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RIIO NIC NETWORK INNOVATION COMPETITION

Electricity Network Innovation Competition: 2014 funding decision

Decision on the second year competition

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Overview

We run an annual Electricity Network Innovation Competition (NIC) to stimulate innovation in electricity transmission. Through the NIC, Network Licensees can apply for up to £27 million to fund innovative projects which have the potential to deliver benefits to electricity customers. This document explains which projects we have selected for funding this year.

This was the second year of the Electricity NIC and there were four applications for funding. We have selected three projects for funding. This decision is consistent with the recommendations of our independent expert panel. We propose to award £18.8 million of the available £27 million to these projects. The Network Licensees' and their partners will invest £3.6 million in funding and in kind contributions in the projects.

The successful projects trial innovative practices and new technologies. They were selected because they will help Network Licensees understand how to meet customers' changing requirements as different forms of generation connect and customers' use of the network changes.

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.
- Managing the increasing impact of distributed resources and active demand on the NETS.
- New sources of generation connecting to the network in areas far from consumption centres.

These challenges will directly affect the way transmission companies plan and manage their businesses. Network Licensees will need to innovate in the way they design, plan, and operate their networks.[1]

The Electricity NIC is designed to help stimulate this innovation. It provides up to £27 million 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 environmental benefits and cost savings to electricity customers in the future.

Associated documents

Electricity NIC Governance Document

RIIO-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

[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).

Contents

Executive summary

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

It provides funding to a small number of large-scale innovation projects. Network Licensees compete against each other for a share of up to £27 million 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 environmental benefits and cost savings for current and future electricity customers.

We ran the competition for the second time this year.[2] This document contains our decisions.

The four submissions we received requested a total of £28.5 million of funding. From these, we have selected three projects for funding. We will approve £18.8 million, of the available £27 million. The project proposals were assessed against published criteria set out in the NIC Governance Document, which we summarise in Appendix 1.[3]

Successful projects

In reaching the decision to fund three projects, we were advised by an independent expert panel, which reviews the project submissions and recommends which projects should be provided with funding.

After careful consideration we have accepted the expert panel's recommendations. We have summarised the successful projects in the table below. We plan to place additional requirements on two of them, to ensure they deliver good value to electricity customers. These additional requirements are outlined in chapter 2.

Project	**Funding requested**
Enhanced Frequency Control Capability This project will address the challenge of controlling system frequency as system inertia reduces,[4] by developing a new monitoring and control system and demonstrating the viability of obtaining rapid frequency response from new resources. *Submitted by National Grid Electricity Transmission (in partnership with Alstom, Belectric, Centrica, Flexitricity, The University of Manchester and The University of Strathclyde)*	£6.9m

[2]The terms "the Authority", Ofgem", "we" and "us" are used interchangeably in this document. The Authority is the Gas and Electricity Markets Authority. Ofgem is the Office of the Authority.
[3] Our Governance Document and criterion have been formulated in line with our principal objectives and general statutory duties.
[4] System inertia is the sum of the stored energy in the rotating masses of the synchronous generators on the system. As the proportion of energy supplied by non-synchronous generators (such as solar PV or wind) increases, the overall system inertia will decrease.

Modular Approach to Substation Construction This project will demonstrate and deploy a modular approach to substation construction which integrates modular substation components with innovations in design and civil engineering. *Submitted by Scottish Hydro Electric Transmission (suppliers to be selected)*	£2.8m
Offshore Cable Repair Vessel and Universal Joint This project will convert an existing telecoms-cable repair vessel so that it can also repair offshore power cables. The project would also develop and test a new cable jointing system to allow dissimilar sections of subsea cable to be jointed together. *Submitted by TC Ormonde (OFTO) (in partnership with Global Marine Systems Ltd)*	£9m

Unsuccessful project

We received an application from one project which we do not intend to fund.

South East Smart Grid (National Grid Electricity Transmission)

National Grid Electricity Transmission's (NGET's) project South East Smart Grid, would aim to develop new technical and commercial services and operating practices through a co-ordinated approach between NGET and the Distribution Network Operator (DNO). The primary aims of these techniques would be to help manage power flows and alleviate voltage control issues across the transmission system in the south east of the country. We were principally concerned about the robustness of the project methodology and whether the project would be value for money for customers.

While the project was not sufficiently well developed to be funded this year, we consider that the underlying opportunity that the project was seeking to exploit is a real and significant one. NGET could develop the project methodology and the costs and benefits case for this project further and bring it forward to a future NIC competition.

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). Network Licensees that are subject to the RIIO price controls recover bid preparation costs through their Network Innovation Allowance (NIA), up to a cap of £175,000 or 5% of the funding requested.[5] However, non-RIIO Licensees do not have a NIA. Instead, they are able to request their bid preparation costs from the funds available for NIC projects each year.

We received a request from TC Ormonde OFTO Limited (a non-RIIO Network Licensee) to fund preparation costs. TC Ormonde has requested £60,655.92 to cover bid preparation costs and we accepted this request and will provide these funds. We have explained the reasons for our decision later in this document.

[5] RIIO (Revenue = Incentives + Innovation + Outputs) is our framework for setting price controls for network companies.

1. Introduction

Chapter summary

This chapter describes the background and structure of the Electricity Network Innovation Competition (NIC), how we and the expert panel have evaluated the projects, and the process we followed during this year's competition.

Purpose

1.1. This document explains our decisions on the applications for funding that were made to the second Electricity NIC. We assessed the projects against the evaluation criteria in the Electricity Network Innovation Governance Document, as well as against our principal objective set out in the Electricity Act 1989 and against our general statutory duties.[6] These NIC Governance Document criteria are summarised in Appendix 1.

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

- The full submissions and the resubmissions for the projects. These provide the information we used to evaluate them against the evaluation criteria.
- The independent expert panel's recommendation on which projects should receive funding.
- Reports by the consultant, PPA Energy, on each project (based on the original project submission). These include a set of challenges posed to the Network Licensees by the consultant, the Network Licensees' responses to the challenges and the consultant's conclusions. The reports aided the expert panel's and our assessment.
- The Network Licensee's answers to questions that we, PPA Energy and the expert panel raised on each project through our formal Q&A process.

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

The Electricity NIC

1.4. Network Licensees need to consider how they can play a full role in tackling climate change while also maintaining security of supply and giving customers value for money. Significant investment in Great Britain's gas and electricity infrastructure is potentially needed ensure security of supply.

[6] Electricity Network Innovation Competition Governance Document

1.5. The Electricity NIC encourages Network Licensees to innovate in the way they design, 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.

1.6. Currently the Electricity NIC is open for applications from transmission licensees. From April 2015 (the start of the RIIO–ED1 price control period) the Electricity NIC will also be open for applications from the Electricity DNOs and Independent Electricity Distribution Network Operators (IDNOs).

1.7. Electricity network customers 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 electricity customers gain sufficient return on their funding through the wide rollout of successful projects. This return includes the delivery of financial benefits and carbon and/or other environmental benefits. Even where the funded projects are deemed unsuccessful at the end of their project life, Network Licensees will gain valuable knowledge that could result in future savings.

Structure of the Network Innovation Competition

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

1.9. 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.

1.10. After the ISP, Network Licensees are invited to develop the eligible projects into full submissions. An independent panel of experts advises us, but we make the final decision on whether to provide funding.[7] 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 the evaluation criteria.

The 2014 competition

1.11. This year's competition began with the ISP in April 2014. We received five submissions and were satisfied that they all met the ISP eligibility requirements. Network Licensees submitted full submissions for four projects by the deadline of 25 July 2014. One ISP project was not brought forward to the full submission stage. A

[7] The biographies of the expert panel can be found here.

brief summary of each project is in chapter 2 and all the ISPs and full submissions are available on our website.[8]

1.12. This year, the combined funding requested was £28.5 million (excluding bid preparation costs) and therefore the fund was oversubscribed.

1.13. The expert panel conducted a thorough evaluation. It reviewed the Network Licensees' submissions and PPA Energy's reports. It also met all the Network Licensees and their project partners twice. It then evaluated the projects against the criteria in the Electricity NIC Governance Document. Where aspects of the submissions required clarification, the Network Licensees had the opportunity to make the necessary changes and resubmit their proposals. The panel made its recommendations based on the final submissions. It submitted its recommendation report to us in early November 2014.

1.14. PPA Energy scrutinised the original project submission, validating the information supplied and challenging the risks and potential shortfalls of the projects in its report. The Network Licensees were sent a draft of the consultant's report and responded to the challenges that were made in writing. PPA Energy then updated its report to include the responses and provided its final analysis.[9] In addition, we, PPA and the expert panel asked questions of the companies throughout the process. All of the questions and answers have been published on our website along with PPA Energy's reports.[10]

1.15. We assessed the projects, taking into account the expert panel's recommendations and the evaluation criteria, to decide which projects should receive funding. This assessment is included in Appendix 1 of this document.

