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LCN Fund
Low Carbon Networks

Innovation in networks – Ofgem's Low Carbon Networks Fund

Decision on third year competition

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Overview:

Ofgem runs an annual competition to help stimulate innovation in electricity distribution networks. This document explains our decision on which projects have been selected for funding through the third annual competition of the Low Carbon Networks (LCN) Fund. Our decision relates to the Second Tier Funding Mechanism, under which Distribution Network Operators (DNOs) can apply, in partnership with other organisations, for up to £64m to fund innovative low carbon projects.

There were applications for seven projects this year. From these, we have selected five projects for funding, as recommended by our independent Expert Panel, who assisted with the evaluation of the project proposals. In total, we propose to award £45.5m of the available £64m to these projects. In addition, the DNOs and a range of collaborators will invest £17.8m of additional funding and in kind contributions in the projects. The fund was oversubscribed this year. We and the Expert Panel considered that two of the projects, while innovative, did not meet the criterion of delivering sufficient value for electricity distribution customers.

The winning projects trial innovative operations and commercial arrangements and use of new technologies. These will help DNOs understand how they can best respond to meeting the changing requirements of consumers and generators as Great Britain (GB) moves towards a low carbon economy. Learning will be relevant to all DNOs and consequently all GB customers will have the potential to benefit from the projects.

Context

As distribution networks are regional monopolies or near monopolies, we conduct regular reviews to ensure they deliver value for money for their customers and for current and future consumers. As part of the last electricity distribution price control (DPCR5), we established the £500m Low Carbon Networks (LCN) Fund. The aim of this fund is to stimulate innovation and to provide Distribution Network Operators (DNOs) with the opportunity to obtain funding to trial innovative solutions to the challenges that they face. These trials are needed so that DNOs can understand how they can meet the changing needs of consumers and generators as Great Britain (GB) moves towards a low carbon economy and can ultimately result in lower costs for consumers.

The learning gained from these trials will be disseminated to all DNOs and will be widely available to other interested parties to help them make the changes required in a timely and cost effective way. Learning from the trials will help to feed into the Smart Grid Forum, which is jointly chaired by Ofgem and the Department of Energy and Climate Change (DECC). Results from the trials will also inform our development of the regulatory framework for networks and help DNOs to prepare well justified business plans for the next electricity distribution price control (RIIO-ED1) and beyond.

This document provides details of the projects which the DNOs submitted to compete for funding and explains our decision on funding for projects in this year's competition.

The detailed rules for the Second Tier competition are in the LCN Fund Governance Document version 5. We may consult on changes to this document based on lessons learnt from this year's process in 2013.

We are extending many of the principles of the LCN Fund as part of the Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) to encourage innovation in gas and electricity transmission networks and in gas distribution networks. This is being taken forward as part of our work on the RIIO price controls.

Associated documents

- LCN Fund Governance Document v.5
- DPCR5 Final Proposals - Incentives and Obligations (145/09)
- Decision and further consultation on the design of the Network Innovation Competition
- Decision on Low Carbon Networks Fund Two Year Review
- LCN Fund: Two year review (167/11)

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Executive Summary

Distribution networks are entering a period of significant change. The challenges presented by the transition to a low carbon economy and the development of new technology will directly affect distribution networks and the way in which distribution network operators (DNOs) interact with their customers.

DNOs will need to innovate in the way they design, plan, build and operate their networks to cope with these challenges. Our Low Carbon Networks (LCN) Fund is designed to stimulate innovation. It provides up to £500m of funding over five years to encourage DNOs to undertake trials to help address these challenges in the most cost effective way. Trials financed through the LCN Fund will generate learning for all network operators and will be made available to all interested parties. The learning also brings potential benefits and cost savings for current and future consumers

Successful Projects

In the third year of the LCN Fund competition, we have selected five projects for funding. In reaching this decision, we were advised by our independent Expert Panel, which reviews the project submissions and recommends which projects to award funding to. Following consideration of the Expert Panel's report, we have agreed with its assessment and selected the projects it recommended. Seven project proposals were assessed against a published set of criteria which we have summarised in the introduction to this document. The full criteria are in the LCN Fund governance document (the governance document). We have summarised the successful projects in the table below. We plan to place additional requirements on some projects in order to ensure they deliver the maximum value to customers.

Project (location)	**Funding requested**
Accelerating Renewable Connections (East Lothian and Borders, Scotland) A project aiming to reduce the time taken and cost of connecting distributed generation (DG). *Submitted by Scottish Power Distribution*	£7.42m
Customer Load Active System Services (North West England) A project that will explore the relationship between voltage and demand with the aim of providing DNOs with the knowledge to use voltage control to manage network constraints. *Submitted by Electricity North West Limited*	£7.17m
FLEXGRID: Advanced Fault Level Management (Birmingham) A project developing new fault level assessment processes, real-time monitoring of fault levels and deployment of alternative mitigation solutions to reduce the cost and time necessary to connect DG. *Submitted by Western Power Distribution (West Midlands)*	£13.51m
Innovation squared (across GB) A project investigating the use of a domestic 'smart socket' to manage	£4.18m

network constraints caused by Electric Vehicles (EVs). *Submitted by Southern Electric Power Distribution*	
Smarter Network Storage (Leighton Buzzard, Bedfordshire) This project will install a 6 MW/10 MWh battery to manage network constraints. It aims to investigate the financial benefits of deferring or avoiding network reinforcement and selling flexibility services. *Submitted by Eastern Power Networks*	£13.22m

The seven submissions we received requested total funding of £75.9m. Of this, the projects we have selected for funding in this year's competition require £45.5m from the annual funding limit of £64m. They address a broad range of issues which are relevant to the challenges that the DNOs will need to address in the move to a low carbon economy. All of the projects will examine how to maximise the use of existing network assets and release capacity.

These projects complement the ten projects already funded under the Second Tier Funding Mechanism[1]. Those projects are currently being implemented and learning is already emerging. That learning, together with learning from this year's projects, will help feed into the DNOs' RIIO-ED1 business plans and into the Smart Grid Forum, which is jointly chaired by Ofgem and the Department of Energy & Climate Change (DECC).

Unsuccessful Projects

We received applications for two projects which we do not plan to fund in this year's competition. While both of these were innovative and could deliver wider benefits, they did not demonstrate that they had performed sufficiently strongly against one or more of the evaluation criteria.

Powering Agriculture, Transport and Heat Sustainably (PATHS) is a potentially important project that could provide carbon benefits through connecting wind energy more quickly. However, it did not demonstrate that it would provide sufficient benefits to electricity distribution customers to be considered for funding. This is a key criterion as electricity distribution customers provide the funding for the competition.

GB Flexibility Market has the potential to release significant network capacity across GB, but we do not plan to fund it for two reasons. Firstly, the submission from Northern Powergrid did not demonstrate that the project would provide sufficient value for money. It did not demonstrate that some of the major costs of the project were based on competitive rates. Secondly, a number of third parties who would potentially receive significant benefits from the project did not provide sufficient financial contributions to the project to appropriately share in the risk involved. We do not consider it appropriate for distribution customers to take the majority of the financial risk for this project if they are not receiving the majority of the benefits.

[1] Information on these projects is available on our website.

1. Introduction

Chapter Summary

This chapter describes the background and structure of the Low Carbon Networks (LCN) Fund, how we and the Expert Panel have evaluated projects, and the process we followed during this year's Second Tier competition.

Purpose

1.1. The LCN Fund incentivises DNOs to innovate in the way they design, build and operate their networks. It consists of two tiers. The First Tier provides DNOs funding for small scale projects and to put in place the people, resources and processes to progress innovative projects. First Tier funding is subject to an annual limit.

1.2. Under the Second Tier of the LCN Fund, we hold an annual competition to award funding to a small number of large scale innovation projects. DNOs compete against each other for an allocation of up to £64 million of funding available each year. This document explains our decision on the projects we have selected for Second Tier Funding in this third year of the LCN Fund.

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

- The full submission for each project, which include the information on each project that we used to evaluate the project against the evaluation criteria.
- The independent Expert Panel's recommendation on which projects should receive funding.
- Reports by our consultant, PPA Energy, on each project. These scrutinise the information provided by the DNOs and provide the consultant's detailed assessment of each project to aid the Expert Panel's recommendation and our decision.
- The DNOs' answers to questions that PPA Energy, the Expert Panel and Ofgem raised on aspects of each project.

1.4. In this document we use a number of terms defined in the LCN Fund governance document.

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

The LCN Fund

1.6. We have previously estimated that over £200 billion needs to be invested in the GB energy market over the next 10 years to secure supplies for consumers and

to move to a low carbon economy[2]. Of this, around £32 billion will need to be spent on pipes and wires. Network companies need to consider how they can play a full role in tackling climate change whilst maintaining security of supply and value for money to customers. In order to meet these challenges they will need to innovate in the way they design, build and operate their networks.

1.7. There are potential benefits from this innovation to customers as networks will be more able to accommodate low carbon technologies such as electric vehicles (EV), distributed generation (DG) and heat pumps. Innovation should also bring environmental benefits in terms of allowing DNOs to provide connections to more DG and other technologies without costly and time consuming reinforcement to the networks. There are also potential wider system benefits if DNOs and other players can understand how to encourage customers to use energy flexibly to minimise overall system costs.

1.8. To encourage DNOs to innovate in the way required we created the £500m LCN Fund as part of the fifth Electricity Distribution Price Control Review (DPCR5). It is designed to enable DNOs to trial new technologies, operating practices and commercial arrangements which are required to meet the challenges associated with the transition to a low carbon economy. The LCN Fund is intended to help the DNOs understand what role they should play in the overall supply chain in a low carbon energy sector and how they can enable the transition. As such, the learning from the selected projects is important not just for DNOs but for the energy industry and its stakeholders as a whole. A key feature of the LCN Fund is the requirement that learning gained from projects must be widely disseminated, in order that customers across Great Britain (GB) gain significant return on their funding through the roll-out of successful solutions and the subsequent network cost savings and/or carbon benefits.

1.9. As part of the RIIO regulatory framework we are establishing the NIC and NIA. These build upon the LCN Fund principles and will encourage similar innovation and learning in electricity transmission and gas networks.

LCN Fund structure

1.10. The governance document contains the regulation, governance and administration of the LCN Fund. The LCN Fund consists of two funding tiers and a discretionary reward mechanism.

1.11. The First Tier Funding Mechanism provides up to £80 million over five years across all DNOs. DNOs can use this to recover a proportion of expenditure incurred on small scale projects. They can also use this funding to put in place the people, resources and processes to progress projects developed under the Second Tier Funding Mechanism.

[2] Project Discovery - Energy Market Scenarios

1.12. The Second Tier Funding Mechanism provides funding of up to £64 million per year - £320m over DPCR5. To provide the best value for money to customers and ensure that only the best projects are funded, this is awarded through an annual competition.

1.13. The Discretionary Funding Mechanism is worth up to £100m over the five year period. This may be awarded to projects that are successfully delivered and bring particular value in helping the DNOs understand what investment, commercial arrangements and operating strategies should be put in place to facilitate the development of a low carbon economy.

Second Tier Process

1.14. The annual competition starts with DNOs submitting outline project proposals in the Initial Screening Process (ISP). Through the ISP, Ofgem assesses whether the projects are eligible for funding against a number of criteria (eligibility requirements). These provide an early indication of which projects are eligible for funding, limiting the costs a DNO might incur in developing and proposing a project that does not perform well against the criteria at the next stage.

1.15. The successful DNOs are then invited to develop these eligible projects into full project proposals (full submissions). Whilst the decision on which projects are funded rests with us, we are advised by an independent panel of experts - the Expert Panel[3]. The Panel consists of individuals recruited to bring knowledge and expertise covering energy networks, environmental policy, technical and engineering issues, economics and finance, and consumer issues.

1.16. The Expert Panel makes its recommendation on which projects should be funded, and we make our decision, by assessing each project against the Second Tier Funding Mechanism evaluation criteria. These are detailed below. We and the Expert Panel also consider the impact of the project on the overall portfolio of projects that have either been awarded funding in the past, or are seeking funding as part of this competition.

Two Year Review

1.17. At the beginning of 2012 we held a two year review of the LCN Fund. The review assessed whether the fund was delivering its intended objectives and identified areas for improvement. Through consultation[4] we asked stakeholders to comment on a range of areas including the evaluation criteria, the Second Tier process and the transition to the NIC.

[3] Biographies of the Expert Panel members
[4] LCN Fund: Two year review

1.18. Following the consultation and our review we published a letter detailing our decision on the future of the LCN Fund[5]. Respondents supported our view that the LCN Fund has worked well to date and has successfully incentivised DNOs to undertake a range of innovative projects. Rather than a wholesale reform, we implemented a number of refinements through changes to the evaluation criteria and competitive process.

1.19. Table 1.1 summarises the current evaluation criteria. The full detail of the evaluation criteria are contained in the governance document.

Table 1.1: Summary of evaluation criteria

Degree to which the solution being trialled:	**Degree to which the project:**
• accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers, • impacts on the operation of the distribution network, • provides value for money to distribution customers, and • generates new knowledge that can be shared amongst all network operators.	• demonstrates a robust methodology and readiness of the project, • is being delivered cost effectively, • involves other partners and external funding, and • is relevant and timely.

