from this project would be directly attributable to electricity transmission customers (through reduced connection or use of system charges, or through more timely connection to the network). However, the learning would also be useful to the equipment manufacturers. Given this likely benefit for manufacturers, we note the expectation set out by NGET in its submission that it would require manufacturers to contribute to the project in order to secure the intellectual property embedded in the MSB.

On value for money in project delivery, we are pleased to see companies use competitive processes when procuring goods or services providing their approach is appropriately structured and we share the expert panel's view that NGET's planned approach is suitable. We note that NGET has, to some extent, taken into account the concern of the expert panel regarding the high level of contingency costs associated with the project by reducing the level of contingency costs by 17.39% of the total project cost in its resubmission. However, we continue to be concerned at the level of contingency that it requested for the project.

(c) Generates knowledge that can be shared amongst all relevant Network Licensees

This project involves a first of a kind application at the transmission level. If successfully demonstrated, MSBs could impact on how the transmission system is managed and deliver learning that would be beneficial to all TOs. The expert panel noted that the project would generate significant knowledge of the engineering and safety processes/procedures of the approach.

We consider that NGET's list of interested parties provides good coverage of those likely to be interested in the learning this project would generate. NGET proposed running a number of events during the course of the project as well as hosting webinars, publishing pod casts, articles and academic papers. We consider this to be a good approach to dissemination.

We note that NGET has indicated that the project would conform to the default IPR arrangements.

(d) Is innovative (ie not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration project to demonstrate its effectiveness

This project would be innovative. It aims to develop a first of a kind MSB for use on the extra high voltage transmission system. Reducing the size of the elements of a substation bay to make it portable is what makes this project innovative.

NGET included a review in its submission of international activities to develop mobile substation technology at various voltages. Based on this evidence, we consider that the MSB would be a first at transmission voltage levels, and as such would be innovative at these voltage levels.

Neither OEMs nor TOs in GB, or internationally, have undertaken trialling of an MSB. However, we note that in its submission NGET explains that OEMs are in the early stages of developing such solutions (albeit these are still at the design stage). We note the expert panel's concern that this lack of development could be indicative of a lack of demand for the product.

We accept NGETs explanation that the project has an unproven business case. On this basis NGET would not fund the project through its existing allowance and has sought funding through the NIC.

(e) Involvement of other project partners and External Funding

The development of relationships with partners or potential partners so far is very limited. The project would rely on OEMs taking on a significant amount of design and manufacturing work. We note that NGET has engaged with a number of possible OEMs. However, discussions to date appear to be at a high level.

The only project partner identified so far is the Carbon Trust. It will be involved in assessing the carbon savings achieved by the project and disseminating learning from the project. These are both areas where the Carbon Trust has experience.

NGET would use a competitive process to engage the OEMs. NGET says this will allow it to ensure that the project is implemented with appropriate project partners. We welcome the proposal that the final partner(s) should provide funding to the project. However, we note that this funding has not yet been guaranteed and so this is an area of some uncertainty.

(f) Relevance and timing

NGET aims to develop the MSB so it can be deployed as a business as usual method from the beginning of the RIIO-T2 period. NGET stated that it would develop a fleet of five MSBs comprising: 2x 400/132kV MSBs, 1x 400/275kV MSB and 2x275/132kV MSBs. However, the expert panel noted that there was a lack of clarity on the circumstances in which an MSB would be the optimal solution.

It is still unclear whether the deployment opportunities are sufficient for MSBs to become a serious alternative to traditional approaches. Despite being asked a number of times in the course of the evaluation process, NGET has only provided a few specific examples of where it would have used this technology in the past (had it

been available). While we recognise that there will be a larger number of renewable generators connecting to the system in the future, we are not convinced that the provision of a substation bay will be on the critical path for these projects.

(g) Demonstration of a robust methodology and that the project is ready to implement

This project includes a well structured project plan, which identifies the resources National Grid would have in place for use in the project. The plan also identifies the key phases in the project. We note that, based on the plan, the project would start in a timely fashion at the end of 2013. However, we do not consider that the full submission has fulfilled this criterion.