[8] Full submissions can be found here.
[9] This was based on the first submission, the consultant was not required to review the resubmission.
[10] You can find all the documents here. This includes the expert panel's report, the full submissions, the consultant's reports, and the questions and answers.

2. Decision

Chapter summary

We have decided to fund three out of the four submissions we received. We will place additional conditions on two projects. In total we are approving £18.8 million of funding. This chapter provides the reasons for our decision.

Overview of full submissions

2.1. This was the second year of the Electricity NIC and we received proposals from two of the Transmission Owners (TOs) and an Offshore Transmission Owner (OFTO).

2.2. Although we were satisfied with the project ideas brought forward we thought that some of the submissions could have been clearer and would have benefitted from more preparation work. Next year the distribution licensees will join the Electricity NIC. We suggest that the transmission companies should learn from the quality of LCN Fund bids, particularly in relation to the clarity with which the projects' objectives are explained.

Table 2.1: Summary of project submissions

Project	Funding requested
Enhanced Frequency Control Capability - EFCC This project aims to address the challenge of controlling system frequency as system inertia reduces, by developing a new monitoring and control system, and demonstrating the viability of obtaining rapid frequency response from new resources. *Submitted by National Grid Electricity Transmission (in partnership with Alstom, Belectric, Centrica, Flexitricity, The University of Manchester, and The University of Strathclyde)*	£6.9m
Modular Approach to Substation Construction - MASC This project will demonstrate and deploy a modular approach to substation construction which integrates modular substation components with innovations in design and civil engineering. *Submitted by Scottish Hydro Electric Transmission (suppliers to be selected)*	£2.8m
Offshore Cable Repair Vessel and Universal Joint - OCRV This project will convert an existing telecoms-cable repair vessel so that it can also repair offshore power cables. The project would also develop and test a new cable jointing system to allow dissimilar sections of subsea cable to be jointed together. Submitted by TC Ormonde (OFTO) (in partnership with Global Marine Systems Ltd)	£9m

South East Smart Grid - SESG This project aims to demonstrate the potential for smart grid solutions that could enable co-ordinated use of distributed resources to manage issues on the transmission system. *Submitted by National Grid Electricity Transmission (in partnership with Elexon, Imperial College, Siemens, and UK Power Networks)*	£9.7m

Our decision

2.3. We have considered the project submissions, the expert panel's recommendations, the formal Q&A process, and the consultant's reports against the competition's framework and our statutory and other duties. We have -

- Selected one project that can be funded as submitted (Table 2.2).
- Identified two projects which will require additional conditions to be agreed by the Network Licensee before funding can be provided (Table 2.3). This is to ensure that customers' money is being spent efficiently and that customers will receive good value for money from these projects. We explain the additional conditions for these projects below in "Reasons for our decision".
- Decided that one project will not be funded (Table 2.4).

Table 2.2: Project selected for funding as submitted

Project (location)	Funding Licensee	Funding requested
MASC	SHETL	£2.8m

Table 2.3: Projects selected for funding with additional conditions

Project (location)	Funding Licensee	Funding requested
EFCC	NGET	£6.9m
OCRV	TC Ormonde	£9m

Table 2.4: Project not selected for funding

Project (location)	Funding Licensee	Funding requested
SESG	NGET	£9.7m

Reasons for our decisions

2.4. We reviewed each submission against the evaluation criteria in the NIC Governance Document. These assessments are in Appendix 1 of this decision. Below we summarise the reasons for our decisions.

Project selected for funding as submitted

Modular Approach to Substation Construction (MASC) - SHE Transmission

Overview

2.5. The project will demonstrate and deploy a modular approach to substation construction which integrates modular substation components with innovations in design and civil engineering. If successful, the modular design approach would reduce the time and costs it takes to develop and commission a new substation and would reduce the impact of construction on the environment.

Summary of assessment

2.6. We consider that, if successful, this project could reduce the time needed to commission and build a new substation, and therefore potentially facilitate an earlier connection of low carbon technologies. The MASC solution could also deliver other environmental benefits including reductions in noise levels, vehicle movements and air pollution by increasing offsite construction. The project also has the potential to deliver significant financial benefits for customers.

2.7. SHE Transmission has only requested NIC funding for the additional costs of using the modular approach for the first time. The costs that would have been incurred for a conventional substation will be recovered through established cost recovery mechanisms for new connections.

2.8. If the project is successful, the MASC solution will have a broad application across both transmission and distribution networks. For this reason, the panel and we considered that SHE Transmission should engage with all other relevant licensees, as well as equipment manufacturers and relevant authorities, from the start of the project. SHE Transmission addressed this concern in discussions and explained that phase one of the project would involve stakeholder engagement, including on the substation specification. SHE Transmission updated the Successful Delivery Reward Criteria (SDRC) to reflect this and we may also further enhance the relevant SDRC through the project direction.

2.9. Initially, we were concerned that this project might not be truly innovative because modular substations have been deployed elsewhere in the world. SHE Transmission has explained that requirements for changes to operational, safety and maintenance procedures are the key innovation in this project and this currently

presents a barrier to implementing this as a business as usual approach. We were satisfied with SHE Transmission's position on the project's innovative elements. We think therefore that the key output from the project should be the knowledge captured on the necessary changes to operational, safety and maintenance practices.

2.10. MASC performed well across all of the evaluation criteria. We plan to fund the project as submitted, subject to SHE Transmission accepting the project direction.

Project selected for funding with additional conditions

Enhanced Frequency Control Capability (EFCC) – National Grid Electricity Transmission

Overview

2.11. This project will aim to address the challenge of controlling system frequency as system inertia reduces, by developing a new monitoring and control system, and demonstrating the viability of obtaining rapid frequency response from new resources (including renewables and demand side response).

Summary of assessment

2.12. EFCC performed well against most of the evaluation criteria set out in the Governance Document. We believe it could potentially result in a significant reduction in the annual cost of controlling system frequency through the use of new response solutions. If successful, the solution would potentially help address the challenges related to reducing system inertia and could remove a barrier to the connection of more renewable generation that contributes little or no inertia to the system.

2.13. Both we and the panel agreed that the project is innovative, and that accurately measuring frequency changes in real time is a difficult but important system issue. We considered that the risks involved in trialling this new frequency control method justify NIC funding.

2.14. Initially, we had a concern that the methodology for the project was not robust enough. Through discussions and further questions from the panel and the consultants, we obtained more information from NGET on the project method and outputs, and we are satisfied that the resubmission addresses this concern.

2.15. Both we and the panel were also concerned about value for money for customers. This was for two reasons: the need to have two universities as partners; and the cost of the storage element of the trials. NGET addressed our concern about the involvement of the two universities (The Universities of Manchester and Strathclyde) by explaining the different tasks that each university will be responsible for. However, we and the panel remained concerned about the cost of the battery to

trial storage as a potential resource. As a condition of the funding, we will require a stage gate after the initial phase of the project to enable us to take a decision on whether NGET should proceed with buying the battery. As part of this stage gate, NGET must also demonstrate that it has investigated the use of existing batteries funded under LCN Fund projects or more widely.

2.16. EFCC performed well across all of the evaluation criteria in the NIC Governance Document, and so we have decided to fund this project if NGET agrees to comply with the condition.

Offshore Cable Repair Vessel and Universal Joint (OCRV) - TC Ormonde

Overview

2.17. This project proposes to convert an existing telecom-cable repair vessel so that it can repair offshore power cables. The project would also develop and test a new cable jointing system which will allow dissimilar sections of subsea cable to be jointed together (a "universal joint"). If the project is successful, repairs to power cables should be undertaken more quickly and at reduced cost compared with existing methods. The repair vessel would be available to all OFTOs and other interested parties if they joined the existing cable repair club (Atlantic Cable Maintenance & Repair Agreement (ACMA)).

Summary of assessment

2.18. TC Ormonde presented a clear problem and solution in its submission and we consider that the project performed well across the majority of the evaluation criteria set out in the NIC Governance Document. We believe that the project would improve the availability of offshore wind generation by reducing offshore cable repair times and costs. A reduction in cable outage times would provide carbon benefits from increased wind output.

2.19. The key concern that both we and the panel had was how the benefits from the project would flow back to all transmission customers. TC Ormonde explained that, due to the competitive nature of both the OFTO tendering regime and the contract for difference award process,[11] consumers will see benefits through a reduced cost for future offshore wind generation. We were still concerned that the benefits from the project might not flow immediately and directly back to customers. We think that to maximise the benefits for customers, we need certainty that all current and future TOs (both onshore and offshore) would be able to access both the modified vessel and the universal jointing technique.