The 2012 Competition

1.20. This year's competition began with the ISP in April 2012. We received seven submissions and were satisfied that they all met the ISP eligibility requirements set out in the governance document. Subsequently, DNOs were able to develop these project ideas into full submissions. DNOs submitted full submissions for all seven projects by the deadline of 17 August 2012. A brief summary of each project is in Chapter 2 and all the ISPs and Full Submissions are available on our website[6].

1.21. We received more submissions than last year and the combined funding requested was £75.9m, more than the £64m annual limit. This is an increase in funding requested from last year. Each DNO has submitted at least one bid to this year's competition.

1.22. The Expert Panel reviewed the submissions and then held meetings with the DNOs to aid its understanding of the project proposals. It was assisted in its review

[5] Decision on the Low Carbon Networks Fund Two Year Review
[6] Full submissions can be found here

by our external consultants, PPA Energy, who assessed the feasibility of the projects, validated the information supplied and presented this information on a comparative basis. PPA Energy's reports are published on our website[7].

1.23. The Expert Panel conducted a thorough evaluation. It reviewed the DNOs' submissions and PPA Energy's reports and met all the DNOs and their project partners twice. It then evaluated the projects against the criteria set out in the LCN Fund Governance document v.5.

1.24. We, PPA Energy and the Expert Panel asked written questions on the submissions at various points in the process. Where answers to questions amended the basis of the DNOs' submission, the DNOs made the necessary changes to their submission. All of the questions and answers that were raised through the written Q&A process have been published on the Ofgem website.

1.25. The Panel also highlighted aspects of the submissions where it had concerns. DNOs were able to respond to these comments by amending their submissions. All DNOs chose to make amendments. Both the original submissions and the final submissions are available on our website. PPA Energy has also provided addenda to their reports that review these amendments. The Panel made its recommendations based on the final submissions.

1.26. The Expert Panel's recommendations are in its report, which it submitted to us on 1 November 2012[8]. We reviewed the Panel's recommendations and took them into consideration when making our decision. We also made our own assessment to decide which projects should receive funding based on their performance against the Evaluation Criteria. This is included in Appendix 1.

[7] The consultants' reports and questions and answers are available here as sub documents to each project submission
[8] The Expert Panel recommendations report

2. Decision

Chapter Summary

This chapter explains which projects we intend to award Second Tier funding to and provides an overview of the reasons behind our decision.

Overview of full submissions

2.1. All DNOs submitted projects this year. This year's projects build on learning from the First and Second Tiers of the LCN Fund and the Innovation Funding Incentive (IFI). We were impressed by the range of innovative technical, commercial and operational ideas in this year's submissions. We agree with the Expert Panel's view that this year's proposals are more diverse and novel than in previous years. We are pleased that some projects are ensuring best value for money by proposing the use of assets from existing LCN Fund projects.

2.2. Following the two year review, we changed a number of the evaluation criteria. This included our approach to the cost benefit analysis to focus this on how LCN Fund projects are reducing barriers to the connection of low carbon technologies. We are pleased to see that this year's submissions have provided clear explanations of how the projects' methods can provide access to network capacity cheaper and faster than the business as usual approach of conventional network reinforcement.

2.3. However, we also have some concerns over this year's submissions. Another change we made through the two year review was to better assess DNOs' approaches to ensuring best value for money in delivery of projects. We echo the Expert Panel's concern that, in a number of cases, project costs appeared to be higher than required. In particular, we are concerned over the extent of competitive processes for selecting elements of projects, including contractors and project partners. We note that there are very few new partners involved in this year's projects. We would expect that competitive approaches to selecting partners and suppliers would yield new entrants, particularly given the level of interest that we have seen in the LCN Fund. Table 2.1 provides a summary of the seven Full Submissions. Further descriptions of the projects are in Appendix 1.

Table 2.1: Summary of project submissions

Project (location)	Funding request	DNO
Accelerating Renewable Connections (ARC) (East Lothian and Borders, Scotland) A project aiming to reduce the time and cost of distributed generation connections by taking a more	£7.42m	Scottish Power Distribution (SPD)

holistic approach to the connections process. The project would partner with Community Energy Scotland, Smarter Grid Solutions and University of Strathclyde.		
Customer Load Active System Services (CLASS) (North West) A project that would explore the relationship between voltage and demand with the aim of providing DNOs with increased knowledge in the use voltage control to manage network constraints.	£7.17m	Electricity North West Limited (ENWL)
FLEXGRID[9] (Birmingham) A project which would develop new fault level assessment processes, real-time monitoring of fault levels at ten substations and deployment of alternative mitigation solutions at five substations to reduce the cost and time necessary to connect DG.	£13.51m	Western Power Distribution (WPD)
GB Flexibility Market (North East, England) A project aiming to facilitate access to flexibility services. The project would trial trilateral agreements between network users, the DNO and National Electricity Transmission System Operator (NETSO[10]) to share flexibility services and establish a prototype market for trading flexibility services.	£16.38m	Northern Powergrid
I^{2}EV [11] (Across GB) A project which would investigate the use of a domestic 'smart socket' to manage a network constraints caused by EVs.	£4.18m	Southern Electric Power Distribution (SEPD)
Powering Agriculture, Transport and Heat Sustainably (PATHS) (Aberdeen) A project which would trial converting electricity to hydrogen, avoiding potential reinforcement costs for renewable generators. The hydrogen produced would be used in the transport sector (fuel cell buses in Aberdeen) and fed into the gas grid.	£14.00m	Scottish Hydro Electric Power Distribution (SHEPD)
Smarter Network Storage (Bedfordshire) This project would install a 6 MW/10 MWh battery on a constrained area of the network. The project aims to investigate the financial benefits of deferring or avoiding network reinforcement and selling flexibility services.	£13.22m	Eastern Power Networks (EPN)

[9] Advanced Fault Level Management in Birmingham
[10] The NETSO has responsibility for making sure that electricity supply and demand stay in balance and the system remains within safe technical and operating limits.
[11] Innovation-squared: managing unconstrained EV connections

Our decision

2.4. Following consideration of the project submissions, the Expert Panel's recommendations and consultants' reports, we have selected five of the seven projects for funding. Of these successful projects, we will place specific conditions on two of the projects. We consider that we need to place additional conditions on these projects to ensure that customers' money is being spent efficiently and that customers are receiving best value for money from these projects. Therefore we have:

- selected three projects that can be funded as they were submitted (listed in Table 2.2).
- identified two projects that will require additional conditions to be agreed by the DNOs before funding can be provided (listed in Table 2.3). We explain the additional conditions for these projects below in the "Reasons for our decision" section.
- decided that two projects will not be selected for funding (listed in Table 2.4).

Table 2.2: Projects selected for funding as submitted

Project (location)	DNO	Funding requested
ARC (East Lothian and Borders)	SPD	£7.4m
CLASS (North West)	ENWL	£7.2m
Smarter Network Storage (Bedfordshire)	EPN	£13.2m

Table 2.3: Projects selected for funding with additional conditions

Project (location)	DNO	Funding requested
Flexgrid (Birmingham)	WPD	£13.5m
I^2EV (Across GB)	SEPD	£4.2m

Table 2.4: Projects not selected for funding

Project (location)	DNO	Funding requested
GB Flexibility Market (North East and Yorkshire)	Northern Powergrid	£16.4m
PATHS (North of Scotland)	SHEPD	£14.0m

2.5. We consider that both of the projects not selected for funding involve innovative ideas that have the potential to deliver benefits. However, we do not consider they demonstrated that they performed sufficiently strongly against all of the evaluation criteria and we do not consider that funding them would be in the best

interests of distribution customers. We explain our reasons for not funding these projects in more detail in the following section.

Reasons for our decision

2.6. We reviewed each project submission against each of the evaluation criteria set out in the Governance Document and against the entire portfolio of first and second year projects. These detailed assessments are in Appendix 1 of this decision. Below we provide a summary of the reasons for our decision.

2.7. The total funding we intend to award this year is under the £64m annual funding limit and it would have been possible for us to fund more than the five projects that have been selected. However, funding can only be provided to those projects that we consider have performed sufficient strongly against the evaluation criteria.

Projects selected for funding as submitted

ARC

2.8. This project aims to improve the connection process for DG so that DG developers get a faster and cheaper connection service. Making the DG connection process more efficient would be an important contribution to the development of a low carbon economy. While we note this may be a more significant concern for SPD than some other DNOs, increased DG connections will be an issue across GB and learning from this project would be of use to all DNOs. In particular, we consider that the comprehensive approach to connections, holistically considering multiple customers, working with community schemes and working across voltage levels could provide significant new learning and benefits to distribution customers.

2.9. However, the Expert Panel raised concerns over value for money in three areas: labour costs were considered too high, the project included a costly battery that provided limited incremental learning and aspects of the project may not be innovative. In their final submission, SPD reduced labour costs and removed the battery from the project. We consider that, following these changes, the project demonstrates value for money.

2.10. Whilst the overall cost of the project has been reduced, there may be some elements of the project which SPD could have been expected to undertake as part of its normal business. Overall the project is innovative and passed the ISP criterion on this basis and on balance we agree with the Expert Panel's view that the project would provide value for money for distribution customers. However, we will consider whether we need to introduce a further criterion at the Full Submission stage to prevent elements of business as usual activity being included within the scope of projects. In addition, we also expect SPD to consider the wider application of elements of this project as part of the development of its RIIO-ED1 business plan.

2.11. Overall, ARC performed well across the evaluation criteria and we plan to fund this project.

CLASS

2.12. CLASS investigates the relationship between voltage and demand. It would test how voltage control can be used to reduce peak network demands, which could defer or avoid reinforcement, and manage high volumes of DG. It would also investigate how DNOs can use voltage control to support the NETSO. This project uses existing infrastructure, is highly replicable and could be a useful tool for managing the impacts of the roll out of low carbon technologies across GB.

2.13. In particular, these methods could give DNOs the time to assess the most efficient response to highly loaded parts of the network. In its final submission, ENW changed the sample of substations in the project to focus on highly loaded parts of the network. This improved the already robust methodology of the project.

2.14. Learning on the customer impact will be crucial. If customers notice changes in voltage levels then the usefulness of this technique could be significantly reduced. We are pleased to see the involvement of a project partner dedicated to customer engagement, including through surveys.

2.15. CLASS performed particularly well across all of the evaluation criteria and we plan to fund this project.

SNS

2.16. This project trials commercial arrangements and a control system to use a large battery for multiple purposes, including managing network constraints and accessing ancillary service markets. It is well designed, has a very strong methodology and has an appropriate group of partners.

2.17. There are existing LCN Fund projects involving battery storage, so we and the Expert Panel carefully considered the extent to which this project would develop new knowledge. We believe that this project has the potential to deliver significant new learning on the commercial and operational arrangements that could make battery storage an economically viable option for addressing network constraints. This would be valuable learning for all DNOs.

2.18. The Expert Panel was concerned over the significant cost of the new battery and questioned whether the size of the battery was necessary to deliver the project's learning. Our initial view was that its high cost did not represent value for money. However, in its final submission EPN reduced the size of the battery which significantly reduced the project costs. We now consider this project demonstrates good value to customers.

2.19. SNS performed well across all of the evaluation criteria and we plan to fund this project.

Projects selected for funding with additional conditions

Flexgrid

2.20. This project addresses fault levels, an area not yet being considered by second tier LCN Fund projects. It builds on learning from previous IFI and first tier LCN Fund projects. It would examine new ways of measuring and monitoring fault levels, which could avoid the need for expensive reinforcement. The project would also evaluate new fault level mitigation technologies, which could provide DNOs with significantly cheaper alternatives to reinforcement. These techniques could reduce the costs of connecting DG, providing significant benefits to distribution customers. This is an issue relevant to all DNOs.

2.21. The Expert Panel had concerns about the value for money of the project, in particular the contractor costs. In their final submission, WPD reduced contractor costs. Following this change, we consider the project performs strongly against the criterion "Provides value for money for distribution customers".

2.22. However, WPD failed to resolve a concern raised by the Expert Panel over the project's methodology. A large proportion of funding is allocated to procuring fault level mitigation technologies. These are not yet defined as WPD propose to tender for them approximately one year in to the project. Whilst we understand this approach from a project management viewpoint, we do not consider committing £7.5 million to unspecified technologies is in the customer interest.

2.23. Therefore before WPD can access this funding, we will require them to consult with all GB DNOs on deployment options, as it is all DNOs that will ultimately be using the learning from this project. This consultation will provide a full report of the fault level assessment and monitoring elements of the project to date and propose a deployment programme of mitigation technologies. We will require WPD to demonstrate how they have considered DNO feedback in developing their deployment programme. We will also require WPD to demonstrate that an appropriate procurement process has been followed before it can award contracts. We will insert a specific Successful Delivery Reward Criteria for this project reflecting this condition.

2.24. With these conditions, Flexgrid performed well across all of the evaluation criteria and we plan to fund this project with additional conditions.