There are also various stage gates within the project where the project will be reviewed and a decision will be made whether to continue. NGET has explained that a steering body would consider any requirements for contingency funds. A contingency plan has been included. We also note that the project has not requested protection against cost over runs or against shortfalls against Direct Benefits.

A risk register has been included within the submission. The register identifies the risks NGET expects to face. While the log includes risk mitigations, we do not consider that these mitigating actions would necessarily lead to the successful delivery of the project. For example, the risk that equipment is too heavy to transport to site by road is identified. The mitigating action is to ensure Highways Agency information is understood and road bearing capacities at specific sites are taken into account. However, the mitigating action does not take into account ensuring equipment can be manufactured that is sufficiently light to begin with.

It is not clear whether it will be possible to deliver the functional requirements of a transmission substation bay in a portable environment. We note that NGET has not sought assurance from manufacturers that the functional requirements it is seeking are possible within the project budget.

We note that NGET has recognised that it would require a high level of cultural change to transfer the MSB to business as usual if successfully demonstrated. However, it is not clear that the activities necessary to drive this culture change have been included as part of the project.

Finally, the SDRCs that NGET has proposed are clear, detailed and link to the Development Strategy. We also note that the SDRCs are placed throughout the development of the project. However, the evidence NGET would submit to demonstrate achieving SDRCs could, in some places, been more focussed and less ambiguous.

Multi Terminal Test Environment (SHE Transmission)

Project overview

This project would establish a collaborative facility that would enable the deployment of multi-terminal, high voltage direct current (HVDC) transmission systems to be studied. In particular, it would allow the inter-operability of the proprietary control systems of different manufacturers to be assessed. The facility would enhance the ability of TOs and the NETSO to plan the integration of HVDC transmission into the GB transmission system. The facility would host a real time simulator to simulate the GB system and replicas of HVDC control panels in use or planned for use on the GB transmission system.

The project would allow TOs, the NETSO and other key stakeholders to understand the impact of different types of HVDC connection on the GB transmission system. The project would allow the TOs to model: point to point HVDC systems; multi-terminal HVDC systems (i.e., where multiple HVDC links connect to a single converter point on the AC system); and multi vendor HVDC systems (i.e. HVDC systems where the converter station at each end of the HVDC link comes from a different manufacturer). It would also allow companies to carry out staff training and network planning studies.

The final location for the test facility would be established during the implementation stage of the project. However, it is expected this will be within SHE Transmission's license area.

(a) Accelerates the development of a low carbon energy sector and/or delivers environmental benefits whilst having the potential to deliver net financial benefits to future and/or existing customers

If successful the MTTE could deliver carbon and financial benefits to electricity transmission network customers. The project could result in financial savings when procuring HVDC systems and through optimising the use of HVDC and AC network assets. In addition, the MTTE could deliver carbon savings by facilitating the early connection of renewable sources of generation.

Low Carbon and/or environmental benefits

SHE Transmission has not quantified the carbon benefits of the project and has not claimed the project will deliver any wider environmental benefits. However licensees are not required to quantify these benefits. We consider that the project would facilitate the Carbon Plan by increasing the amount of renewable generation that can be connected to the network.

Government incentives mean renewable generation is expected to grow significantly as a share of the generation mix over the next twenty years. SHE Transmission stated that HVDC will facilitate the connection of multiple sources of renewable

generation in RIIO-T1 and beyond. For longer distances (over 60-70km) HVDC links are the only option. For this reason HVDC links are seen as beneficial for connecting new sources of offshore renewable generation to the transmission system. The MTTE could, if successful, accelerate the use and optimisation of HVDC links – which could mean more renewable generators are connected more quickly.

The MTTE would use replica control panels connected to a simulator to optimise the operation of HVDC converters before the real devices are energised on the transmission system. We accept SHE Transmission's argument that the MTTE would assist in the further delivery of low carbon benefits through enhancing the understanding and operation of different HVDC systems – which could reduce the operating risk of these systems and encourage their adoption.