2.20. We have decided that the following conditions should be complied with at a stage gate after the initial project phase (the spend to this stage gate is no more

[11] Contracts for Difference (CfDs), as part of the Electricity Market Reform, will provide long-term revenue stabilisation for new low carbon initiatives.

than 4% of the project budget). Ofgem will determine the continuation of the project following the stage gate. The conditions are:

1. The existing club (ACMA) members agree to the arrangements for allowing all OFTOs and TOs to join their club and use the converted vessel.
2. All existing OFTOs agree that they will participate in the project.
3. TC Ormonde has engaged with TOs on the specification of the vessel and universal joint.
4. The existing OFTOs agree with Ofgem a specific mechanism to share savings that result from the use of the converted vessel on existing OFTO assets with transmission customers.
5. TC Ormonde has engaged with the insurance industry on how the terms for insuring offshore cables will be affected by the new method of repair.
6. TC Ormonde has engaged with the cable manufacturers to ensure that there will be no impact on the warranty of the cables as a result of using the universal joint.

2.21. The inclusion of these additional conditions is to mitigate our concerns about customers receiving the benefits of this solution. OCRV performed well across all of the evaluation criteria, and we have decided to fund this project subject to TC Ormonde agreeing with the additional conditions.

2.22. In the event that TC Ormonde cannot meet these conditions, we would consider whether it is appropriate for TC Ormonde to progress with the universal joint part of the project.

Project not selected for funding

2.23. The remaining project, while aiming to address an important problem, did not perform sufficiently strongly against the evaluation criteria. We have, therefore, decided not to fund it. We did not consider that we would be able to resolve the concerns we have by placing further conditions on funding. This project is described below.

South East Smart Grid (SESG) – National Grid Electricity Transmission

Overview

2.24. The aim of this project would be to develop new commercial services and operating practices through a co-ordinated approach between the TO and DNO. The primary aims of these techniques would be to help manage power flows and alleviate voltage issues across the transmission system. If successful, the project would

facilitate both connection of future interconnectors and connection of higher volumes of renewable generation without the need for major network investment.

Summary of assessment

2.25. Both we and the panel had several concerns about this project's ability to meet some of the evaluation criteria. We did not consider that the concerns raised during the evaluation process were adequately addressed in the re-submission. We do not consider that our concerns would be mitigated by additional conditions.

2.26. We agreed with the panel that the project was innovative in its approach to monitoring the combined transmission and distribution systems, and managing the transmission network by co-ordinating the control of resources on the distribution network. The learning developed as a result of this project would have been applicable to other network licensees and could have been deployed in other regions of the network with similar issues.

2.27. We were principally concerned about the robustness of the project methodology. This concern was shared by the expert panel. Throughout the assessment process, NGET was not sufficiently clear on the problem, solution or methodology for this project. Both we and the panel also felt that the objectives of the project were not sufficiently well defined.

2.28. We were not convinced that funding this project would represent good value for money for customers. We were concerned about the significant costs for the project partners given the lack of clarity over their deliverables for the project. NGET sought to clarify the roles of the project partners in the resubmission. However, we remained concerned that the cost of several of the project partners would be substantial. We were also concerned that the design phase and the hardware procurement phase would have been run in parallel. The risk of stranded costs would have been minimised if the project phases were sequential.

2.29. Both we and the panel also concerned about the deliverability of the distributed resource required and whether these would be sufficient to avoid constraining interconnectors. We do not consider that NGET has provided enough evidence that the distributed resource would be available to deliver the suggested potential savings.

2.30. We had serious concerns about the performance of this project against the evaluation criteria set out in the Governance Document on "value for money" and "demonstrates a robust methodology". We will therefore not fund it this year. While the project was not sufficiently well developed to be funded this year, we consider that the underlying opportunity that the project was seeking to exploit is a real and significant one. NGET could develop this project further and bring it forward to a future NIC competition.

Customer issues in running the projects

2.31. We do not expect the projects selected for funding to have any significant direct customer impact during trialling. No direct customer interaction was identified in the submissions.

Bid preparation costs

2.32. A Network Licensee Group can use up to a maximum of £175,000 or 5% of the amount of funding it requested, whichever is smaller, in any year to cover expenditure it incurs in submitting bids to the NIC. Network 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 bid preparation costs as part of their full submission and - if deemed efficient - these are provided to the licensee through the NIC Funding Direction.

TC Ormonde's request for bid preparation costs

2.31. TC Ormonde was successful at the ISP stage and is, therefore, eligible to receive bid preparation costs in accordance with paragraph 3.8 of the Governance Document. TC Ormonde has requested and justified costs of £60,655.92. The requested bid costs do not include costs associated with the 2014 ISP submission, as it was a resubmission of the 2013 ISP.

2.32. The amount requested is below £175,000 and below 5% of the funding that was requested to implement the project. In accordance with paragraph 7.2 of the Governance Document we will require the National Electricity Transmission System Operator (NETSO) to transfer these funds to TC Ormonde. This instruction will be made through the Funding Direction.

3. Next Steps

Chapter Summary

Projects will receive their project direction in December 2014 and will be receiving funding from 1 April 2015. We will publish the dates for next year's competition in early 2015.

Funding selected projects

3.1. Before funding a project, we issue a project direction explaining the terms that the funding licensee has to comply with as a condition of funding.[12] We are currently preparing project directions for the successful submissions and we will issue draft versions of these to funding licensees shortly. The project directions for EFCC and OCRV will include the additional conditions outlined in chapter 2 of this document.

3.2. Once all the funding licensees have decided whether to accept their project direction, we will issue a funding direction. This will specify the amount of money NETSO will be allowed to recover from its customers over the next regulatory year to fund the successful NIC projects. The funding direction will require those funds to be transferred to the relevant Network 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 2014.

3.3. Although funding will not be raised until the next regulatory year (starting on 1 April 2015) we expect the funding licensees to start their projects as quickly as possible, according to the terms in their project direction and the NIC Governance Document.

3.4. We will monitor projects to ensure they are implemented in line with the full submissions. Each funding licensee will have to provide a detailed report, at least every six months, to allow us to evaluate the project's progress. We will publish these on our website to make project learning available to all interested parties. Funding licensees should also share their project's learning according to the plan set out in their project submissions. In addition, funding licensees, including those from last year, must hold an annual conference, open to all, where they present the learning from their projects. Finally, the Energy Networks Association has developed a portal which holds learning from innovation projects, including from the LCN Fund and the Gas and Electricity NICs, and we expect learning from this year's projects to be made available through the portal.[13]

3.5. Network 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. The Successful Delivery Reward is designed to reward

[12] The terms 'project direction' and 'funding licensee' are defined in the Governance Document.
[13] Please see Smarter Networks portal here.

those projects which are well managed and completed to at least the standard that could be expected from the full submission.

Future competitions

3.6. As explained in chapter 2 of this document, 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.

3.7. The expert panel also provided its views on the quality of the submissions in section 4.5 of its 2014 recommendation report. We ask Network Licensees to take these points into account when developing their submissions for future competitions.

3.8. We may also consult on potential changes to 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 third year of the Electricity NIC. This will be in place prior to the ISP deadline in 2015.

3.9. We will confirm the ISP and full submission deadlines in early 2015. We expect that they will be similar to the deadlines in 2014.

3.10. The results of our 2016 review of the outcomes and benefits of Low Carbon Network Fund projects will inform the levels of funding available under Electricity NIC in the future. We will consult on the scope and methodology of our review next year.

Appendix 1 – project evaluations

This appendix contains our detailed evaluation of each project against the Electricity NIC criteria. The Governance Document explains the criteria and our evaluation process in full, but here is a summary.

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.

Enhanced Frequency Control Capability (NGET)

Project overview

This project would seek to address the challenge of managing system frequency, as system inertia reduces, by developing a new monitoring and control system. It would also demonstrate the viability of obtaining rapid frequency response from new resources, including renewable generators and demand side response. This could potentially significantly reduce the annual cost of controlling system frequency by using new response solutions. If successful, the solution would potentially help address the challenges related to reducing system inertia and it could remove a barrier for the connection of more renewable generation that contributes little or no inertia to the system.

As the generation mix in GB changes to include more renewable generation, system inertia will reduce. This project sets out to demonstrate that system frequency stability, under conditions of lower system inertia, can be achieved more efficiently if the response can be locationally targeted. EFCC will potentially allow NGET to reduce the capacity of responsive conventional plant that it has to operate. This will potentially reduce the costs associated with managing frequency.

(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 claimed substantial carbon savings and financial benefits for the project. It aims to address one of the key system challenges - the increasing penetration of renewable generation. If successful, the solution would facilitate the connection of additional renewable generation to the network and reduce the costs of frequency control. There is no transmission capacity released as part of the project.