I^2EV

2.25. This project is focussed on managing clusters of EVs while reducing the need for investment on the LV network. It would trial a new control device (Esprit) that could prevent EV chargers overloading the network. This technique could also

provide DNOs with a useful tool to give them time to consider the most efficient response to LV networks being penetrated by EVs. Esprit is intended to be quickly deployable so could either be deployed as an interim measure while the network is reinforced, or as an enduring alternative. The project would also trial commercial arrangements for third party delivery of projects on DNO networks. We are pleased to see that this bid has been managed by a third party, EA Technology Limited (EATL), and sponsored by SEPD. EATL is responsible for managing the project, but SEPD is responsible for the project's successful delivery, including compliance with the LCN Fund governance framework and licence obligations.

2.26. We have some concerns over the benefits of the project, particularly the benefits of the commercial method. However, taking into account the size of funding requested, we consider this project could provide significant financial benefits to customers and facilitate earlier and less costly connection of EVs.

2.27. We also had a concern is over the intellectual property arrangements. This project aims to test, develop and prove the Esprit product. A requirement of the LCN Fund is that learning from a project must be available to all DNOs so that all customers will benefit. Customers will only benefit from this project if they can access Esprit at a reasonable price. Therefore we are pleased to note that EATL have set a target price of £2,000 or less per feeder.

2.28. We identified a concern over the project methodology. The project needs to recruit a number of clusters of EVs. This could be difficult given the limited uptake of EVs to date and the difficulties other LCN Fund projects have faced in recruiting EVs, although we note the significant subsidy provided by Nissan. We are not willing to commit £4m of customers' money to a project that might not be able to test the real effect of the device, or provide statistically significant results.

2.29. However, as mentioned, this project has the potential to provide significant benefits to customers. Therefore we will place a stage gate in the project. SSE must recruit at least 100 EV customers in at least 7 separate clusters within 12 months following the start of the project. There must be a minimum of 10 EV customers per cluster. This deadline may be linked to the point at which their plan for customer engagement is approved by Ofgem. We will not allow SSE to use LCN funding on aspects of the project that are due after this point of the project until this condition is met. With this additional condition on funding, we consider the project performs sufficiently strongly against the criterion "Demonstration of a robust methodology and that the project is ready to implement". We will insert a specific Successful Delivery Reward Criteria for this project reflecting this condition.

2.30. With this condition, I^2EV performs well across all of the evaluation criteria and we plan to fund this project with additional conditions.

Projects not selected for funding

2.31. The remaining two projects involve innovative ideas that have the potential to deliver benefits. However, they were not able to demonstrate sufficiently strong

performance against all of the evaluation criteria and we do not plan to fund them. We did not consider we were able to resolve the issues with the projects by placing additional conditions on funding. We have irresolvable concerns with the benefits to electricity distribution customers delivered by PATHS and the value for money being delivered by GB Flexibility Market.

GB Flexibility Market

2.32. This project would aim to reduce the barriers to trading flexibility services, such as demand side response (DSR) and energy storage. Method 1 would look at commercial arrangements for sharing flexibility between DNOs and the NETSO. Method 2 would then develop and trial a market platform for flexibility, which would involve suppliers and energy traders. We consider this to be a creative and innovative project which could release flexibility capacity for all DNOs. Developing a market for flexibility services could provide significant financial and carbon benefits across GB.

2.33. The Expert Panel had a number of concerns about how this project would meet some of the criteria, not all of which were sufficiently addressed in the final submission by Northern Powergrid.

2.34. We and the Expert Panel had concerns over the contractor costs involved in this project, and the process used to select partners. The day rates for contractors in this project are high and it was not demonstrated to us that the rates reflect the value of the work provided. Given the amount of time committed to the project, we would expect rates to be significantly lower. With the exception of the academic partners, rates are higher than for contractors providing similar services to other projects this year. We are also concerned that partners are charging the same high rates for the implementation stage as for the more complex design phase. We would have expected lower rates for implementation. Northern Powergrid has not demonstrated that it has applied appropriate competitive pressure in negotiating these contracts. In particular, we are concerned about the lack of competitive process in Northern Powergrid's approach to selecting the contractors. As such, Northern Powergrid has not demonstrated that the funding requested has been efficiently allocated.

2.35. Funding potentially inefficient expenditure is not in the interest of electricity distribution customers or consumers. We do not consider that Northern Powergrid have shown this project to have performed sufficiently strongly against the criterion "Provides value for money to distribution customers".

2.36. The Expert Panel also questioned whether involving only British Gas as a supplier would be sufficient to ensure that the market design reflected industry needs. In its final submission, Northern Powergrid included a consultation process that would engage all suppliers and other market participants. While to some extent this may allay our concerns about the industry buying in to the market design, we still have a strong concern that British Gas's significant involvement in the detail of the market design would give it a competitive advantage should the market

mechanism be rolled out. This could provide British Gas with significant financial benefit.

2.37. The evaluation criterion "Involvement of other partners and external funding" requires that parties that benefit from the LCN Fund provide funding commensurate to those benefits. Northern Powergrid estimates that almost 40 per cent of the benefits of method 2 would accrue to suppliers. Similarly, Northern Powergrid estimates that roughly 15 per cent of the benefits of methods 1 and 2 would accrue to the NETSO. Given the benefits that could accrue to these parties, we have significant concerns over the limited contributions that they have made to the project. The LCN Fund is focussed on the DNOs' understanding of the role they can play in the move to a low carbon economy. Its purpose is not to fund activities that provide significant benefits to other parties. It is not appropriate to fund a project with much wider benefits almost entirely with DNO customers' money. We do not consider that this project has performed sufficiently strongly against the criterion "Involvement of other partners and external funding".

2.38. We have considerable concerns with the evidence provided against two of the criteria. We do not consider it in the interest of electricity distribution customers to fund the project with the magnitude of costs and funding arrangements as they stand. As such, we will not fund this project. However, this is a highly innovative project that could provide significant benefits to customers across the electricity value chain. We and the Expert Panel encourage bids in this area that take account of our concerns in future years of the LCN Fund and NIC.

2.39. All existing and potential participants in the LCN Fund and NIC should note that value for money is a key consideration in the evaluation of bids. Bidders should exert the same pressure on costs in innovation projects submitted under this fund as they would in business as usual projects and demonstrate this in their submissions.

PATHS

2.40. This is a very innovative project that would aim to facilitate the connection of wind generation to constrained networks by converting excess electricity to hydrogen using electrolysis. The methods it would trial could provide carbon benefits through connecting wind energy more quickly. The trial of the electrolyser could also facilitate the decarbonisation of heat and transport.

2.41. The Expert Panel was concerned that these methods may be an expensive way of connecting wind power and avoiding constraints. For this approach to provide financial benefits to electricity distribution customers there would need to be a significant increase in the costs of conventional reinforcement (or reduction in the cost of the method proposed). In particular, we were concerned that under this method the electricity distribution customers were asked to pay the majority of the costs of the electrolysers but that the related benefits are not directly attributable to electricity distribution customers.

2.42. The criterion (b), "Provides value for money to distribution customers" requires projects to demonstrate the size of benefits that are attributable to the distribution system. SHEPD has not adequately demonstrated to us that it is likely that these methods would have the potential to provide substantial benefits to electricity distribution customers. Due to this concern, we do not consider this project has performed sufficiently strongly against the criterion "Provides value for money to distribution customers".

2.43. We recognise that the methods could have significant benefits beyond the distribution system by aiding the hydrogen economy, and decarbonising heat and transport. This wider benefit is highly conditional on the economic viability of the production of hydrogen through electrolysis. Criterion (d), "Involvement of other partners and external funding", requires that parties that benefit from the LCN Fund provide funding commensurate to those benefits. We are concerned that distribution customers could be taking on the majority of the risk of this project and other parties would be benefitting disproportionately compared to the level of risk that they would take on.

2.44. While this is an important project, it has not been adequately demonstrated that it would provide sufficient benefits to distribution customers, while significant benefits could accrue to other sectors. These sectors should be taking on proportionate risk of the project's failure (since they are likely to receive benefits of its success). Therefore we do not consider that this project has performed sufficiently strongly against the criterion "Involvement of other partners and external funding".

2.45. Therefore, we have concerns with the evidence provided against two of the criteria. As such, we will not fund this project.

2.46. However, we recognise the important role of the DNO within the wider project. We do not consider, for example, that there are any regulatory barriers to SHEPD making an interactive connection offer to the electrolyser and the wind farm using active network management.

2.47. We and the Expert Panel were also concerned about SHEPD's labour costs. In response, SHEPD reduced its labour costs by 15 per cent in its final submission to reflect a common approach to project management, governance and knowledge management across all of its innovation projects. All DNOs should ensure that their second tier funding request is as efficient as in business as usual projects. SHEPD should have included this cost saving in their original submission (and indeed all future submissions). We are very concerned that it originally proposed higher prices.

Customer issues

2.48. Several of this year's projects could have a direct impact on customers. We consider that all of these projects have put in place appropriate arrangements to mitigate the risk of adverse customer impacts.

2.49. I^2EV may require planned interruptions to customers' supplies. It is currently unclear whether the monitoring device fitted in substations as part of this project can be installed 'live', avoiding a supply interruption. This would depend on the configuration of the substations where devices are to be fitted. There have been examples of these devices being installed live. SEPD will only know if interruptions are required when it has identified clusters and investigated the substations. Smarter Network Storage and Flexgrid will both install new equipment. There is a small risk of customers experiencing unplanned interruptions. Both DNOs have identified mitigations to minimise the risk and impact of interruptions. These include emergency return to service plans and factory acceptance testing.

2.50. SEPD, EPN and WPD will also have to develop a strategy to communicate this message to customers.

2.51. We are keen that all three projects properly communicate to customers the reasons for the interruptions and why the potential benefits from the projects justify the inconvenience. Under the governance document DNOs have to provide us with their strategies for communicating with and minimising the inconvenience to customers whose supply will be interrupted.

2.52. The CLASS project involves substantial customer interaction. The project would involve varying the voltage across 60 substations affecting around 350,000 customers. As required by the governance document, ENW would engage affected customers before the trial begins. This engagement would explain the project, outline the benefits and look to alleviate any customer concerns. This engagement would be undertaken through a variety of media. If there are concerns raised during the trial, ENW intends to put the trial on hold in the area of the complaint and investigate the complaint. The trial would only be resumed once customer concerns are alleviated. If the concerns cannot be alleviated then the trial would not be resumed in that area. We feel that this approach is reasonable considering the benefits that could be delivered.

3. Next Steps

Funding selected projects

3.1. Before a project is funded, we will issue a direction ('the project direction') setting out the project specific terms that the DNO has to abide by as a condition of the funding[12]. We are currently preparing project directions for the successful projects and we will issue draft versions of these to DNOs shortly. The project directions for I^{2}EV and Flexgrid will include the additional conditions outlined in chapter 2.

3.2. Following the acceptance of the project direction by the relevant DNO, we will issue a separate direction (the 'funding direction'). This will set the amount of money which each DNO will be allowed to recover from their customers over the course of the next regulatory year[13]. The funding direction will also require funds to be transferred to the relevant DNOs in order to fund the selected projects. We will issue the funding direction in time for the DNOs to prepare their indicative use of system tariffs at the end of December.

3.3. Although funding will not be raised from customers until the next regulatory year, starting 1 April 2013, we expect the DNOs to commence their projects as quickly as possible, according to the terms set out in their project direction and the governance document.

3.4. We will monitor projects to ensure they are being implemented in line with the full submissions. Each DNO implementing a project will be required to provide a detailed report, at least every six months, to allow us to evaluate the project's progress. We will publish these on the Ofgem website to make project learning available to all interested parties. Each of the implementing DNOs should also be sharing what it is learning from its project according to the plan set out in its project submission. In addition, DNOs are required to hold an annual conference, open to all interested parties, where DNOs will be able to present the learning from their projects[14]. Finally, we note the ENA is working to develop a portal which will hold smart grids data, including LCN Fund learning.

[12] The requirement for a project direction is set out in charge restriction condition (CRC) 13 of the electricity distribution licence. Further details are set out in the LCN Fund governance document.
[13] The requirement for a funding direction is set out in charge restriction condition (CRC) 13 of the electricity distribution licence, and further details are provided in the governance document.
[14] The second annual conference was held in October 2012. The slides from the event are available on the ENA website: http://www.energynetworks.org/electricity/smart-grid-portal/lcnf/2012-low-carbon-networks-fund-annual-conference.html

3.5. DNOs are incentivised to deliver the projects to a high standard. They will be eligible to apply for a delivery reward (called the Second Tier Successful Delivery Reward) if they meet the delivery criteria set out in the project direction.

Future competitions

3.6. As explained in Chapter 2, we had some concerns about certain areas of this year's submissions. Even more can be done by DNOs to ensure value for money in project delivery. We expect DNOs to put the same pressure on value for money in LCN Fund projects as they would under business as usual operations. In particular, we were concerned about the approach to selecting partners and procuring contractors. DNOs should also note criterion (d) – "Involvement of other parties and external funding". If parties other than distribution customers are benefitting from projects, then they need to provide funding commensurate with that benefit. Distribution customers should not be taking on the risk associated with other parties' benefit.

3.7. The Expert Panel has also provided its views in section 4.4 of this year's recommendation report. We ask potential bidders in next year's LCN Fund and the NIC to take these points into account when developing their submissions for next year.