Net financial benefits

We accept SHE Transmission's explanation that the project could deliver financial savings in three key areas -

- Firstly, it stated that the project could deliver cost savings of 2-4% per HVDC scheme, through enhancing the setup of HVDC converters to reduce losses and improve efficiency, on point to point HVDC links. This would result in a saving for customers of between £113m-£493m (this figure does not include the cost of using the MTTE facility) if learning impacts upon two thirds of the potential GB HVDC links.

- Secondly, it stated that, as a result of the project, fewer HVDC converter stations would be required, resulting in a saving of approximately £117m per avoided converter station. This is through the development of multi-terminal links, i.e. a number of HVDC links connecting to the AC transmission network through a single HVDC converter.

- Finally, the project could deliver financial benefits to customers by increasing competition between HVDC vendors. The project would undertake research to understand how HVDC converters from different manufacturers could be used at either end of the same HVDC link, or together in a multi-terminal scheme.

(b) Provides value for money to electricity transmission customers

If successful the MTTE would deliver financial benefits to transmission customers. It would also deliver significant new learning for all TOs (including OFTOs) and allow the NETSO to better understand and take account of HVDC links in the way it plans and operates the NETS.

Learning from the MTTE would have a direct impact on the operation of the transmission system. Electricity transmission customers would benefit through reduced transmission use of system charges as learning from the project should allow more efficient operation of the AC and HVDC network.

This project would deliver learning that can be applied to the transmission system and benefits that are applicable to the transmission system rather than other parts of the supply chain. Customers should benefit financially through the improved procurement and operation of HVDC links.

SHE Transmission has adopted different methods for selecting partners and suppliers. We welcome SHE Transmission's decision to use a competitive process to procure a number of the major cost items, including: the MTTE building, the real time digital simulator, HVDC technical advice and academic support. SHE Transmission has issued requests for information to a number of potential academic partners and requests for quotations to the two main manufacturers of real time simulators. SHE Transmission intends to validate these quotes through third parties. We consider this to be a sensible approach.

However, there were areas associated with value for money where we were concerned and these concerns were shared by the expert panel too. In its original submission SHE Transmission did not appear to have considered converting an existing building to host the MTTE. However, we welcome that in its resubmission SHE Transmission has indicated it will consider whether it would deliver greater value for money to convert an existing building when implementing the project. However, we remain concerned that, following the project, customers could have funded the building or development of a facility that may only be used for a limited amount of time. We will address this by including extra conditions within the MTTE Project Direction. Throughout the NIC process we wish to ensure value for money for customers.

Finally, we have concerns regarding the level of vendor support and participation required for the project to be successful (this is discussed later in this appendix under criteria (e) and (f)). These concerns may mean the MTTE would not be able to deliver the benefits claimed. Therefore before SHE Transmission can access funding we will require it to secure contractual commitments to participate in the project from at least two of the three large European equipment manufacturers (i.e. ABB, Alstom or Siemens).

In addition we will require SHE Transmission to agree contractual commitments, or put in place agreements - deemed appropriate by Ofgem - with parties involved in prospective multi terminal HVDC schemes (i.e. developers of Crown Estates Round 3 offshore wind farms, interconnector developers, the NETSO, OFTOs and TOs). The aim of these arrangements must be to ensure, with the highest level of certainty, that a multi terminal scheme that is certain to be constructed, is tested within the MTTE facility.

The inclusion of these additional conditions is to ensure that the project meets the requirements set out in the competition's evaluation criteria and to mitigate our concerns regarding the participation of HVDC vendors.

(c) Generates knowledge that can be shared amongst all relevant Network Licensees

The project could generate new incremental learning that would be useful to all transmission owners, OFTOs and offshore renewable generator developers. This learning will be associated with the planning and operation of HVDC links and their impacts on the NETS.