Low Carbon and/or environmental benefits

NGET identified several potential environmental benefits as a result if this project. It states that reducing system inertia threatens to act as a barrier to more renewable generation connecting to the grid. EFCC would remove this barrier and facilitate the connection of more renewables. The solution would also avoid the need to dispatch large amounts of conventional fossil-fuelled generation to provide frequency response services.

NGET has estimated that 20.2TWh of response from conventional generation would be saved by 2020/21 under National Grid's Gone Green scenario, and 18.5TWh would be saved under the Slow Progression scenario. It has also set out in its submission carbon savings related to energy from renewable sources that would be curtailed without the EFCC project. It suggests that 19,000GWh of renewable generation would otherwise be curtailed by 2020.

Net financial benefits

EFCC would potentially provide significant financial benefits for customers. NGET stated that, without an innovative solution, the costs of frequency response will rise by £200m-250m per annum by 2020. EFCC will potentially reduce the overall level of conventional

response required to manage frequency. Through reducing the overall level of response required NGET has estimated that EFCC could result in savings to consumers of £150m-£200m per annum by 2020.

NGET explained that the level of cost savings would depend on which of the three conventional options for providing frequency response would otherwise be pursued:

- Compared with the costs of constraining large generation and interconnectors, so that the system remains resilient to the largest loss of power infeed in a lower inertia situation, EFCC would lead to a cost reduction of £131m per annum by 2020 and £268m per annum by £2021.
- Compared with constraining generators on, to secure a higher level of inertia on the system, EFCC would lead to a cost reduction of £600m per annum by 2020
- Compared with increasing the volume of response purchased from conventional power stations, EFCC would lead to a cost reduction of £210m per annum by 2020.

We note that the Panel challenged the calculations of the anticipated carbon and financial benefits during discussions with NGET. NGET further explained its calculations during discussions and in its resubmission. Both we and the panel considered the likely environmental and financial benefits of the project are sufficiently large to justify the project cost (p.11, Panel report).

(b) Provides value for money to electricity transmission customers

NGET explained that as the project is targeted at improving the operation of the electricity system, the majority of the potential benefits resulting from EFCC will flow to the transmission system operator and transmission customers. It highlighted that cost savings will flow to customers through a reduction in the Balancing Services Use of System (BSUoS) charge. As the cost of frequency control is one of the key elements of the BSUoS charge, this project would directly reduce the costs of this component of consumers' bills.

The recruitment of partners was achieved through a competitive process of inviting and evaluating expressions of interest. All proposals were assessed and ranked against criteria of price/contribution, organisation/resource, understanding and delivery, and the solution offered.

Our key concern about meeting the value for money criterion was the cost of the storage element of the trials. The costs associated with the proposed battery storage and reactive power provision amount over £500,000 which is a significant proportion of the capital costs of the project. We were concerned that NGET had not properly engaged with existing storage projects, such as the LCN Fund Smarter Network Storage project, to assess the possibility of using an existing battery. Following discussions with the Panel at the second bilateral meeting NGET suggested that a stage gate could be included in the programme when it would be decided whether to purchase the new battery. The condition for this stage gate is detailed in chapter 2 of our decision.

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

The project would generate important knowledge that would be shared with, and be relevant to, all network licensees. The learning will be of primary interest to the System Operator but the increased visibility of system frequency across the network will also be

valuable to transmission owners (TOs). NGET stated that TOs will benefit through: enhanced system monitoring, which will enable them to study system behaviour in greater detail; and detailed knowledge of new services delivered by network users. The new services for fast frequency response, which are being developed, will also provide important learning and an opportunity for parties that might want to enter this new market.

The submission explained that there will be a range of approaches used for knowledge dissemination, including a new working group that will be formed to monitor and challenge the project, and the development of an on-line portal to enable data sharing and publishing of trial results.

NGET stated that the project will comply fully with the default intellectual property rights arrangements. The project partners have been made aware of these arrangements and have agreed to comply with them.

(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

Both we and the panel agreed that the project is innovative, and that accurately measuring rapid changes in frequency is a difficult but important system issue. NGET highlighted key aspects of the project that are innovative. The development of the control system would enable a "world-first" approach to using non-conventional sources of frequency response services and real-time triggering of fast-response using wide area signals. The project would also be innovative in the coordination of response from a range of resources, optimised locally and nationally, and controlled via a Wide Area Control System.

NGET stated that there is no provision for the trialling of new frequency control systems as part of business as usual, particularly those which require new infrastructure to be built for the purposes of demonstration. It also explained that renewable generators are not currently able to provide the required services as business as usual and that this project will address that issue. We were satisfied with NGET's justification that this project could not progress as business as usual and that NIC funding is required.

Initially we were concerned that NGET may not have used any learning from other countries that are also facing system inertia issues. NGET explained that, although it was not referenced in the initial bid, it has engaged with a number of different stakeholders including ENTSO-E and the system operators from Denmark and Ireland. This engagement was captured in the resubmission and NGET stated that EFCC would add to, rather than duplicate, studies conducted elsewhere. We were satisfied with the information provided in response to our questions and in the resubmission.

(e) Involvement of other project partners and External Funding

NGET stated that, following identification of potential projects, it engaged with a range of external stakeholders to develop the ideas. This was achieved through a request for project proposals. Formal expressions of interest were also sought from parties interested in participating in the project. The following partners were selected:

- **Alstom** would be the technology provider and responsible for developing the monitoring and control system.

- **Belectric** would provide response capability from PV power plants and storage facilities.
- **Centrica** would provide response capability from CCGT power plants and wind generation.
- **Flexitricity** would be the demand side response provider, recruiting customers as required and interfacing its customer control system to the monitoring and control system.
- **University of Manchester** would provide academic support and demonstrate hardware testing using a Real Time Digital Simulator (RTDS).
- **University of Strathclyde** would provide academic support and run the trials in the Power Networks Demonstration Centre.

All the partners are making contributions to the project through discounted rates, which amount to £1.4m.

Initially, we shared the panel's concern about the need for two universities to partner in this project and the associated costs. In the resubmission NGET addressed this concern by explaining the differences in the task that each university will be responsible for. NGET explained that the University of Strathclyde will test the physical infrastructure and demonstrate the full monitoring, control, communications and response systems. The University of Manchester will be testing components of the control system in its real time simulation system. We are satisfied that the roles the universities will fulfil in this project are sufficiently different to warrant both as partners.

(f) Relevance and timing

We consider that the project is both relevant and timely. The key challenge that the project aims to address is how to continue to manage the system safely, reliably and in a cost-effective manner, as more renewables connect and system inertia decreases. NGET states that by 2018/19 (under National Grid's Gone Green scenario) inertia will have reduced by 37% and that the time taken for frequency to drop to the threshold (at which customer load is disconnected) will be less than half the time it takes today.

The frequency reserve cost is already rising because of the increasing penetration of renewables. NGET explained that a conventional solution for the challenge of reducing inertia will be very expensive. Therefore, it is timely to start this project now to ensure there is a functioning, diverse frequency response services market before the costs increase significantly.

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

We consider that the submission describes the problem the project aims to address well. There is a clear governance structure presented and the project has defined work packages which cover each aspect of the project, from control system design to commercial and communication operations. As the project involves a number of independent activities, we had a concern about how effectively the different workstreams will be integrated to deliver a successful overall outcome.

A high level project plan was presented in the original submission and NGET stated that the project would start in a timely manner beginning with initial assessments of existing equipment. The project partners would begin work in April 2015. The project plan was improved in the resubmission with more detail and a greater breakdown of tasks. This project plan helped to address our concern around how all the workstreams will be

integrated to deliver the overall project outcome. A comprehensive risk register was also included in the submission which details risks across all of the workstreams. Key risks identified for the project included difficulties in recruiting sufficient DSR participation, and the potentially deficient quality of technology for the monitoring and control system and the equipment installed at the response sites. NGET included reasonable actions in the risk register to mitigate these risks.

Both we and the panel were concerned that further work might be required before the technique could be implemented as business as usual. In discussions with the Panel, NGET explained that if the proposed solutions worked it believes that the technique can become business as usual relatively easily. In the resubmission, NGET added an additional work package to ensure that the technical issues with roll-out are identified on the same timescales as the commercial framework is designed. This should ensure there are no hindrances to implementation.

The Successful Delivery Reward Criteria (SDRCs) for the project relate to key development stages of the project. In the resubmission, NGET improved the SDRCs adding more detail on the evidence required for each criterion.

Modular approach to substation construction (SHE Transmission)

Project overview

Scottish Hydro Electric Transmission plc (SHE Transmission) proposes to demonstrate and deploy a permanent substation designed using a Modular Approach to Substation Construction (MASC). SHE Transmission states that the fundamental approach to substation construction has not changed significantly in 60 years, but that innovations in design and civil engineering could make substation construction cheaper, faster to deploy and more suited to GB's low carbon energy future.