3.8. We intend to amend the governance document to further encourage collaboration. As explained in our open letter[15], collaboration with third parties is a key element in maximising the value for money of the LCN Fund. Some stakeholders have raised a concern that there are barriers to participation in the LCN Fund. This concern has been reinforced by the limited range of partners in this year's projects, and the processes DNOs appear to have followed to select partners. Therefore we propose to include an evaluation of network companies' approaches to collaboration with third parties at the ISP stage of the LCN Fund.

3.9. We may also change the governance document to incorporate lessons learnt from this year's process and to make a number of housekeeping changes. The LCN Fund Governance Document (v6) will govern the fourth year of the LCN Fund. This will be in place prior to the ISP deadline in 2013. We will confirm the ISP and Full Submission deadlines in the New Year. We expect that they will be similar to the deadlines in 2012.

[15] Low Carbon Networks Fund: New Collaboration Criterion

Appendices

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Appendix 1 – Project Evaluations

This appendix contains our detailed evaluation of each project against the LCN Fund evaluation criteria. The governance document explains the evaluation criteria and our evaluation process in full, but we have summarised the process in the introduction and the criteria in the table below. Note that due to a typographical error, there is no criterion (e) in version 5 of the governance document. This will be amended in version 6 of the governance document.

Degree to which the solution being trialled:	**Degree to which the project:**
• accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers, • impacts on the operation of the distribution network, • provides value for money to distribution customers, and • generates new knowledge that can be shared amongst all network operators.	• demonstrates a robust methodology and readiness of the project, • is being delivered cost effectively, • involves other partners and external funding, and • is relevant and timely.

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

ARC – Accelerating Renewable Connections (Scottish Power Distribution)

Project overview

This project proposes to examine the entire distributed generation (DG) connection process. The method would address both the stakeholder issues – providing better information, encouraging dialogue and capacity sharing, working with community generation groups – and also the technical issues including the use of Active Network Management (ANM).

The project would examine each part of the connection process, with the goal of better facilitating DG connections. The project aims to allow customers to make more informed connection choices by increasing engagement prior to a formal connection application being made. This would help customers to better understand their options for connection, with the aim of customers applying for connections that may be cheaper or quicker to commission. The project would also investigate matching local generation and demand within communities through schemes such as using wind energy to heat homes locally. One of the project partners, Community Energy Scotland, would facilitate this work. The project would trial commercial and technical arrangements to facilitate new connections to already constrained networks. The project would seek to build on existing learning in this area by using ANM holistically rather than on a case by case basis for individual connections.

The project would take place in the Borders and Lothian region of Scotland. Customers applying for new connections would be given the choice of participating in the novel techniques or using the current SPD process for establishing a connection.

(a) Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers

This project aims to improve the connection process for DG. This would facilitate the government's Carbon Plan[16], which requires a significant increase in electricity from renewable sources. It would do this by streamlining the connection processes, contributing to a reduction in the costs of connection, which can be a significant barrier to the deployment of distributed generation. It also aims to accelerate the connection process, bringing connections online more quickly.

SPD has estimated the capacity released by the proposed methods based on the size of generation connection they could facilitate in a number of case studies. The level of capacity released across the case studies varies significantly. For example, method 1 could release 27.5 MW of network capacity for the connection of wind farms up to three years more quickly than through conventional reinforcement. This would be

[16] The Carbon Plan

achieved by managing constraints at the boundary with the transmission network by installing an ANM scheme at the Grid Supply Point (GSP). Method 2 could release 24.7 MW of capacity for connection of wind farms up to a year faster than through conventional reinforcement by using ANM on constrained connections. Method 3 could allow 500 kW of small scale wind farms to connect up to six months more quickly by using advanced voltage control at a primary substation with a localised controller at the generator. We note that this does not provide an indication of the potential total capacity that could be released, but consider that the project has the potential to release significant network capacity more quickly than through reinforcement.

This process could provide significant financial benefits. Again, this has been estimated in terms of the different case studies and as such does not provide an indication of the potential total financial benefits of the particular methods so is subject to some uncertainty. The financial benefits could be significant: up to £16 million for method 1, £3.9 million for method 2 and £0.6 million for method 3. We question some of the assumptions behind some of these claimed benefits. We note that method 1 could result in reduced transmission reinforcement costs, but consider this is subject to significant uncertainty as it is highly dependent on the scope of reinforcement required at the GSP and on the transmission system.

However, on balance we agree with the Expert Panel's view that the project could result in significantly lower connection costs and quicker connections for distribution customers.

This project has the potential for replication across all DNOs. The case studies cover a broad range of connection challenges, which are likely to be relevant to all DNOs. However, there may also be challenges in rolling out elements of the project that would require changes to DNO systems and processes. We question some of the assumptions on the financial benefits of roll out. These are based on connection specific circumstances that may not apply to all similar connection challenges. While the total financial benefit of roll out may be lower than SPD has estimated, it still has the potential to deliver material financial benefits.

We consider this project has the potential to provide a contribution to the development of a low carbon economy and provide material financial benefits to customers.

(b) Provides value for money to distribution customers

This project is concerned with reducing the costs of connection, so benefits are largely attributable to distribution customers.

One of the methods could result in a reduction in the costs of reinforcing exporting GSPs. In this situation, reinforcement of the wider transmission network beyond the GSP may be avoided. These savings would accrue to transmission customers. However, the extent of the avoided reinforcement is unclear and is likely to vary significantly from case to case. In some cases the reinforcement costs at the GSP necessary for the connection of DG are charged to DNO customers. Savings on this reinforcement would directly accrue to distribution customers. Depending on the

nature of the connection application, distribution customers could be liable for all costs of transmission reinforcement.

This project would be focussed on facilitating connection of DG to the distribution network. Therefore learning is directly applicable to the distribution network and benefits would largely accrue to distribution customers. While some benefits could accrue to transmission customers through reduced transmission reinforcement costs, there is a lot of uncertainty over the size of these benefits and who receives them. This is likely to vary from case to case dependent on the nature of the connection.

We are pleased that SPD would be ensuring value for money in procuring equipment by competitively tendering. We consider cost estimates are reasonable as they have been based on indicative costs and prior experience. We also consider that contractor costs are appropriate.

We did have some concerns over value for money in other areas. In particular, we and the Panel considered that Work Package 1 is not particularly innovative. We share the Expert Panel's concern that there are certain elements of the project that SPD should be undertaking anyway. However, at ISP we considered that the project demonstrated that it was trialling untested methods and that it could only be undertaken with the support of the LCN Fund. Overall we consider that the project is innovative and provides value for money.

We also had significant concerns that a large proportion of the budget was to be spent on battery storage. The cost seemed particularly high and we were unconvinced that the project would provide significant learning, given the range of battery storage projects already underway in GB. We are pleased to note that SPD decided to remove the battery storage in their final submission.

Finally, we were concerned by the relatively high labour costs. We note that SPD reduced labour costs by 10 per cent in their final submission, which we consider to be appropriate. However, we are very concerned that it originally proposed higher prices.

We consider the cost levels to be appropriate and therefore we consider that ARC provides value for money to distribution customers.

(c) Generates knowledge that can be shared amongst all DNOs

This project would generate new knowledge. In particular, it would provide new knowledge on how to provide integrated connection offers working across voltage levels and with communities. We consider the work in providing additional information to customers, the novel ANM approach that treats connections holistically rather than in isolation and work with transmission owners on exporting GSPs would provide valuable learning. We note that the battery storage would have provided only limited new learning and are pleased to note that it has been removed from the final submission.

Connecting renewable generation is an issue for all DNOs, though we note that the issue may be greater for SPD than some other DNOs. However, case studies apply to a range of connection issues. Learning on all aspects of the connection process and

how to integrate the holistic approach into the DNO business model would be applicable to all DNOs.

We are pleased to see a dedicated work package focussed on knowledge dissemination. Given the importance this project places on building on existing learning, the work stream on bringing existing knowledge in to the project would also be crucial. We consider the use of the University of Strathclyde Power Networks Demonstration Centre valuable. The dissemination tools are well thought through, including process maps for the improved connection process and a deliverable focussed on updating policies and standards. We also consider the internal dissemination process to be key and are pleased to see the use of the Power Networks Demonstration Centre to train staff.

We note SPD has confirmed that the project would conform to the default Intellectual Property Rights (IPR) conditions.

(d) Involvement of other partners and external funding

This project includes a limited group of partners. However, the partners are appropriate to the project and we agree with the Panel's view that the project has a strong group of technical partners with Smarter Grid Solutions and the University of Strathclyde. Community Energy Scotland would help engage with community energy schemes.

The level of external funding is limited, but we consider the sources of funding to be secure. While Smarter Grid Solutions have provided some external funding, the University of Strathclyde and Community Energy Scotland have provided minimal amounts. We also note that all of the external funding is in kind rather than financial. Some benefits could accrue to transmission customers in certain circumstances, although there is some uncertainty attached to these. The majority of the benefits of this project accrue to distribution customers and the learning is directly applicable to the distribution system, so on balance we consider the level of funding appropriate.

We are pleased to see a competitive process to identify partners for the project. SPD approached 200 organisations and received 40 responses. Whilst this process resulted in the selection of Smarter Grid Solutions, a partner that SPD has a working history and relationship with, we consider this approach has merit. We note the appointment of University of Strathclyde and Community Energy Scotland was not subject to a competitive approach. However, we consider that Community Energy Scotland provides a specialised role that would be difficult to select competitively and we consider they are providing services at appropriate day rates. While we are concerned about the process to select the University of Strathclyde, they are providing services at appropriate day rates.

(f) Relevance and timing

This project is relevant. Connecting DG is an immediate and significant challenge for DNOs, although we note the issue may be greater for SPD than some other DNOs. The connection application process is seen as costly and lengthy by some stakeholders, and resolving this barrier could be a significant step in facilitating DG.

This project is very timely. In many cases, distribution networks are reaching saturation point and large numbers of connection offers are not being accepted. The project would be able to feed into the DG Forum and feed into DNOs' future business planning. We note that, due to its focussed nature, this project would have less impact feeding into business planning should the uptake of DG be lower than expected. However, we consider it is highly likely that the connection of DG will be a significant issue for DNOs.

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

ARC has appropriate project management structures. These include a project steering board, with relevant input from management levels of SPD and all project partners. The project also has a dedicated executive sponsor. While the project plan lacks some detail, SPD has provided significant detail on the six work packages and the individual sub work packages. We understand that the resources dedicated to the project have been approved and consider them sufficient to deliver the project, although we note that specific staff have not yet been appointed. We have concerns over the detail of the financial management process. SPD has not highlighted the specific arrangements for managing cost overruns, but the executive sponsor would be responsible for financial management. SPD has also built in an appropriate level of contingency. As mentioned under criteria (a) and (b), we have some questions over the estimates of project benefits, but consider costs to have been reasonably estimated.

We consider that the project is ready to implement. SPD has existing senior management buy-in to the project and a working relationship with their project partners, which would help facilitate timely commencement. SPD has also identified the key initial tasks, including finalising collaboration agreements, recruiting staff and commencing initial discussions with developers.

We have some concerns over the detail behind some methods as it is not clear what range of technologies the "smart interventions" would involve. However, we consider the project technically feasible as it would largely be using existing technologies in novel ways. Given it uses existing technologies, importing knowledge from other DNOs and elsewhere is a key component of the project. Therefore we consider that the work stream dedicated to bringing in external knowledge is appropriate and important, and we note the discussions that SPD has had with SHEPD on its Orkney ANM project.

Although the risk register is lacking in some detail, SPD has identified the major project risks. The mitigations and contingencies are appropriate. The key risk is that not enough developers come forward for the trial, and it is difficult to develop mitigations for this risk. However, we consider that a significant quantity of renewable generation is already under development in the area, and more is expected in the timeframe of the project. SPD has put in place appropriate processes to identify circumstances to halt the project.

We do not foresee any adverse impacts on domestic customers as a result of this project. It trials new arrangements for new generation connections and customers may choose to use new arrangements or existing arrangements.

The Successful Delivery Reward Criteria (SDRC) are SMART, but did not originally cover all of the sub work packages. We are pleased to note that they have been improved in the resubmission to cover more outputs of the project, including more connections and the deployment of the ANM scheme.

CLASS – Customer Load Active System Services (Electricity North West Ltd)

Project overview

This project aims to explore the relationship between voltage and demand. The project would seek to use existing network assets in an innovative way to vary the voltage on the network to reduce the load. By reducing the voltage across the network, load would be reduced. Reducing peak demand in this manner should make better use of existing network infrastructure. If this is the case, network reinforcement could be deferred or avoided.

The project would consist of three trials. Trial one would investigate the relationship between voltage and demand. This trial would create a mathematical matrix for describing the relationship by customer group over a year. Trial two would investigate whether the methods can provide a demand response for DNO or NETSO use.

Trial three would investigate the viability of staggering taps on distribution network transformers to regulate voltage. Staggering the tap positions causes a circulating current to flow between the pair of transformers. This absorbs reactive power and reduces the voltage on the distribution system. Trial two would also involve disconnecting one of the pair of primary transformers. This also has the effect of reducing voltage on the distribution system but this effect is achieved more quickly than by staggering the taps. The project would develop installation and application methodologies and a voltage regulation scheme to allow other DNOs to use these methods effectively to manage voltage.