SHE Transmission has identified a number of interested stakeholders and a number of methods for disseminating learning from the project. We particularly welcome SHE Transmission's intention to establish an HVDC Operator's forum to act as a knowledge sharing body. As well as publishing and disseminating learning through papers and conferences SHE Transmission also plans to use the MTTE to provide training to system planners and control room staff. This will allow staff to gain firsthand experience working with replica panels before working with 'live' devices. We consider that SHE Transmission has set out a methodology that would allow learning from the MTTE to be captured and effectively disseminated.

We note that SHE Transmission has indicated that it would conform to the default IPR arrangements.

(d) Is innovative (i.e. not business as usual) and has an unproven business case where the innovation risk warrants a limited Development or Demonstration project to demonstrate its effectiveness

The MTTE would be a collaborative facility that will involve the innovative use of replica HVDC control panels. The panels will be connected to a real time digital simulator so that TOs and the NETSO can understand how to most effectively operate HVDC systems from initial commissioning and to fully understand the impact of these systems on the transmission network.

The use of replica HVDC control panels in conjunction with a real time digital simulator to understand the impacts of HVDC on the system is innovative in GB. While a similar facility exists in Canada, this project would be specific to the GB transmission system. The simulator would be programmed using models of the GB system.

SHE Transmission argued that licensees implementing HVDC schemes would be unlikely to carry out research work through business as usual schemes because of the extra costs. However, we believe that the operation of a collaborative facility can have benefits for all licensees and their customers.

(e) Involvement of other project partners and External Funding

In addition to SHE Transmission, the two other onshore GB transmission owners are participating in the project. In its resubmission SHE Transmission also committed to

hold an event to explain the purpose of the MTTE and invite OFTOs and generators to participate.

It is a key assumption that HVDC vendors will participate in the project by providing replica control panels. The involvement of HVDC vendors is crucial to the successful implementation of the project. Without engagement by the vendors, the MTTE would not be able to operate in a way which would deliver the project's expected benefits. However, as noted above we will include extra conditions to ensure that customers' money is not committed to the project until two of the incumbent large vendors have agreed to participate in the project.

A number of other key roles within the project do not appear to have been filled at this time, e.g. the academic partner has not yet been appointed. As discussed above we welcome SHE Transmission's intent to tender for the provision of a number of goods and services required to implement the project. With the exception of the OFTOs these additional roles will be filled through competitive processes. We would expect a project which will rely on academic support, such as this, to have identified the likely partners early in the development process. SHE Transmission has gone some way to achieving this by establishing a short list of academic partners.

(f) Relevance and timing

As noted above, the amount of renewable generation connected to the GB transmission system using HVDC is expected to increase significantly over the next two decades. However, transmission owners do not currently have sufficiently well developed experience of working with HVDC systems to fully exploit this opportunity. The learning that the MTTE project could deliver is therefore highly relevant.

New HVDC systems connecting to the transmission network will involve new risks and challenges for transmission owners. In addition to delivering cost savings as new HVDC systems are commissioned, the MTTE could also be used to train staff in the operation of HVDC systems. The cost of implementing a new HVDC scheme is high – and the market is dominated by a small number of established vendors. Learning from this project could lead to savings by increasing competition in the market for providing HVDC equipment and reducing the number of converter stations that are required.

Learning from the MTTE should feed into the future business planning activities of all three TOs and the NETSO. Therefore we consider that learning from the MTTE would be relevant and timely.

(g) Demonstration of a robust methodology and that the project is ready to Implement

Throughout our consideration of this project we have been concerned regarding the level of detail included in the project plan. We would have expected to see more detail. In particular, we would have expected further information regarding what work would be completed under each of the work streams. We recognise that SHE

Transmission has been asked about aspects of the plan in the course of the evaluation process and its responses have demonstrated the depth of thought behind the plan. Given that SHE Transmission has obviously developed this thinking further, we consider that it should have included further detail in its re-submission. We will require SHE Transmission to include a more detailed project plan in its first six monthly report. SHE Transmission has however included a risk register and mitigations for all issues they are able to control.