For this project the proposed approach is to build a new 132/33kV substation using a modular approach. This will connect a renewable generation development to the transmission network[14]. The project would last for approximately 5 years with the aim of providing incremental learning and creating new standards in substation design and operation.

The total cost of the project is £3.26m with a NIC funding request of £2.84m. For this project the NIC funding is sought to cover only the additional costs of demonstrating the MASC approach for the first time; the actual substation project costs will be covered using price control revenues.

(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

SHE Transmission stated that, if successful, the MASC solution could deliver significant financial savings, projected to lie between £151 and £655 million by 2050. The project could also facilitate faster connections of renewable developments. This would marginally accelerate the growth of renewable capacity and therefore also accelerate the reduction in carbon emissions. It would also deliver other wider environmental benefits as explained below.

Low Carbon and/or environmental benefits

SHE Transmission stated that the solution will provide cost efficient connections for new low carbon and other generation projects alike. SHE Transmission recognises that the reduction of carbon emissions would not be directly influenced by the MASC project. However, the shorter timescales of construction and deployment, as a result of the MASC solution, will help connection of new renewable developments and therefore facilitate an acceleration of the reduction in carbon emissions.

It is not clear exactly what overall reduction in the time to connect would be delivered through the MASC approach. Following questions from the consultants, SHE Transmission explained that initially the MASC solution may only be marginally quicker than a conventional substation construction. However, in the future, as the modular approach becomes business as usual, it could become significantly quicker.

[14] In Scotland, 132kV is classed as a transmission voltage.

The MASC solution would deliver other environmental benefits. In particular, an increase in off-site construction would have benefits at the construction site. Noise levels, vehicle movements and air pollution would all be reduced. The modular solution would also mean there would be a reduction in the construction footprint and associated civil works as a consequence of smaller foundation requirements and reduced earthworks.

We had a concern about the use of SF6 in the modular design and any potential associated negative environmental impact. SHE Transmission explained that the volume of SF6 in the modular design is low; a MASC solution will typically contain less than 60kg of SF6 which is 43% less SF6 than in a conventional gas insulated substation. SHE Transmission stated that all necessary precautions would be taken to ensure that SF6 leaks were kept to an absolute minimum. It is also considering the potential for SF6 alternatives for the generic substation specification. The other environmental benefits would still result in an overall positive environmental case in comparison to air or gas insulated substations.

Net financial benefits

The MASC solution would reduce the overall costs of substation projects which would reduce the connection costs for developers, and capital and operational costs for network operators. As consumers fund investment in substation infrastructure they would see the benefits through reduced transmission charges.

If MASC were successful, SHE Transmission estimated that it would save up to 20% of the cost of a substation over the whole life of the asset. This assumption is based on SHE Transmission's initial engagement with several manufacturers and its internal review of the approach's application. SHE Transmission has stated that although the cost of the electrical equipment for the MASC solution would be higher than a BAU approach, this would be more than off-set by the reductions in civil, project management and transport costs. SHE Transmission explains that deployment of the modular approach across GB between 2014 and 2050 could have net savings of between £151m and £655m. To calculate these potential benefits SHE Transmission considered the "Slow Progression" and "Gone Green" scenarios (National Grid's Electricity Ten Year Statement) to estimate the total number of potential MASC projects. Potential projects connecting to the transmission system were identified using National Grid's Transmission Entry Capacity register. Potential 132kV projects in the distribution areas in England and Wales were identified by examining the DNOs' Long Term Development Statements. SHE Transmission assumed that the MASC approach would be adopted on 30%-50% of projects and deliver a 20% cost saving. The high end of the potential benefits (£655m) assumes the "Gone Green" scenario for renewable generation growth, 20% MASC cost saving and 50% adoption of the MASC approach.

SHE Transmission suggested that this approach could be deployed in 30% to 50% of substations on the GB transmission network from now until 2050. We expressed concerns about how easily the MASC solution could be scaled up to higher voltages. After questions from the consultants and the Expert Panel, SHE Transmission stated that 132kV was chosen as it is typical of a new generation connection and will allow many of the potential benefits from MASC to be fully demonstrated. SHE Transmission is confident that the demonstration will provide the necessary detailed learning to progress such a solution at 275kV and 400kV. We are satisfied that the learning from the trial will be relevant at higher voltages, and it is reasonable to focus the trial on a 132kV substation.

(b) Provides value for money to electricity transmission customers

The project has a direct impact on the network as it will lead to a change from historical bespoke substation designs to a standardised approach which will enable licensees to implement costs savings for end consumers and developers. The NIC funding is only requested for the additional cost of delivering a MASC substation for the first time (including knowledge capture, dissemination, extra monitoring and evaluation). The substation costs will be covered by existing business mechanisms.

SHE Transmission stated that, as the project would be trialled at 132kV, the learning from the project will be directly relevant for transmission and distribution licensees in Scotland and distribution network operators (DNOs) in England and Wales. However, as SHE Transmission believes that the solution could be scaled up to higher voltages, it considers that the learning will be relevant to the transmission licensee in England and Wales too.

The tenders for the development and manufacture of the modular substation will be invited from a wide range of competent parties including some who have already expressed interest. SHE Transmission stated that it uses competitive procurement processes for all purchases of goods and services and all procurement activity is transparent and responsible. The project will fall under SHE Transmission's established governance processes to ensure value for money.

We had a concern about the large range of the potential benefits presented. SHE Transmission explained that the benefits are related to the number of substation projects which could be developed in GB between now and 2050. We think that the savings at the lower end of the benefits range would still provide good value for money for consumers.

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

SHE Transmission explained that the knowledge from the project will build investment level confidence amongst GB network licensees, planning authorities and the supply chain in the MASC approach. The project marks a step change away from historical, bespoke substation designs to a standardised "pre-cut" approach. This knowledge will be applicable to all electricity network licensees. The key learning objectives will relate to new substation design options; safety requirements; performance, operability and maintenance requirements; future usage options, and supply chain capability in delivering the modular solution. We think it will be critical for this project to begin engaging with stakeholders and sharing the project knowledge from the initial stage of the project. This engagement will be necessary to ensure buy-in to the new modular approach from other network licensees.

SHE Transmission stated that the intention is to adhere to the NIC default IPR arrangements, subject to the final confirmations with equipment suppliers, project partners and other stakeholders. It will be a condition of awarding the funding that all project partners will adhere to the NIC default IPR arrangements.

The company said that a clearly defined knowledge dissemination programme has been developed and that this programme will include reports, workshops and seminars. In addition, the project will develop a decision tool that all licensees could use to provide a cost-benefit analysis for substation planning, and a three-dimensional virtual simulation tool which will allow users to virtually tour the substation.

(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

SHE Transmission stated that the project is innovative because demonstration of a permanent modular substation at this scale has not been implemented on the GB electricity network before.

We had a concern that the project may not be truly innovative because modular substations have been developed and deployed elsewhere in the world. Therefore, we requested information on the barriers preventing the technology from being commonly adopted in GB. SHE Transmission explained that requirements for changes to operational, safety and maintenance procedures are a barrier to implementing this approach. It highlighted that although modular substations have been deployed elsewhere these are generally specific cases where a faster deployment is necessary, rather than a business as usual approach. It also suggested that the proposed approach has risks which would prevent it from becoming business as usual without successful demonstration. SHE Transmission stated that the project could not be carried out under business as usual because proof of concept has not been established in GB. Also, it would require examining the GB safety specifications which one transmission owner would not be willing to carry out on its own. We agreed that the requirements to change operational, safety and maintenance procedures would be a barrier to one licensee implementing this approach as business as usual.

We have concluded that the work necessary to develop, consult on and agree changes to operational, safety and maintenance procedures necessary for the MASC approach is material. This is an innovative element of the project which would create too much risk for SHE Transmission to pursue unilaterally. On this basis NIC funding is justified.

(e) Involvement of other project partners and External Funding

SHE Transmission said that the project does not require the recruitment of formal project partners because SHE Transmission can take a coordinating role and involve all other licensees, in particular through in-depth stakeholder engagement within Phase 1 of the project (planning and technical specification). Some concerns were raised about SHE Transmission choosing not to partner with a DNO. It explained that the reason for this was that it wanted to ensure that all other licensees and stakeholders were involved in the process. Stakeholder engagement will run throughout the project, with all of the electricity network licensees and other stakeholders such as consent and planning authorities, environmental experts and developers.

SHE Transmission explained that there are several project supporters from within the supply chain. It will be looking to ensure that collaboration with the supply chain is robust so that the MASC solution can be deployed quickly following the project.

(f) Relevance and timing

SHE Transmission stated that the primary area relevant to the businesses, which would benefit from the MASC project, is the increasing requirement for transmission owners and DNOs to provide network capacity for new renewable generation, driven by the move to a low carbon electricity sector in GB.