The voltage control equipment would be used to adjust the voltage on the 11 kV network through the 33/11 kV transformer tap changers. The project would be trialled across 60 substations.

ENWL would monitor customer perception of voltage changes and the long term effect on the life of assets these methods may have.

(a) Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers

This project would facilitate the aim set out in DECC's Carbon Plan to decarbonise the generation of electricity. The methods would use voltage control to help alleviate peak demands, control system frequency and provide reactive power control. This could remove barriers to the connection of DG to the distribution network by using voltage control to defer or offset costly network reinforcements. Secondly, it could provide a cost effective and non intrusive demand response option to help manage intermittent renewable generation, both for the distribution network and potentially GB system wide. To the extent that lower voltage levels do reduce demand, this could also lead to lower network losses, providing further carbon benefits.

The CLASS methods of voltage control have the potential to become an alternative to network reinforcement. ENWL estimates that the methods could provide up to 11.8

MW of capacity at a trial level, 70 MW of capacity at DNO level and up to 937 MW of capacity at GB level. Installing a voltage controller module at a primary substation would take roughly one week, compared to over a year to install additional switch gear and transformers. We note that this method would not always be a permanent alternative to network reinforcement. In a lot of cases, it would defer reinforcement and provide time to assess the most efficient longer term response.

We originally had concerns that the project might not provide sufficient financial benefits to customers. The initial cost benefit analysis suggested that it could be a more costly approach than conventional network reinforcement. Given that available headroom varies by substation, the effect of the method could range from permanent deferral to a short term deferral of the need for reinforcement. However, we note that ENWL had made extremely conservative assumptions on benefits in its original submission.

In its final submission, ENWL amended its site selection methodology such that it focussed more on those substations with an imminent need for reinforcement. This allows ENWL to use voltage control to provide time to consider alternatives and deliver the most efficient network solution. We agree with the Expert Panel that this "optionality" could provide significant benefits. ENWL's analysis estimates that this could provide financial benefits to distribution customers of over £5 million in the trial area. We also note that this takes no account of the potential revenues from providing network services to the NETSO.

This method is highly replicable across GB, although we note the voltage demand relationship depends on the demand characteristics in a specific area. We also note that Trial 2b and Trial 3 require two transformers and thus are only applicable to standard substations with transformer pairs. The NETSO/DNO operational link is also highly replicable across GB.

Overall this project has the potential to provide material financial benefits and provide a strong contribution to the development of a low carbon economy.

(b) Provides value for money to distribution customers

This project provides clear value for distribution customers as this approach could either defer the need for network reinforcement or remove it altogether. This would lead to a reduction in costs for customers. The learning is also clearly applicable to the distribution network in terms of the voltage/demand relationship, the potential for reducing peak demand and the customer response to such techniques.

However, we also note that wider benefits may accrue to the wholesale markets through the provision of low cost, low carbon ancillary services. ENWL has not quantified these benefits, and we note the project's business case is based purely on the benefits to distribution customers. There would also be some learning relating to how voltage control can be used by the NETSO. As such, learning on customer impact would also be relevant to the NETSO.

We note that project partners have been selected in a "quasi competitive" rather than openly competitive manner. As such, we did have some concerns about whether the project would be delivering best value for money for customers. However, we

note all costs have been benchmarked and ENWL has undertaken a survey in conjunction with Siemens to ensure realistic values for installation costs. ENWL's labour cost and time devoted to the project is appropriate given the active role ENWL would be taking in the project.

(c) Generates knowledge that can be shared amongst all DNOs

This project would generate significant new learning on the use of voltage control, including on the reaction of customers, how the Grid Code may need to change and asset health implications. It would provide useful new learning on network operation in terms of how voltage control impacts on power quality, losses and available network capacity. This is applicable to all DNOs.

ENWL has put in place appropriate plans for knowledge dissemination with a separate, well thought out work stream and a specific budget for capturing results and disseminating learning. It has identified the key audiences, including customers, DNOs, academia and wider industry. It would use a range of dissemination tools, both externally and within ENWL, and has clearly defined tools for each audience.

We note that ENWL has confirmed that the project would conform to the default IPR conditions.

(d) Involvement of other partners and external funding

This project involves a relevant and very strong group of project partners. They provide appropriate expertise, including in academic and technical areas. In particular, we are pleased to note there is a dedicated partner for customer research. We are also pleased to see the involvement of National Grid, given the potential importance of the DNO/NETSO relationship.

We also note that external funding is secure and that all partners have made contributions to the project. We are also pleased to see National Grid's contribution of £160,000, which is partly in kind and partly financial, given the potential benefits that could accrue to it as the NETSO.

We have some concerns over the approach used to select partners as there has been no clear tender process. However, we note a "quasi competitive" approach, which was based on criteria of prior experience in the area and value for money. We have a concern that this could have precluded potential partners that could have added value to the process. It is also unclear how ENWL decided on the CLASS project over other potential ideas for projects.

(f) Relevance and timing

This project could potentially facilitate the connection of DG and low carbon technologies, as well as provide an alternative option to the NETSO for managing intermittent generation. It is highly relevant and could feed into business planning during the RIIO period.

This project is timely, and could provide valuable learning in this area. We note that the Smart Grid Forum is exploring the market arrangements for the provision of ancillary services by DNOs.

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

CLASS has a detailed project plan, clearly breaking down the project into six phases. Each of the phases and their outcomes are described. The consortium is well structured and we are pleased to note that all partners have agreed to work schedules, project plans and cost contributions. The roles and responsibilities of each project partner have been clearly defined. The project management structure, which builds on experiences of ENWL's Capacity to Customers project, is appropriate. This approach, combined with senior management support and detailed initial work and preparatory reports produced by the University of Manchester, means the project is ready to be implemented. We consider ENW has put in place sufficient resources to deliver the project.

CLASS would have a dedicated management accountant to manage costs and report in line with ENWL's standard policies and frameworks. ENWL has also proposed an appropriate level of contingency. As mentioned under criteria (a) and (b), we consider the costs and benefits have been appropriately estimated.

We consider that this project has a strong methodology. It is technically feasible as it uses existing assets and proven voltage management techniques. The project's methodology also builds on previous IFI work and international examples. Work by the University of Manchester and PB Power has validated the project's statistical robustness and ensures that it is technically representative of the GB network.

The CLASS risk management process uses the standard ENWL process. A detailed risk register has highlighted a range of risks and appropriate mitigations and contingencies. In particular we note two key risks. The customer impact could be significant, but we consider ENWL has put in place strong mitigations and contingency plans. ENWL would engage customers before the trial begins to alleviate concerns. If there are concerns raised during the trial it intends to put on hold the trial in the area of the complaint and investigate the complaint. The trial would only be resumed once customer concerns are alleviated. If the concerns cannot be alleviated then the trial would not be resumed in that area. The other key risk is the impact of the methods on asset health, for which ENWL has proposed a strong asset monitoring strategy. ENWL has put in place appropriate processes to identify circumstances to halt the project.

The SDRC are SMART, well defined and linked to the outputs in the project plan.

FLEXGRID – Advanced Fault Level Management (Western Power Distribution)

Project overview

This project aims to release network capacity by better managing fault level in urban HV networks. Fault level is a measure of electrical stress when faults occur within networks. More DG would increase the fault level on distribution networks. Current solutions to fault level problems involve installing new switch gear with a high capital cost.

The project proposes three methods (Alpha, Beta and Gamma) to address the problem. Method Alpha involves using a probabilistic approach to calculate fault level and aims to improve standard industry approaches. Method Beta would involve the deployment of devices to monitor the actual fault level on the network. The data from these devices would substantiate the findings of method Alpha. Method Gamma would involve the trial of five, as yet unspecified, fault level mitigation technologies. WPD has identified a range of technologies that may be used depending on the outcomes of methods Alpha and Beta. The project would explore how each of these methods, or a combination of them could reduce connection costs for DG.

The project would take place in Birmingham.

(a) Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers

DG is expected to play a crucial role in the decarbonisation of electricity. This project would facilitate DECC's Carbon Plan by enabling the connection of DG, particularly in urban environments. In particular, this project aims to facilitate the connection of Combined Heat and Power (CHP) and associated district heating networks by providing new approaches to measuring, monitoring and mitigating fault levels. This provides a potentially lower cost option for upgrading the network to connect DG than the current approach of new cables and switchgear, which can be particularly expensive.

Methods Alpha and Beta could avoid the need for reinforcement altogether by developing a probabilistic approach to fault level management and installing fault level data measurement devices. This could release up to 5.6 MW of capacity at each relevant HV substation. Method Gamma could provide significant savings where reinforcement would normally be required by using alternative fault level mitigation techniques that could release up to 27.7 MW of capacity per HV substation. These alternative mitigation techniques could release this capacity significantly more quickly than through conventional reinforcement.

We note that the costs of installing fault level mitigation technologies can prove to be significant and can often make the installation of DG uneconomic. This project could help remove this barrier by significantly reducing costs of connection. As mentioned above, methods Alpha and Beta could prevent the need for reinforcement. WPD estimates that the apportioned cost to a 750kW generator for the replacement of switchgear can be up to £4m, although we consider that this estimate is likely to be

on the high side. Method Gamma could provide alternative fault level mitigations to the installation of new switchgear and cables at a far reduced cost. However, we note that the base case quoted by WPD may be overstated. We also note that this benefit is subject to some uncertainty as these technologies have not yet been confirmed, though the costs are based on requests for information. We consider this project could provide material financial benefits to distribution customers.

Fault level issues from increased DG could be widespread. As these techniques could be applied to substations across GB, we consider that this project has good potential for replication. While fault levels are a particular issue to inner city networks, these methods could also be applicable to some rural networks.

(b) Provides value for money to distribution customers

The benefits of this project are clearly attributable to distribution customers due to the potentially large cost reductions from avoided or cheaper reinforcement. We also consider the learning is directly applicable to the distribution system as the project could provide new alternatives to installation of switchgear and cables.

We are pleased to see that an open and competitive procurement process has been held to select the academic partners in this project, although we note that only one university responded to the tender. We also note that a competitive process would be used to select which fault level mitigation solutions are trialled under method Gamma. While we note that there is some uncertainty over what these technologies would be, the costs are based on requests for information and we consider the cost estimates are reasonable.

We agree with the Expert Panel's concern over certain contractor costs, particularly the scale of project management support from PB Power. We are also concerned that PB Power was selected on the basis of collaborative discussions rather than through competitive tendering process. However, we note that WPD has reduced PB Power's project management support by 20 per cent in their final submission. We and the Panel were also concerned about the high labour costs and significant time committed to the project by WPD staff. Again, we note that this has been reduced and we now consider that this project provides value for money. However, we are concerned that WPD was able to reduce costs by such a degree and consider that it should have sought to deliver best value for money in its original submission.

(c) Generates knowledge that can be shared amongst all DNOs

We recognise that fault level management is an area that has not been covered by the second tier of the LCN Fund, and there is the potential for significant new learning in this area. Specifically, this project could generate new learning on the understanding of the assumptions underpinning fault level, real time monitoring of fault level and the effectiveness of new fault level mitigation technologies. This learning is clearly related to the planning, development and operation of an efficient distribution system as it would provide an option to facilitate the connection of DG in constrained urban networks.

The dissemination plans identify the key audiences and areas for knowledge transfer. They also specify some of the routes for dissemination, including workshops.

We note the project conforms to the default IPR conditions.

(d) Involvement of other partners and external funding

We consider that this project involves a small but appropriate group of collaborators. We note PB Power would bring considerable power systems experience to the project. The University of Warwick would provide academic engineering support. We were pleased to see the inclusion of further academic review by the Universities of Southampton and Manchester.

The project involves significant funding from collaborators of £1.7 million, almost 10 per cent of the project's cost. However, £1.3 million of this is earmarked to come from suppliers of fault level measurement, monitoring and mitigation technologies that would be identified during the course of the project, so is subject to some uncertainty. The University of Warwick and PB Power are also providing in kind contributions.

We are pleased to see that WPD has made use of the Energy Networks Association (ENA) LCN Fund portal. We also note that WPD is open to ideas for projects, and reviewed and responded to all LCN Fund collaboration enquiries. However, it is not clear what process WPD has gone through to select which of these ideas it takes forward for full consideration, or how WPD ultimately selected Flexgrid as a the idea to take forward as an LCN Fund project.

(f) Relevance and timing

This project is highly relevant. Fault level is a major barrier to the connection of distributed generation in some situations. A greater understanding of the need for fault level mitigations, and providing alternative mitigations, could lead to significant cost reductions and is clearly relevant to DNOs. WPD has seen an increase in fault level related expenditure and this could rise significantly in the RIIO-ED1 period and beyond. The Flexgrid methods could be used as an alternative to network reinforcement, impacting significantly on this expenditure, and become a crucial part of business planning.

The connection of DG in the near future, in particular CHP, is highly likely and as such this project is very timely.

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

Flexgrid has a sufficiently detailed project plan that identifies the phases of the project, but does not provide breakdowns of subtasks and lacks detail on the responsibilities for the phases. WPD has also identified the interdependencies between methods Alpha, Beta and Gamma and has the resources to deliver the project. This, along with senior management commitment and internal stakeholder engagement, means the project is ready to implement.