SHE Transmission has outlined how it intends to control the costs in the project and that the project will be subject to SHE Transmission's internal governance reviews as a major project. We also welcome SHE Transmission's proportionate approach to managing the risks involved in the project. It has provided more detail in its submission for the risks that have the greatest impact. It has in place a robust methodology for the implementation of the project which includes stage gates where the project will be assessed and, if necessary, halted.

As noted throughout this appendix, a lack vendor participation is a major risk for the project. SHE Transmission has acknowledged this throughout the evaluation process. While, it appears to have in place a number of the resources required and the funding to successfully implement the project. It is yet to agree who will fulfil a number of key aspects of the project.

SHE Transmission has also recognised that the lack of a sustainable business plan for the period after completion of this NIC project is a major risk. We agree this is a risk. As well as benefitting from learning that is developed through the project, we consider that customers should also benefit from the MTTE facility they are funding if it is decided that the facility should be sold or used for another purpose following the NIC funding period. We note that, in its resubmission, SHE Transmission has proposed to seek permission from the Authority for any proposed use of the facility following the NIC funding period.

We had a number of concerns regarding the appropriateness of the proposed SDRCs and the links to key project milestones in the original submission. In general, the evidence that SHE Transmission proposed to deliver as illustrating its achievement of SDRCs lacked detail. In addition, the SDRCs were weighted towards the front of the project. However, SHE Transmission has improved all aspects of its proposed SDRCs in its resubmission and these are now better spread through the course of the project and are more detailed.

Appendix 2 - Glossary

A

Authority

The Gas and Electricity Markets Authority is the governing body for Ofgem, consisting of non-executive and executive members.

D

Department of Energy and Climate Change (DECC)

UK Government department responsible for setting energy and climate change policy.

E

Energy Networks Association (ENA)

ENA is the industry body funded by UK gas and electricity transmission and distribution licence holders. It lobbies on common issues in the operating environment, both at domestic and European levels, and provides technical services for the benefit of members.

G

Great Britain (GB)

I

Innovation Funding Incentive (IFI)

Scheme established under previous price control settlements. The IFI is intended to encourage Licensees to invest in appropriate research and development activities that are designed to enhance the technical development of their networks (and to deliver value (ie financial, supply quality, environmental, safety) to end customers.

Initial Screening Process (ISP)

The Initial Screening Process is a pass/fail evaluation of Electricity NIC bids that takes place before the full submission process. The purpose of the ISP is to prevent Network Licensees spending money to fund project bids which do not meet the Electricity NIC criteria.

Intellectual Property Rights (IPR)

Comprises copyright, designs, patents, confidential information and trademarks.

L

Low Carbon Networks (LCN) Fund

Funding to encourage the DNOs to innovate to deliver the networks we will need for a low carbon economy.

M

Memorandum of Understanding (MoU)

N

National Electricity Transmission System Operator (NETSO)

National Electricity Transmission System Operator has responsibility for making sure that electricity supply and demand stay in balance and the system remains within safe technical and operating limits. In GB this role is undertaken by National Grid.

Net present value (NPV)

Net present value is the discounted sum of future cash flows, whether positive or negative, minus any initial investment.

Network Innovation Competition (NIC)

The Network Innovation Competition will apply the LCN Fund concept to electricity and gas transmission and gas distribution network companies. The competition will also be open to independent network operators.

R

Reporting instructions and guidance (RIGs)

A document that is published as part of the price control settlement which sets out further detail on how the price control is to be implemented and how compliance with it will be monitored.

RIIO

Revenue=Incentives+Innovation+Outputs. New framework for network regulation which was developed as part of the RPI-X@20 review.

S

Successful delivery reward criteria (SDRC)

Successful delivery reward criteria are project specific objectives. The Network Licensee will be eligible to claim a successful delivery reward, equal to their compulsory contribution, if all SDRCs are met.

T

Technology readiness level (TRL)

Technology readiness level is a measure used to assess the maturity of evolving technologies. It is graded on a scale from 1 to 9. TRL 1 occurs when scientific research begins to be translated into applied R&D with TRL 9 describing a proven technology.