SHE Transmission explained that it expects to expand its transmission network significantly over the coming decade to facilitate the growth of renewable generation in the north of Scotland. If the MASC project is successful then the decision tool can be used by SHE Transmission, and all other licensees, to run a cost benefit analysis of a conventional solution compared to the MASC solution.

SHE Transmission stated that it believes the MASC approach has the potential to be widely adopted by all electricity network licensees. It has provided its analysis of future substation infrastructure developments. This suggests that by 2050, across GB, over 1330 projects could be candidates for the MASC approach and that up to 50% of these will be suitable.

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

SHE Transmission has stated that the project is supported at all levels within the company via its established innovation steering board, and that senior management will be involved in the development and operation of the project. A dedicated project manager will be appointed to deliver the MASC project.

SHE Transmission has provided an appropriate project plan showing its expected timescales and key delivery dates for the project. It has also provided a risk register. This explains that MASC does not involve any interaction with end consumers and does not risk supply interruptions. Therefore there is no customer impact associated with the project.

If the MASC project is successful, SHE Transmission said that it can be deployed on an individual basis using the decision tool, created as part of the project, to ensure the MASC solution is used in appropriate cases.

We were concerned that the risk register may not fully take account of the challenges to the supply chain in providing solutions that meet the operational and financial ambitions of the MASC project. SHE Transmission explained that the risk register is an evolving document, and the information received from parties in the supply chain so far has been consistent and that a range of suppliers have successfully provided equipment to various locations across the world.

The consultants raised a concern that the evidence requirements for the Successful Delivery Reward Criteria (SDRC) that SHE Transmission provided were not specific enough. SHE Transmission clarified the evidence requirements of the SDRCs in its resubmission document and we are satisfied that the SDRCs have improved.

Offshore Cable Repair Vessel and Universal Joint (TC Ormonde)

Project overview

The aim of this project is to improve the availability of offshore power cables by reducing the time and costs associated with cable repairs. The project proposes to convert an existing repair vessel for subsea telecoms cables so that it would also be capable of repairing offshore power cables. This repair vessel would be available to all offshore transmission owners (OFTOs) and other interested parties if they joined the cable repair club (ACMA).

The second part of this project would be to develop, test and manufacture a universal cable joint – which would allow the jointing of dissimilar sections of subsea cables. All interested parties will have access to trained staff to carry out the jointing.

TC Ormonde estimated that the financial benefits of the project could range from £2.2m to £6.2m per year, from 2020 to 2030 respectively, for wind generators as a result of increased wind output (assuming 20GWh of additional generation for every outage-month saved). The financial benefits for OFTOs due to reduced repair costs was estimated to range from £2.8m to £10.5m per year, from 2020 to 2030 respectively. The submission explains that these cost savings will be passed to the consumer through lower future transmission costs and more competitive contract for difference (CfD) bids in the auctions established by the Electricity Market Reform.

(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

The project aims to improve the availability of offshore wind generation by reducing offshore cable repair times and costs. A reduction in cable outage time would provide carbon benefits from increased wind output. The immediate financial benefits will flow directly to OFTOs and offshore wind generators. However, TC Ormonde explained that all customers would potentially see benefits in the future through more competitive CfDs and future reductions in OFTO bids, onshore transmission revenue requirements and corresponding transmission charges.

Low Carbon and/or environmental benefits

The submission says that carbon savings would arise from the increased renewable generation output through reduced cable outage times. The amount of offshore wind energy released (that would otherwise have been constrained by cable outages) was calculated as 22.1GWh per annum by 2020 and 62.1 GWh per annum by 2030 (based on National Grid's slow progression scenario of future offshore wind development). TC Ormonde converted this into carbon savings of 9,510 tonnes of CO2 per year by 2020 and 26,689 tonnes of CO2 per year by 2030. TC Ormonde also considers that there will be a wider environmental benefit through potentially reducing the number of export cables required for each project (due to increased availability) which would reduce the environmental impact of cable installation work.

Net financial benefits

TC Ormonde explained the Base Case cost and the Method Cost of undertaking an offshore cable repair. The total cumulative financial benefits estimated for this project are £18m by 2020, £175m by 2030 and £625m by 2050.

In the project submission, the benefits case was only based on the benefits arising from the OFTOs' use of the vessel and the joint. TC Ormonde describes the financial benefits for generators and OFTOs as follows:

- Wind generators will see benefits, through increased wind output (assuming an additional 20GWh of generation for every outage-month saved), ranging from £2.2m per annum to £6.2m per annum from 2020 to 2030 respectively; and
- the OFTOs will see benefits, as a result of reduced repair costs, ranging from £2.8m per annum to £10.5m per annum from 2020 to 2030 respectively.

The repair vessel would also lead to benefits for interconnectors and bootstraps and more competitive energy prices as a result of increased interconnector and bootstrap availability. The universal joint would not be applicable on these cables.

TC Ormonde explained that, due to the competitive nature of both the OFTO tendering regime and the CfDs award process, consumers will see benefits through a reduced cost for future offshore wind generation. There are two stages to the benefits of this project. Firstly, there will be benefits for projects that are already operational, and these benefits will be captured by OFTOs and generators. Secondly, there would be benefits which arise for future offshore generation projects, which could be passed through to consumers.

The submission highlights the short payback period of the project. TC Ormonde estimated that, even without another offshore wind farm being added and even if the vessel was only used for OFTO cable repairs, the project would be paid off in 2-3 years.

We were concerned that the potential benefits from the project may not flow immediately and directly back to transmission customers. We consider that, for the benefits of the project to be maximised for customers, all current and future transmission owners (TOs) (both onshore and offshore) would need to be able to access both the vessel and the universal jointing technique. We think that there are several potential barriers to this: ACMA may not agree to new members joining the club; other OFTOs may not buy into the idea; or the TOs may not be engaged and will not join ACMA. To address these concerns we have included conditions at a stage gate after the initial phase of the project. This stage gate will ensure that there is also agreement on a mechanism for a share of the savings to flow directly back to customers. The proposed conditions are detailed in chapter 2.

(b) Provides value for money to electricity transmission customers

TC Ormonde explained that the scale of the project is appropriate as it is the minimum scale required to deliver a suitable repair vessel and universal joint design within a suitable commercial arrangement. It also claims that even a small reduction in the funding requested would impact the functionality of the solution and reduce the cost-effectiveness of the project.

TC Ormonde stated that the proposed commercial arrangements with ACMA will ensure value for money. It will mean a lower-cost solution than a purpose built subsea power cable repair vessel; all parties that join ACMA will have access to the vessel under the same terms; and the charges for using the vessel are fixed. The commercial access to the universal joint and jointers will be either through ACMA and/or through a supplementary agreement between power cable owners and GMSL. The details of this commercial structure are to be decided at the initial stage of the project as part of the finalisation of arrangements with ACMA. TC Ormonde stated that any commercial structure used will allow access on the same terms for all GB network licensees.

The jointing subcontractor will either provide full training to GMSL staff so that power cable jointing will be undertaken as part of the ACMA services accessible to all, or they will provide jointing services (likely alongside GMSL staff) on a long-term call-off basis with man-hour rates set in advance at a reasonable level. This will prevent the jointing contractor from extracting unreasonable profits when the joint enters service.

Both we and the panel were concerned that Global Marine Systems Ltd (GMSL) might stand to significantly benefit from owning the modified vessel and its potentially increased usage. TC Ormonde explained that there are several measures in place to ensure that GMSL would not profit unreasonably from the vessel. The profit margin earned by GMSL on all works is fixed (the profit earned by the jointing subcontractor will be limited during the selection process) which it states is reasonable due to the risks being taken by GMSL. TC Ormonde also stressed that ACMA would prevent GMSL from increasing the charge rate for the modified vessel. We are satisfied with this explanation.

We also had concerns about the high level of contingency budgeted for the project. Following questions from the consultants, TC Ormonde justified this by identifying three specific risks: the risk of higher than expected subcontractor price; potential need to change GMSL's fixed price contract (e.g. if additional tests are required); or increases in internal costs. We are satisfied that the overall level of contingency is reasonable.

We also asked for further clarity on the reasons for the prime subcontractor, GMSL, not being selected through a competitive process. TC Ormonde explained that the prime contractor must be one of the vessel operators contracted to ACMA, and there were two operators to choose between. GMSL was selected because it put forward an attractive proposal based on the conversion of its telecom subsea cable repair vessel and was willing to accept the risks associated with becoming a project partner. The jointing company that will be employed to develop the universal joint will be subcontracted by GMSL through a competitive tender process run in the initial phase of the project. We are satisfied that these reasons justify the selection process for the prime subcontractor.