As set out under criteria (a) and (b), we consider that costs and benefits have been reasonably estimated. WPD has appropriate project management measures in place to limit cost overruns.

We consider that the project has a robust methodology as it is technically feasible and takes a sensible step-by-step approach to measuring, monitoring and mitigating fault levels. However, we echo the Expert Panel's concern over method Gamma. This method is not yet well defined as it has not identified the specific fault level mitigations it would use, yet involves significant expenditure. We consider further certainty over these mitigations is required to ensure effective expenditure. Therefore we propose to include a break point in the project before WPD can commit expenditure on fault level mitigations. We will require WPD to consult with DNOs on the proposed range of possible fault level mitigations, as well as set out its approach to ensuring value for money in procurement of these mitigations for our approval.

We are pleased to see that WPD would engage with the Health and Safety Executive (HSE), including in the design phase. Demonstrating the safety case for any methods developed would be key for successful roll out of the methods across GB.

WPD has included an appropriate risk mitigation process, including a risk register and its approach to managing and mitigating these risks. It has also included a contingency plan. We consider that the project would still deliver benefits in the absence of take up of new distributed generation, as there is already distributed generation in the trial area. WPD has put in place appropriate processes to identify circumstances to halt the project.

This project could have a minor customer impact, but WPD has proposed effective mitigations. There is a slight risk that installation of monitoring and mitigation equipment on the network could result in unplanned interruptions but WPD has already identified several prevention strategies and mitigations. It would carry out acceptance testing prior to commissioning and develop an emergency return to service plan.

The SDRC are SMART, but not in all cases linked to the project plan.

GBFM – The GB Flexibility Market (Northern Powergrid)

Project overview

This project would aim to explore ways of reducing the cost and increasing the availability of flexibility services to DNOs, the NETSO and suppliers. Flexibility services include DSR.

The project would consist of two methods. The first would involve creating and trialling an innovative trilateral agreement between the DNO, the NETSO and a large Industrial & Commercial (I&C) customer. The agreement would provide a flexibility service that would meet the DNO's and the NETSO's requirements whilst providing a financial benefit to the provider of the service. Currently DNOs and the NETSO have different providers of flexibility services. The project would explore if the DNO and the NETSO can share the flexibility service as their requirements may not overlap. Sharing this resource could reduce costs passed on to customers.

The second method would create a prototype market platform for the trading of flexibility services. This method would involve multiple parties establishing and trialling a screen-based market platform that would match a purchaser's requirements with a provider's or aggregator's services. A functioning market for flexibility could reduce transaction costs for procuring flexibility services.

(a) Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers

This project would aim to make it easier for providers of flexibility, for example responsive demand, to make their services available to DNOs and the NETSO at lower cost. This has the potential to facilitate the decarbonisation of electricity generation, as outlined in the government's Carbon Plan, by releasing untapped capacity for DNOs, avoiding the need for network reinforcement. This could enable the connection of DG. It could also allow DNOs to more cheaply manage the impact of intermittency on their networks, as well as provide a cost effective, network wide balancing option for the NETSO. This would facilitate the connection of low carbon, intermittent generation. Finally, DNOs could utilise additional capacity for the connection of low carbon loads such as EVs and heat pumps, meeting the Carbon Plan's goal of decarbonising heat and transport.

Two methods are proposed and both could release significant network capacity across GB. Method 1 involves DNOs and the NETSO jointly procuring flexibility services to meet both of their requirements. Northern Powergrid estimates that this could release 925 MW of distribution network capacity GB wide. Method 2 would establish a market platform to allow trading of flexibility services between all parties. Northern Powergrid estimates that this could release 944 MW of distribution network capacity GB wide. Combined, methods 1 and 2 could release 1.2 GW GB wide. We note these estimates are based on modelling by Work Stream 3 of the Smart Grid Forum.

Northern Powergrid estimates that this additional capacity could provide significant financial benefits to customers of between £12 (method 1) and £17 (method 2) per

kW per year. This is when using methods 1 and 2 instead of network reinforcement. There are also potentially wider benefits for the NETSO, through lower balancing costs, and suppliers, through avoided imbalance charges. In total, Northern Powergrid estimates the benefits by 2040 to be up to £255 million for method 1 and £867 million for method 2. We note these estimates are based on a range of assumptions and so are subject to a large degree of uncertainty. However, we consider that joint procurement of flexibility and reduced transaction costs could provide significant financial benefits.

This project would develop a GB wide trading platform for flexibility, and so has significant roll out potential. Based on modelling by Work Stream 3 of the Smart Grid Forum, GB Flexibility Market could be applicable to around two-thirds of the GB network.

Overall, we consider that this project could provide significant financial benefits to customers, and make a good contribution to the development of a low carbon economy.

(b) Provides value for money to distribution customers

Benefits from this project are directly attributable to distribution customers through avoided reinforcement costs. However, we note that a significant proportion of the financial benefits would accrue to other parties. The NETSO could receive benefits of £34 million through method 1 and £140 million through method 2. Through method 2, suppliers could also receive £331 million of benefits. These are significant proportions of the total benefits.

Learning on how DSR and storage provide flexibility, and in particular how the DNO can use this flexibility effectively, is clearly applicable to the distribution system. However, similar learning would also be applicable to suppliers, energy traders, the NETSO and other participants in the flexibility market.

On value for money, we were pleased to see that Northern Powergrid is using competitive processes to procure some technology inputs, including the market platform, and we note that the cost of the market platform is based on a request for information. However, it is not clear how many of the equipment items would be competitively tendered for. We are also pleased to see the use of existing assets from Northern Powergrid's existing Tier 2 project, Customer Led Network Revolution (CLNR). We also note that Northern Powergrid's labour costs are low.

Contractor costs are the most significant cost area of the project. We agree with the Expert Panel's concern over the high costs of consultants. We do not consider that Northern Powergrid has demonstrated that it has taken appropriate steps to ensure best value for money in this area. It does not appear that contractors have been selected through competitive processes. Northern Powergrid has not demonstrated that it has allocated a significant proportion of project cost competitively or benchmarked costs.

This is reflected in the day rates for contractors, which we consider to be very high when compared to the day rates for other projects submitted this year. This is a particular issue given the significant time that the contractors are providing to the

project. We would expect the certainty in revenues that this provides to lead to a significant reduction in day rates. We are also concerned that contractors are charging the same rates for the platform design and implementation stages. Given the lower complexity in the implementation stage, we would expect a lower daily rate, or Northern Powergrid to have selected an alternative contractor for this phase.

The Expert Panel raised this concern with the project team. In its final submission, Northern Powergrid revised costs down. However, we note that a significant proportion of these reductions were achieved by reducing contingency, and the reductions in day rates were modest. We have very significant reservations over the value for money in project delivery.

(c) Generates knowledge that can be shared amongst all DNOs

This project could deliver significant new learning that would prove valuable to all DNOs. Whilst we note that learning on how storage and DSR can provide flexibility is not particularly new, there would be valuable learning on how DNOs can use this flexibility efficiently. There would also be important learning on the sharing of flexibility services with the NETSO and through developing, trialling and understanding the market.

We and the Expert Panel consider that the project has well thought through dissemination plans, and are pleased to see that Northern Powergrid is building on its experiences of the CLNR project. It has identified key learning outcomes and the routes for dissemination, which would include a project website and regular reports. We agree with the Expert Panel's view that the simulation trading day for cross-industry learning was a particularly novel approach to dissemination and could be very effective.

We note the project would conform to the default IPR arrangements.

(d) Involvement of other partners and external funding

We agree with the Expert Panel's view that this project has a strong group of partners that are appropriate to the needs of the project. It covers a range of market participants and economic, technical and market design expertise. However, as previously mentioned, we question the processes that Northern Powergrid went through to select partners and ideas for their project. It states that a number of meetings were held with industry consultants, and that all requests to discuss ideas for LCN Fund projects were accepted. This was then followed by an internal selection process. However, we note that the ultimate project partners are partners Northern Powergrid has worked with before on previous projects. We share the Expert Panel's view that the range of new partners in the project is limited.

While the partners cover a number of potential market participants, only one supplier is involved in the project. We agree with the Expert Panel's concern that this may mean that the market design may not reflect the needs of the industry. We consider that buy-in from all suppliers would be crucial for the roll out of this method across GB. This is covered further under "Demonstration of a robust methodology and that the project is ready to implement". We are also concerned that National Grid has not

yet committed to method 2. The involvement of National Grid, as NETSO, would be crucial to the success of the project.

We are pleased to see that this project involves some external funding, the majority of which is from British Gas. Of this contribution, however, only £1.6 million is new, the remaining £1.5 million being existing equipment funded through the CLNR project. We also note that £3.8 million of the project costs is attributable to British Gas, meaning it is actually a net cost to the project rather than a contributor. We are concerned about the limited funding from British Gas, and other suppliers. Northern Powergrid estimate that almost 40 per cent of the benefit of method 2 would accrue to suppliers. We do not think suppliers' contributions to the project are commensurate to this benefit. Similarly, Northern Powergrid estimate that 13 per cent of the benefits of method 1 and 16 per cent of the benefits of method 2 would accrue to National Grid as NETSO. National Grid's contribution to the project is not commensurate to the benefits they would receive.

(f) Relevance and timing

This project could provide an economic alternative to network reinforcement for the connection of DG and low carbon loads such as heat pumps and EVs. This is highly relevant to DNOs, as there is expected to be significant growth in these technologies. If successful, this method could clearly be used in business plans as an alternative to reinforcement. The method could be of use if the uptake of low carbon technologies is lower than expected, as it could be just as effective in accommodating the connection of conventional loads.

This project has the potential to inform electricity market developments in GB and Europe. However, we have some questions over the timeliness of the project. For example, we note that the project would be installing technology to facilitate flexibility, which suggests that there is not necessarily sufficient flexibility resource available. Additionally, the demand and availability for flexibility from DNOs by 2020 is expected to be quite limited. The project's full value would not be realised until 2030, by when demand for flexibility is expected to increase significantly.

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

GBFM has a detailed project plan and appropriate project management structures. Northern Powergrid has clearly set out the tasks and responsibilities for each work stream and interdependencies, including with CLNR. The project management structure has built on CLNR, and includes an executive sponsor, steering group, advisory board and project management team, all with defined responsibilities. As noted under criterion (b), Northern Powergrid and its partners are committing significant resources to the project, including in project management.

This project demonstrates a reasonably robust methodology. However, we have some concerns over the methodology behind method 1. Northern Powergrid has provided specifics of the market design for method 2, but very little detail on the methodology behind the sharing of flexibility between parties in method 1. Additionally, commitment from market participants is vital for the effective trialling of the market platform. In particular, we note that the NETSO has not yet signed up to

method 2. The NETSO would be a critical part of any market for flexibility services. However, Memorandums of Understanding (MoUs) are in place with other market participants.

Apart from the lack of detail on method 1, we consider the project ready to implement. Significant resources would be applied to the mobilisation stage, and pre-work has been undertaken with all project partners. We also note senior support from all partners in the project.

GBFM would implement a formal risk management process, with appropriate systems for raising risks to senior levels. The risk register identifies the key risks, and mitigations and contingencies in general seem appropriate. We have concerns in two areas in particular. As mentioned above, National Grid is a crucial partner for the project, and we are concerned they have not yet signed up to method 2. Secondly, battery storage would be a crucial provider of flexibility. This project intends to make use of battery storage from the CLNR project. This is to be provided by A123 systems, which we understand may be currently experiencing financial difficulties. Should A123 be unable to deliver the battery, Northern Powergrid intends to model this element of the project. We do not consider that this would provide learning of a sufficient quality. Northern Powergrid has put in place appropriate processes to identify circumstances to halt the project.

There is potential for a minor customer impact. There is a slight risk of unplanned customer interruptions installing equipment necessary for the trial. However, Northern Powergrid has already identified several prevention strategies and mitigations, and has conducted a risk assessment.

GBFM's approach to managing cost uncertainty is suitable. Northern Powergrid has included an appropriate level of contingency and the budget would be a standing item on the project steering group. Northern Powergrid's financial function would manage the budget and work in tandem with the project team. Northern Powergrid proposes not to utilise a separate bank account to hold the LCN Funding, but would conform to the requirements of the LCN Fund governance document and would appoint Deloitte to audit this. As mentioned under criterion (a), we consider that benefits are reasonably estimated as they have been based on Smart Grid Forum modelling.

The SDRC are SMART, evidence based and linked to the key outputs of the project. We are pleased to see the stakeholder engagement process has been included as an SDRC in the final submission.

I^2EV – Innovation squared

Project overview

This is a relatively small project that aims to trial a 'smart socket' in domestic properties to help DNOs to manage 'clusters' of electric vehicles (EVs). The project would involve the recruitment of ten clusters of ten or more EVs on a single LV feeder. Customers would be offered a subsidised rental of a Nissan LEAF vehicle to take part in the trial. Each charging unit installed in a customer property would be fitted with EATL's Esprit device. A corresponding device would be fitted in the appropriate substation. The substation device would monitor the load on the LV feeder. If the monitor detects the load of the LV network above its rating it would signal to the charging units to reduce their demand to ensure load is kept at a manageable level. If proven successful by the trial, the product could provide DNOs a low cost, easy to implement, alternative to traditional network reinforcement when faced with high penetration of EV chargers. This project would be managed by EATL on behalf of SEPD.