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

In the project submission TC Ormonde explains that the project will deliver knowledge in two forms:

1. "Pure" knowledge from the development and design of the joint and the conversion of the vessel. This knowledge will be circulated through reports, peer reviews etc.

2. Knowledge embedded in the products of the project (the cable repair vessel and the universal joint). This embedded knowledge would be available to all licensees if they join ACMA. There will also be knowledge transfer in the form of training on the universal cable joint.

The learning from this project would be relevant for a number of stakeholders including all other OFTOs (existing and future); transmission licensees; interconnector owners; and offshore wind generators. The learning will be available to all interested parties. In addition to the requirements in the Governance Document, knowledge will be disseminated through a final project report capturing the work undertaken and lessons learned; a peer review conference; the project outputs will be promoted by ACMA and by GMSL on behalf of ACMA; and knowledge will be disseminated through trade bodies.

The applicant will not gain preferential access to the vessel or the jointing technology through IPR since the default IPR arrangements will be adhered to. The memorandum of understanding between TC Ormonde and GMSL states that the IPR will comply with the requirements set out in the NIC Governance Document. The selected jointing company will also be required to comply with 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

In the project submission, TC Ormonde claims that both aspects of the project, the modification of a telecoms vessel and the development of a universal joint, are innovative. Although vessels have been converted for carrying out power cable repairs before, TC Ormonde has explained that the main innovation in relation to the vessel modification is establishing the commercial arrangements for the use of the vessel through the repair club. This will be the first time that a universal joint will be available for offshore cables, which is not a product of the original cable manufacturer. We had a concern about the level of innovation in the actual modification of the vessel itself but we think that TC Ormonde's justification, that the innovation lies in the commercial arrangements and the development of the universal joint, addresses this concern.

TC Ormonde gave a number of reasons to justify why NIC funding is required for this project. Firstly, the OFTOs could not fund this project because the way they are financed means they do not have the capital available to fund the upfront costs of the project. Also, the "free rider" problem would prevent any OFTO from unilaterally funding the project as all OFTOs would eventually gain the benefits. The "free rider" problem would also be an issue for generators funding the conversion because benefits would be competed away when bidding for CfDs. The vessel owner would not be able to fund the project because the fixed rates set by the ACMA mean that the fees from additional repairs would be insufficient to cover its costs. We are satisfied with the reasons TC Ormonde presented for the difficulty in progressing this project without NIC funding.

(e) Involvement of other project partners and External Funding

TC Ormonde has selected GMSL as the prime contractor and supply-chain partner for the project. GMSL is not able to contribute as an external funder because ACMA's rules on pricing would prevent GMSL from being able to charge higher fees for the converted vessel in order to recover the funding. There are no other project partners (the jointing company will be subcontracted by GMSL) and there is no external funding for the project.

We had concerns about the level of engagement with other industry parties, specifically other OFTOs, onshore network licensees and interconnectors. As mentioned above, TC Ormonde has proposed to include a stage gate after the initial project stage (spending no more than 4% of the project budget) and we propose to include a condition at the stage gate to ensure the project is accepted by the industry.

(f) Relevance and timing

The submission explains that the move to a low carbon economy is bringing an increase in the use of offshore wind generation. A key challenge related to this move is the construction, maintenance and repair of offshore cables. It also explains that repairs are currently characterised by very long waiting periods before the repair is undertaken and extremely high costs.

If the method proves successful, TC Ormonde has stated that it will use the solution to reduce its costs on its existing OFTOs, and also to allow it to bid lower prices in future OFTO competitions. It expects that the concept would also be rapidly adopted by all other existing OFTOs and future OFTO bidders. The concept would also be relevant for interconnector owners and transmission licensees with regard to offshore bootstraps.

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

In terms of the feasibility of the project proposal, the underlying technologies are not new and an independent review of the basic design of the modified vessel concluded that the work is significant but achievable. An independent review of the universal cable joint development also concluded that it is technically feasible, subject to the identification of a suitable jointing company, and adherence to test regimes and carrying out of sea trials.

TC Ormonde has provided a detailed budget that has been independently verified. A project plan, risk register, and mitigation and contingency plans were also submitted which identify the key project stages and the project specific risks.

A clear, simple project structure has been chosen. TC Ormonde has suggested that this will enable the project to start very rapidly, if it is successful in winning NIC funding. There will be a single ultimate authority (the TCS board), a single client project manager, and a single prime-contractor project manager. It is suggested that this simple structure will facilitate decision making and accelerate the project start up. We note that the memorandum of understanding has already been signed by TC Ormonde and GMSL, which will enable the project to start promptly.

South East Smart Grid (NGET)

Project overview

This project would aim to develop new technical and commercial services and operating practices through a co-ordinated approach between NGET and the distribution network operator (DNO). The primary aim of these techniques would be to help manage power flows and alleviate voltage issues on the transmission system. This would be achieved by better understanding the relationship between the distribution and transmission networks. Having gained this understanding, the project would then develop technical and commercial services – which would be provided via the distribution network – to deal with problems on the transmission network.

The transmission network in the South East is a relatively weak part of the GB network. There is only one major synchronous generation source in the area to provide system inertia and regional voltage support. In addition, National Grid's Gone Green 2014 Future Energy Scenario estimates an additional 2GW of European interconnectors and approximately 1GW of solar and wind capacity will connect in the south east in the next decade. The management of thermal, short circuit and voltage limits is expected to result in more frequent system constraints in the future. Changes in the generation mix will present additional challenges. The business as usual approach to overcome these difficulties would be to build a new 400kV transmission line and install reactive power compensation devices.

This project would aim to provide alternative 'non-build' solutions to manage the network in this area. Alternative solutions would involve developing a more informed means of managing the system, adjusting supply and demand on the distribution network, to alleviate constraints on the transmission network. If successful, the project would help facilitate the connection of interconnectors and higher volumes of renewable generation while deferring (or in some cases possibly avoiding) the need for major network investment. The project is focused on the South East area of England but the learning from the project would be applicable across GB.

We agree that the challenge of taking an integrated approach to monitoring the combined transmission and distribution networks in the region and operating them as an integrated system is an important one, and that the learning from this project would be beneficial for other network licensees.

(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, this project could provide innovative, quicker, cheaper and more environmentally friendly options for increasing the network capability as an alternative to building new network infrastructure.

Low Carbon and/or environmental benefits

NGET said that the project would play an important role in enabling the UK to meet its low carbon emissions targets by enhancing the network capability to accommodate low carbon generation technologies and new interconnector capacity in the South East. In the Department of Energy and Climate Change's (DECC's) Carbon Plan, more European

interconnection was identified as a key element required in order to help achieve our emissions targets. NGET calculated that the additional 2GW of interconnector capacity planned to connect in the South East will result in savings in excess of 6 million tonnes of CO2 per annum. In addition, the carbon savings from the predicted connection of wind and solar generation in the South East would be in excess of 3 million tonnes per year (based on 2020 expected capacity according to NGET's Gone Green scenario). The SESG solution would help facilitate these developments by reducing or eliminating operating constraints on the transmission network.

We had a concern around the validity of the potential carbon saving claims. The presented potential benefits are based on the total energy generated by new renewables (as assumed by National Grid's Gone Green scenario) connected in the South East. The submission assumes that all of this benefit is derived as a result of the project. While we agree that the method could help facilitate the connection and delivery of this generation, we consider the approach to quantify this benefit may overestimate it (p6, PPA report).

As part of the submission, NGET also identified wider environmental benefits which could result from identifying alternatives to building new infrastructure. A non-build solution would avoid the environmental impact of building a new transmission line, including environmental issues such as land use, noise, soil erosion, visual impact, and impact on local wildlife.

Net financial benefits

They key financial benefit that NGET identified for customers is the unconstrained operation of the interconnectors in the South East. NGET claims that this would deliver a saving of up to £500m per annum. The financial benefits that are presented are largely based on the increase in interconnector capacity. 2GW of interconnector capacity is planned to connect into the South East by 2020.

The submission explains that with this additional interconnection and an increase in renewable generation in the area, the network will be very difficult to manage and the business as usual approach would be to either constrain generation or to reinforce the network. To assess the financial benefits, NGET compared the costs and benefits of a business as usual approach to the SESG solution. The different transmission constraints it has identified have different potential financial benefits:

- To ensure steady state voltage control, generators would need to be constrained at a cost of at least £14m per annum (2013 cost) but SESG would potentially avoid some of the need to constrain generators and save up to £6m per annum.
- Managing dynamic voltage stability would mean that at least £60m extra investment is needed once the new interconnectors connect. SESG would result in up to £20m potential savings by removing the need for at least one statcom unit (a device that can dynamically provide variable reactive power to the system).
- Ensuring reliable commutation of the IFA HVDC interconnector would require constraining the interconnector at a cost of at least £80m per annum. SESG would potentially avoid some of the need to constrain the interconnector and save between £35-45m per annum.
- Thermal overloading and maintaining rotor angle stability would lead to the need to build a new transmission line, at a cost of about £500m. SESG would potentially delay the need for this investment.

We note the Panel concerns regarding the lack of clarity over which of the many potential issues were really the key ones the project would aim to address, including whether the focus was on real or reactive power. The Panel also noted the limited insight into the nature and potential of the techniques that SESG would employ to manage the network, and whether any work has been done to understand to what extent these would be able to provide a firm and sustainable response and deliver the consequent financial benefits (p29, Panel report).

We were concerned about the deliverability of the distribution resource required and whether it would be sufficient to avoid constraining interconnectors. In response to questions and in discussion with the Panel, NGET explained how the distributed resources could help manage voltage and fault level contribution to avoid constraining the interconnections. We do not consider that NGET has provided enough evidence that the distribution resource would be able to deliver the suggested potential benefits.

The Panel and we consider that the potential savings presented may be so large that if even a small proportion can be realised then the project would deliver substantial benefits to customers. We think this strengthens the case for NGET to develop this project further and bring it back for a future competition.

(b) Provides value for money to electricity transmission customers

NGET listed the beneficiaries of the SESG project as the transmission owners, system operator, generators, and electricity customers. Although the project is focused on challenges that are applicable to the South East region, the learning will also be applicable to the rest of GB. NGET explained that other parts of the networks face similar challenges, for example, North Wales, due to the connection of offshore windfarms or the South West of England with the increasing penetration of embedded generators.

NGET formally invited various stakeholders to submit their expressions of interest for participation in the project. The selection of partners was then based on price/contribution, organisation and resource, understanding of the project, and the solution offered. Project partner selection is discussed further in the section related to criterion (e) below. We were concerned about the project cost that was associated with the Siemens system and whether this represents an innovative development or could be regarded as implementation of an off-the-shelf solution. NGET explained the software will be developed to allow coordinated control between transmission and distribution and therefore would provide a new means of managing the transmission network. We were satisfied that NGET has addressed this concern.

We were concerned with the significant costs for Imperial College (£1.5m) and Siemens (£2.6m) given the lack of clarity over their deliverables for the project. NGET clarified the roles of the project partners in the resubmission. However, the cost of Imperial College remained significant (in the order of 15 person years). The Panel noted it was not clear that a robust competitive process against a defined scope of work and clear published criteria had been undertaken before it was selected (p29, Panel report).

We also had concerns about whether the project management approach would deliver value for money for customers. This is discussed under the section related to criterion (g).

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

The project could potentially generate learning on the synergies between the transmission and distribution networks which would be relevant knowledge for all network licensees. We understand from the submission and from further questions that the project is looking to address two issues facing the transmission and distribution networks in the South East area; power flow limitations and voltage stability issues. We think that the key piece of learning from this project would be in the interaction between the distribution and transmission networks. NGET summarised the key areas of knowledge that could be shared with other licensees as follows:

- The design of new, more effective system monitoring tools;
- The learning generated from the demonstration of a non-build solution to defer or avoid infrastructure investment;
- The validation of a smart grid network under different system conditions; and
- The coordinated operation of equipment connected at different voltage levels and the efficient method of communicating with and controlling distributed resources.

We had a concern over the extent to which the system monitoring element of SESG would generate new knowledge over and above what is being delivered through other projects such as VISOR[15]. NGET said it would ensure no duplication in the installation of the monitoring devices and wherever possible SESG would make use of monitoring devices already available on the system. NGET also explained that SESG's purpose of monitoring goes beyond the monitoring that VISOR is focused on. SESG will build new models and develop control strategies to address a fundamentally different problem to VISOR. We were satisfied with this justification.

NGET states that knowledge would be disseminated throughout the duration of the project. NGET's customer and stakeholder engagement team will oversee the overall approach to knowledge dissemination. The three approaches to knowledge dissemination would be: the creation of an SESG "e-Hub" with bimonthly webinars, publication of data and test results, project updates, etc; an annual technical workshop; and an annual public workshop.

SESG project will adhere to the default intellectual property rights (IPR) arrangements. The project partners have agreed that work undertaken using NIC funding will adhere to the 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

NGET explained that distributed resources have the potential to help with managing transmission constraints and provide significant benefits to customers. To enable this potential, whole system monitoring and control, resource estimation and initiation, as well as new commercial arrangements are required. The application of these at such a scale has not been demonstrated before.

We accept NGET's case for this being an innovative project. We agree that SESG could provide innovation in:

[15] Details of Scottish Power Transmission's NIC project VISOR (Visualisation of Real Time System Dynamics using Enhanced Monitoring) are available here.

- whole system monitoring that combines both transmission and distribution networks;
- enabling the use of distributed resources to manage transmission constraints; and
- developing commercial arrangements to enable the roll out of the concept.

The submission explains that this project could not be trialled as business as usual for a number of reasons. The modification of existing operating procedures would require considerable investigation and effort. NGET highlights several other risks that would prevent this project from proceeding as business as usual, including the commercial risk that new market arrangements are required to incorporate coordinated response from transmission and distribution resources. We were satisfied with NGET's justification that this would not be conducted as business as usual.

(e) Involvement of other project partners and External Funding

NGET engaged with external stakeholders once the project idea was identified. It discussed the project with relevant customers, suppliers and partners to develop the project's aim and objectives in further detail. The submission states that a range of candidates, ranging from technology providers to demand side aggregators and universities, have shown interest in the project. The project partners are:

- Siemens - would be the key technology provider with a substantial involvement in delivering the state estimation work package
- Imperial College of London - would provide academic expertise as well as data evaluation, validation, quality control, testing and knowledge dissemination
- UK Power Networks (UKPN) - would facilitate access to distributed resources and provide knowledge and experience of the distribution network
- Elexon - would provide expertise in designing new commercial services.

NGET discussed the need for external funding with these selected project partners and all have agreed to contribute to the project, although the external funding amounts to only 6.7% of the total project costs.

The role of the distributed resource service providers (demand side response (DSR) aggregators) will be crucial for this project and we are concerned that NGET did not identify an aggregator in the project submission. In response to a question from the consultants on this issue, NGET explained it is confident that a sufficient volume of DSR can be secured by the aggregators it works with already. NGET suggested this approach will allow it to procure the service at the best price and from a range of service providers. We are still concerned that this element of the project has not been sufficiently developed. NGET could also have demonstrated it has taken learning from previous LCNF or NIC projects that trialled the procurement of DSR resources.

(f) Relevance and timing

Both we and the panel agreed that the project would be relevant and timely. The network in the South East is already congested and two interconnectors are expected to be connected in this area by 2020. The need for constraint management in this region is increasing each year. We are satisfied with the case NGET has presented to demonstrate

this project would be relevant and timely. The project seeks to develop a new suite of services that could change operational practices for network operators. NGET stated that SESG will provide a "whole system" approach to managing the transmission system that would be applicable to other network licensees and could be rolled out to other areas of the network.

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

Throughout our consideration of this project we were concerned about the clarity of the project's methodology.

Throughout the assessment process, NGET was not sufficiently clear on the problem, solution or methodology of this project. The Panel and we felt that the objectives of the project were not well enough defined. For example NGET was not clear whether the key objective of the project is to manage voltage issues or thermal issues, or both. Our key concern was that the project lacked clarity in relation to the outputs that it would deliver.

We were also concerned that the required volume of distributed resources necessary to achieve the project objectives has not been identified. There was a lack of clarity as to what distributed resources will actually be called upon to do and how they would be engaged/recruited. NGET only stated that it was confident that the DSR aggregators would have access to sufficient volume of DSR so that the trials can take place. We note the Panel's concern that the proposal did not adequately recognise the learning from previous LCN Fund projects. This did not provide us with a sufficient level of confidence that the project could in practice address the constraint issues that it was aimed at.

A series of work packages were presented in the submission and NGET stated that these work packages have been agreed with the project partners. In the original submission the project plan was high level with no delivery dates or milestones. The project plan was more detailed in the resubmission and NGET stated that all project partners had agreed to the deliverables and delivery dates. Although the resubmitted project plan was more detailed we were concerned that the design phase and the hardware procurement phase would be run in parallel. The risk of stranded costs would have been minimised if the project phases were sequential. The submission included a thorough risk register which identified risks and mitigation actions, along with contingency and cost implications. The project submission also explained that the project is supported at all levels within NGET via the established Innovation Steering Board.

In the original submission the evidence that NGET proposed to demonstrate achievement of its Successful Delivery Reward Criteria (SDRCs) lacked detail. Following questions from the consultants, NGET improved the SDRCs in the project resubmission including more detail on the specific evidence for each criterion. We are satisfied that the SDRCs have improved.