(a) Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers

This project aims to prove two methods, both of which could facilitate the low carbon transition if proven successful. Firstly, the commercial method aims to develop commercial and operational templates for third parties to manage innovation projects on network companies' networks. Third party managed delivery could potentially be more efficient than DNO led delivery, and also provide a greater pool of resource to deliver such projects. If proven successful, this could allow DNOs to enable the low carbon transition more efficiently, facilitating a number of areas of the government's Carbon Plan.

This project's technical method would trial the Esprit technology, which could remove barriers to the connection of EVs, particularly those caused by clustering of EVs on single circuits. This is in line with the Carbon Plan's aim to decarbonise the transport system. The technical method could achieve this by releasing roughly 30 kW of capacity per installation, which would take up to three weeks. This is significantly faster than the conventional alternative of laying cable, typically taking up to 4 months. The effectiveness of the commercial method in releasing capacity depends on the work being undertaken by the third party (eg a third party trialling a certain technique might release more capacity than one trialling a different technique), but we note that it has the potential to deliver projects more quickly than through DNO provision. We also note that EATL would be assessing the effectiveness of the technology as part of the project.

SEPD has suggested that the commercial method could deliver projects more efficiently. For example, it suggests that the I2EV project would take 5 years if DNO led, but only 3 years if led by EA Technology. SEPD estimate that third party rather than DNO delivery could deliver savings of up to £14 million by 2040 through more efficient delivery of up to 40 projects. We are unconvinced by the assumptions behind the base case delivery time and costs, and also note that third party delivery

of innovation projects would present new challenges that have not been factored in. Therefore we question whether the commercial trial would directly deliver financial benefits to present or future customers. However, this approach has the potential to reduce barriers to third party participation in the LCN Fund. A wider pool of participants could provide DNOs with access to more ideas that could potentially deliver benefits to customers.

The Esprit technology is estimated to cost £30,000 over 10 trial sites. EATL suggests that the alternative, laying 3,000 metres of cable, would cost £295,000, although we note significant uncertainties in the cost of cable laying. We also have some questions over whether the technology would avoid or merely defer reinforcement. We consider it likely that its application would result in a mix of both, which would reduce the overall benefits suggested by the project. However, given the low cost of Esprit, we consider that this could still result in material financial benefits to customers.

Both methods have potential for replication. The commercial method could be applied to innovation projects by network companies across GB. The technical method is also widely applicable to significant proportions of rural, suburban and urban feeders based on Smart Grid Forum modelling. We also note an output of the project would be an assessment of the method's potential for replication.

The technical method has the potential to provide a good contribution to the low carbon transition through removing barriers to connection of EVs. It could also provide material financial benefits as an alternative to conventional reinforcement. However, we have some concerns over the assumptions behind the commercial method and question the level of benefits it could provide.

(b) Provides value for money to distribution customers

Distribution customers may benefit from the commercial method through lower cost and quicker project delivery. Other network customers could also benefit as the operational and commercial templates could also be used for delivery of other innovation projects, such as through the NIC.

The technical method is very much focussed on the distribution network system, and benefits would accrue to distribution customers through lower cost connections and deferred reinforcement. However, we also note that facilitating the connection of EVs could provide benefits throughout the EV value chain, including for EV developers such as the project partner Nissan. A significant proportion of benefits would also accrue to EATL as the project would progress its Technology Readiness Level (TRL) and hence the commercial value of the Esprit technology. The benefits to distribution customers would also depend on the access DNOs have to Esprit. Crucially, this relies on the ultimate price EATL charges other DNOs to purchase Esprit and we note the business case for the project rests on the fact that Esprit would cost £2,000 per site.

The key technical learning resulting from this project would be on the use of Esprit. This learning is applicable to the design and operation of the distribution system. A further key learning would be on the customer acceptance of load control for EVs and usage profiles of EVs. While this is clearly relevant to DNOs, it would also be applicable to EV manufacturers.

We have some concerns about the steps SEPD has taken to deliver the project at best value for money. Only two project partners have been selected competitively. In particular, while we are pleased to see that this project would be managed by a third party, it is not clear what processes SEPD went through to select EATL as a partner rather than other potential parties. This is a particular concern given the significant role played in the project by EATL. However, we note the day rates for EATL and other parties in this project are at competitive prices compared to other projects. We also note that EVs are currently a specialist area and there may be limited access to EV expertise, particularly given Nissan's market position in the UK.

We are also concerned that SEPD were unable to reduce their costs in this project through synergies resulting from managing multiple LCNF projects simultaneously, as they proposed to do in the PATHS project.

(c) Generates knowledge that can be shared amongst all DNOs

The commercial method has the potential to generate knowledge useful to DNOs on third party delivery of projects through the testing of commercial and operational templates. The technical knowledge could generate useful incremental learning on customer behaviours and charging habits. Knowledge about the installation, operation and impact of Esprit as an alternative to network reinforcement would also be new and applicable to other DNOs.

We note that the project would conform to the default IP requirements. This is of particular importance for this project. Given the significant investment of DNO customers in this project, it is important that they are able to gain significant benefits. All DNOs would need to be able to access Esprit on reasonable terms. Therefore we are pleased to note that EATL set a target price of £2,000 or less per feeder.

SEPD has put forward a good approach to knowledge dissemination. It has identified the key audiences and the key areas of knowledge these audiences would be interested in. It has proposed a number of routes for dissemination, including a dedicated website, use of social media and media coverage. There would also be formal written reports on each of the learning areas.

(d) Involvement of other partners and external funding

We consider that the project has a strong group of partners. Nissan's involvement is crucial, as we consider it unlikely that EATL would recruit sufficient clusters without its support. We agree with the Expert Panel that customer engagement is crucial to the successful delivery of the project, so we are pleased to see additional partners brought on board to facilitate customer response.

As mentioned under criterion (b), benefits could accrue to other parties. Most notably, EATL would have the opportunity to develop the commercial viability of their product. EATL's contribution to the project is 7 per cent of the total project cost. We consider this an appropriate contribution as, while EATL would receive some benefits through developing Esprit, the majority of the benefits of the project would accrue to distribution customers. This project could potentially lower the cost of connecting EVs, so the EV supply chain could also benefit. Therefore we are pleased to see a

large in kind contribution from Nissan, mainly in the form of discounted electric vehicles.

While we are pleased to see that SEPD has been open to ideas from third parties, we question the structure and effectiveness of SEPD's process for selecting this project over others. It is not clear what processes SEPD went through to select this idea and lead partner over other potential candidates. However, we are pleased to see that EATL has actively sought out ideas for finding clusters, deploying EVs, analysis and customer engagement. This has been informed by discussions at EV conferences, circulating invitations to tender and discussions with relevant government agencies.

(f) Relevance and timing

EVs are expected to be a key aspect of the low carbon transition. Industry forecasts suggest a significant increase in EV penetration over the next few years. As this project aims to offer an alternative connection technique to costly reinforcement, it is clearly timely. As a low cost alternative to reinforcement, it would also be useful to all DNOs in business planning, particularly for responding to network constraints caused by clustering of EVs. In the absence of EV uptake, we note that Esprit could have an application for facilitating heat pumps. However, there is a significant difference in customer use profiles for heat pumps and EVs, and we note that key customer learning could be largely irrelevant in this case.

The commercial method would involve third party delivery of projects on a DNO's network. The main purpose of the commercial method appears to be for innovation projects such as the LCN fund and Network Innovation Competition. Learning from this method could inform the development of DNOs' innovation strategies. However, if successful, we would expect this method to be applied in business as usual where appropriate.

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

The project has a sufficient plan given the relative simplicity of the project, but we consider it would benefit from further detail on the breakdown of tasks. SEPD has provided some detail on interdependencies, particularly on the various tasks required through the trial, which demonstrates how it would manage the potentially staggered timings of different clusters. This, along with senior management commitment and internal stakeholder engagement, means the project is ready to implement.

We consider that the project has a robust methodology. However, we agree with the Expert Panel's view that the trial can be delivered but it is critically dependent on recruiting viable clusters. Recruitment of sufficient clusters of EV users is a challenging proposition. SEPD has proposed the use of heat pumps if sufficient EV customers are not recruited. We do not consider that this would provide sufficient learning, nor would the existing approaches to customer engagement be appropriate.

Therefore, as mentioned in chapter 2, we intend to include a stage gate in the process. If sufficient EVs cannot be recruited, we would be able to halt the project. The project would also impact on customer charging patterns and customer acceptance of this impact would be crucial learning. Customer impact is otherwise limited as installation would only result in a short customer interruption.

As set out previously, we consider that costs and benefits have been reasonably estimated, although we question the level of benefits proposed for the commercial method. SEPD has appropriate project management measures in place to limit cost overruns, including monthly reporting.

SEPD has included an appropriate risk mitigation process, including a risk register and its approach to managing and mitigating risks. The key risk, customer recruitment, is discussed above. SEPD has put in place appropriate processes to identify circumstances to halt the project.

The SDRC are SMART, but were in some cases lacking in detail. We are pleased to see additional detail on the SDRC in the resubmission, and in particular in relation to the successful recruitment of clusters.

PATHS – Powering Agriculture, Transport and Heat Sustainably (Scottish Hydro Electric Power Distribution)

Summary

The PATHS project would explore a novel approach to managing network constraints. It forms part of a wider project based in Aberdeen. The project would use hydrogen electrolysers and ANM to manage the connection of a wind farm that is currently being developed off the coast of Aberdeen. The hydrogen produced by the electrolysers would power ten buses in Aberdeen and excess hydrogen would be blended into the local gas network. This solution could form part of an integrated and sustainable solution to connecting renewable energy in areas with constrained networks.

(a) Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers

This project's solution would accommodate peak outputs from intermittent renewable generation using local energy management and energy transfer from highly constrained electricity networks. This potentially facilitates DECC's Carbon Plan by reducing the cost of reinforcement, which could be a significant barrier to the connection of renewable generation. We note there could also be benefits beyond the distribution system, as the use of hydrogen as an energy vector could also help facilitate the decarbonisation of heat and transport.

The capacity released by the PATHS methods varies depending on the size of the wind farm and available network headroom. Based on a range of case studies, SHEPD has estimated that the PATHS methods could connect wind farms ranging from 15 MW to 81 MW, with an average of 44 MW. SHEPD considers that the PATHS method could release this capacity up to one year more quickly than conventional reinforcement, depending on external factors such as planning permission. We note that facilitating an additional year of wind generation would provide some carbon benefits.

SHEPD estimates that the PATHS methods could provide financial benefits of £300 million if it were rolled out across GB as an alternative to network reinforcement. However, we note significant uncertainty in the underlying assumptions. In particular, there would need to be a significant increase in the cost of conventional reinforcement for the method to be an economic alternative. It is difficult to justify the significant cost of the electrolyser as it is only required to produce hydrogen from excess wind in the relatively rare times when the network is constrained. Also, a proportion of these benefits relate to the implementation of the ANM scheme rather than the use of a hydrogen electrolyser. Therefore it has not been made clear whether this project would have the potential to be cheaper than conventional reinforcement or other alternatives, such as constraining excess wind for the limited time the electrolyser actually reduces such constraints.

SHEPD also highlights significant financial benefits through the use of hydrogen in heat and transport as an alternative to heat pumps and electric vehicles. This is because avoiding the connection of heat pumps and electric vehicles would reduce

the need for distribution network reinforcements. Again, we consider there to be significant uncertainty over these benefits as they are highly dependent on the economic viability of hydrogen production. They are also particularly dependent on the viability of generating hydrogen through electrolysis compared to other currently more economic approaches.

SHEPD has provided analysis on the applicability of the PATHS methods to a range of wind farms with different characteristics that are currently under development. This analysis suggests that the PATHS methods could be applicable to 23 per cent of wind farms currently in the planning process. Given the potential number of wind developments across GB, we consider that the PATHS method could only be broadly applicable if it became an economic alternative to reinforcement.

We agree with the Expert Panel's view that PATHS could aid the low carbon transition by facilitating the decarbonisation of heat and transport, and provide valuable experience on the potential of hydrogen electrolysis. Therefore we consider that PATHS could provide a contribution to the development of a low carbon energy sector. It is unlikely that this project would provide financial benefits in the near future, however, as certain improbable assumptions would need to be realised. In particular, we note the Expert Panel's questions over the plausibility of hydrogen produced from excess wind becoming economically viable over the next decade.

(b) Provides value for money to distribution customers

We consider it unlikely that this project could provide benefits that are attributable to the Distribution System. The benefit to distribution customers would result from potentially lower charges from reduced reinforcement costs. As we have noted, there is significant uncertainty over the size of these benefits. Due to the integrated nature of the project, substantial benefits would also accrue to other sectors, such as gas and transport. SHEPD claims that only those elements of the project that benefit distribution customers are paid for through the LCN Fund. However, the benefits to other sectors are not quantified so this is difficult to assess. We also note that DNO customers are paying for a large proportion of the capital and operational expenditure for the electrolysers, from which BOC Linde would benefit. We further believe that SHEPD could make a connection offer, using ANM, to the wind farm and the hydrogen electrolyser without LCN Fund support. Therefore we do not consider this to provide benefits to the Distribution System.

Learning from the project has the potential to be applicable to the distribution system, most notably how to use hydrogen as an energy vector to offset network reinforcement. However, we note that certain learning is not directly attributable to distribution customers, for example a feasibility study on the maximum level of hydrogen which can be blended with natural gas and learning on the potential for PATHS to supply mobile agricultural applications.

We have some concerns about SHEPD's steps and processes to ensure that the Second Tier Funding Request represents the best value for money to Distribution Customers. While we note that PATHS is being undertaken in line with SHEPD's Large Capital Project Governance Framework, it is not clear whether it has applied, or would apply, competitive processes to the majority of cost items. We were also concerned about the considerable labour costs and level of resources applied to the

project. SHEPD responded to this in its resubmission by reducing labour costs, and we now consider the project provides improved value for money.

However, we note that these costs were subsequently cut through a "common approach to project management, governance and knowledge management elements". All DNOs should be seeking to provide best value for money across the portfolio of their innovation projects, and there should not be duplication of resources. We are also concerned that SHEPD was able to reduce labour costs to such a degree (over 15 per cent) and consider that SHEPD may have provided high costs in its original submission. Following this reduction, we still consider SHEPD labour costs to be high.

(c) Generates knowledge that can be shared amongst all DNOs

We consider that the project could provide modest new learning that could be shared amongst all DNOs. We agree with the Expert Panel that the project could provide commercial and technical knowledge about the use of controllable demand (eg electrolysers) for managing network constraints. In particular, the project could provide learning on how ANM and energy transfer can be used in tandem to connect generation and address peak constraints. These techniques are relevant to all DNOs. However, we note the Expert Panel's concern that, due to the uncertainty around the economic viability of hydrogen, this approach would require considerable government support.

We consider that the project has effective learning dissemination plans. SHEPD has identified the key interested parties and the particular aspects of the project that each would be interested in. There is a clear plan for dissemination, involving dedicated staff and a range of events and other dissemination techniques.

We note that the project conforms to the default IPR conditions.

(d) Involvement of other partners and external funding

We agree with the Expert Panel's view that the project involves a strong group of partners. The range of partners is particularly appropriate as they cover the wide range of activities that would be undertaken as part of the project, and we consider they provide the necessary expertise to deliver the project.

We are also pleased to note that these partners are making significant financial contributions to the project. We consider this appropriate given the significant benefits that could accrue to other sectors. However, we note the Expert Panel's concern that the proportion of funding paid by the distribution customers is high given the limited financial benefits that could accrue to them. We also note that funding provided by Scotland Gas Networks is not yet secure. This is a concern given the importance attached to hydrogen injection into the gas grid.

We are pleased to note that SHEPD is open to ideas for LCN Fund projects and developed the project in response to stakeholder demands. However, it is not clear that there has been a clear process to identify project partners or select which ideas for LCN Fund projects will be taken forward to the Initial Screening Process.

(f) Relevance and timing

We consider this to be a relevant project. The connection of renewable generation is relevant to all DNOs. If successful, the project could be relevant to future business planning of all DNOs, as SHEPD claims that the technique could be applicable to 23 per cent of wind farms currently in the planning process. However, it is not clear whether the project would be applicable in the absence of the connection of low carbon technologies, particularly wind generation.

We question the timeliness of the project. The economics of hydrogen will need to change considerably to make the project viable, as it is highly reliant on the use of hydrogen for heat and transport. We also note that the success of the methods would depend on the economics of electrolysis of hydrogen compared to other methods of its production. It is debateable whether this will happen in the near future.

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

The PATHS project plan identifies the key phases of the project but does not explain the specifics of sub tasks. For example, the ANM and communications task is a single bar covering five years of activity. The plan includes stage gates at decision points between phases, but otherwise lacks detail on interdependencies. SHEPD has identified clear working arrangements with all partners and some governance documents and processes, including a project steering group. However, we consider that there is a significant project management challenge to a project of this complexity and involving so many partners. We consider the resourcing arrangements are appropriate and note that some, though not all, of the delivery team is in place.

We consider that the project is technically feasible as it uses a range of mature technologies. The innovative element is the novel integration of these technologies. We have some questions over the feasibility of gas injection. However, SHEPD has provided some evidence of its feasibility, and proposes to reduce the concentration of hydrogen injected as part of the project. There is also little explanation of the ANM commercial arrangements, and the Expert Panel noted that these commercial arrangements must be put in place for the project to proceed. We have a concern that SHEPD has provided limited detail on how these commercial arrangements would be developed.

This project would be managed in line with SHEPD's Large Capital Project Governance Framework risk management plan. Given the size and complexity of the project, SHEPD has provided a limited risk register and contingency plan. We consider there to be two significant project risks that have not been sufficiently considered. Vattenfall, the wind farm developer, could withdraw from the project in favour of a different connection offer. SHEPD suggests that an aggregation of small scale wind farms is the most likely alternative. However, we consider that it is unlikely that the unproven PATHS methods would prove an attractive proposal to multiple small scale wind farms. Secondly, the project has not yet secured funding for the gas injection part of the project. Gas injection is a significant part of the project's learning and SHEPD have not yet identified the route for SGN's funding, or fully explored the alternatives. This project does not involve any significant customer impacts. Gas injection could impact customers. As mentioned above, we consider that SHEPD has demonstrated their approach could be feasible.

Costs would also be managed in line with SHEPD's Large Capital Project Governance Framework risk management plan. This would include cost reviews at each stage, but it is not clear what underlies this cost management process. This framework also includes appropriate processes to identify circumstances to halt the project. We consider PATHS includes an appropriate level of contingency for a project of its size and complexity. As set out under criterion (a), we do not consider that benefits have been reasonably estimated. We also have particular concerns about labour cost, though note the reduction in the resubmission.

The project involves minimal customer impact, with no anticipated risk of unplanned interruptions.

The SDRC are SMART, but very focused on learning outcomes. These have little to do with the technical installation and operation of the PATHS methods. It is important that the SDRC are linked to the project plan.

SNS – Smarter Network Storage (Eastern Power Networks)

Summary

This project would investigate the viability of large batteries as a tool for avoiding network reinforcement. Specifically it would trial a range of commercial applications for the battery to identify ways of maximising financial revenues. The services trialled would include providing Short Term Operating Reserve (STOR) and frequency response services for the NETSO. The project would involve the installation and optimisation of a 6MW/10MWh battery at a substation in Leighton Buzzard.

(a) Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to future and/or existing customers

SNS would aim to develop the business models and commercial arrangements to use battery storage for multiple purposes and access new revenue streams such that it can be an economic alternative to network reinforcement. This has the potential to reduce the costs of, or defer, network reinforcement, which can be significant when connecting DG, electric vehicles, heat pumps and other low carbon technologies. SNS could facilitate government's Carbon Plan by helping to decarbonise the electricity system and enabling the electrification of heat and transport. It also has the potential, through the provision of ancillary services, to facilitate intermittent generation by providing low cost balancing services. This would have the additional benefit of offsetting carbon intensive peaking generation.

SNS would achieve this by providing 6 MW of battery storage capacity. This could provide network capacity two years earlier than through traditional reinforcement using additional cables and transformers.

Using this method to address system constraints could be up to £3 million cheaper than traditional reinforcement. The method would use storage as an alternative to reinforcement and also sell capacity into the STOR and frequency response markets. The financial benefits of the method depend on assumptions behind the value of future revenue streams from STOR and frequency response together with the cost of the offset or deferred reinforcement. We consider these assumptions to be reasonable. The method's financial benefits also rely on significant future cost reductions of £2.3 million for this type and size of battery. This is based on estimates from Work Stream 3 of the Smart Grid Forum. We also note that the assumptions also rely on significant innovation/first of a kind benefits of £6.7 million. We consider these benefits may be somewhat overstated. However, we consider that the method could provide financial benefits to customers in the future.

SNS has good potential for replication. EPN's analysis of applicable substations is robust, and this suggests that up to 2 GW of battery storage could be integrated in to distribution networks through this method. This could provide financial benefits of up to £700 million by 2040.

We consider that SNS could provide significant distribution network capacity and provide carbon benefits to customers through the early connection of low carbon technologies. We also consider that the method could provide financial benefits to future customers.

(b) Provides value for money to distribution customers

The key benefit to distribution customers would be a lower cost and faster alternative to network reinforcement. However, we note that for this method to be lower cost than network reinforcement, the battery must be used to sell STOR and frequency response to the NETSO. This method could provide up to 2 GW of additional sources of ancillary services to the NETSO. It is not currently clear how these benefits would be returned to distribution customers, although we also note that a key aim of the project is to explore appropriate commercial and regulatory arrangements to return these benefits to customers. It is likely that this approach would also reduce the costs of ancillary services, and some benefit would likely accrue to the NETSO.

Learning is clearly applicable to the distribution system. This project would develop and demonstrate the operational and commercial arrangements necessary to use a battery as an alternative to reinforcement. It would also explore the necessary IT systems to manage flexibility in the operation of distribution networks.

The most significant cost item in this project is the battery, costing £9.6 million. We are pleased to see that EPN has run a full competitive tender process to select the battery supplier, and has also appointed a reserve supplier, thereby seeking to deliver best value for money to customers. However, the Expert Panel had concerns whether a smaller battery could deliver the project's learning. They noted that the battery was modular and could be expanded for business as usual purposes should the need for reinforcement to that scale arise. Therefore we were pleased to see that EPN has revised the battery's storage duration, significantly reducing project costs but delivering the same learning. We were pleased to see that a competitive tender process has been run to select the supplier of the Smart Operational Control System, and a further competitive tender process would be run for the civil works. The DNO labour costs for this project are reasonable.

We note there are numerous parties able to offer analytical, market and regulatory expertise, an area in which contractor costs are on the high side. Although it is not clear what processes EPN have followed to select these partners, we consider the costs to be appropriate given the complexity of the work and time the relatively limited time committed to the project.

(c) Generates knowledge that can be shared amongst all DNOs

A number of storage devices are currently being trialled across the GB network. However, we consider that this project provides new learning over these existing projects. In particular, the key learning would be from trialling the commercial arrangements that would allow storage to access a range of value streams. This learning could be a crucial step in storage becoming an economically viable alternative to network reinforcement. We consider a battery of this size would provide the opportunity for commercial learning that other existing projects do not provide, and would be capable of accessing a wider range of value streams. This

project would generate learning on the usage profile of storage and the necessary IT systems to maximise flexibility. Therefore we consider that the development of model contracts and business models for deployment of storage would be particularly important.

The project has an appropriate knowledge dissemination plan, including a dedicated workstream. Outputs include a range of reports, algorithms and a site visit. EPN has identified a reasonable range of stakeholders and use a good range of dissemination media, which would vary by stakeholder type. We are pleased to see a focus on internal dissemination.

This project conforms to the default IPR conditions.

(d) Involvement of other partners and external funding

This project involves a large number of experienced partners, with expertise appropriate to the requirements of the project. The project includes strong academic support from Durham University and Imperial College London and strong energy storage support from Swanbarton.

There could be benefits outside the distribution system and we are concerned that the total external funding is limited to 6 per cent of total project cost, and does not include financial contributions. In particular, National Grid could benefit from an increased availability of ancillary services. While we are pleased that National Grid has made a contribution, we are concerned that it is small. We note EPN considers all parties in the project could be receiving benefits from participation in the project. We are pleased that all partners are contributing resources to the project at discounted rates or no cost. However, this project is focussed on the economic use of storage in distribution networks, and the financial benefits largely accrue through reduced costs of reinforcement and distribution customers' contribution is appropriate.

We note the Expert Panel's concerns that certain suppliers were not selected through a competitive process, but through collaborative discussion. However, we are pleased to see that the selection of the IT partner was selected through the LCN Fund collaboration portal, and the battery supplier was selected through a competitive tender process.

(f) Relevance and timing

Overcoming network constraints for the connection of low carbon technologies is a key issue for facilitating the low carbon transition. This project provides a further solution to this issue for DNOs and is therefore timely. We note significant interest in the sharing of services between the NETSO and DNOs, and the discussions at the Smart Grid Forum around using batteries for multiple purposes to maximise their value.

The new commercial arrangements and multiple uses of battery storage could have widespread application and be implemented by all DNOs to relieve constraints. We note that if the growth of low carbon technologies is lower than expected, it would still have application in connecting conventional load. On the other hand, lower penetration of renewable generation would lead to lower demand for balancing

services, and as such the more limited commercial opportunities could hinder the method's business case. However, we consider this project relevant to DNOs.

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

EPN has provided a very detailed project plan, which breaks down the project in to five work streams. There are detailed descriptions of the sub-work streams, identifying the key tasks, outputs, interdependencies, and roles and responsibilities for each. We consider that EPN have the necessary resources and expertise to deliver the project, and they have appointed a construction, design and management coordinator.

This project is ready to implement. The key initial deliverable is the battery storage. The storage tender is complete, and initial design work has been undertaken. EPN has commenced initial planning activities for the Leighton Buzzard site and are working with Central Bedfordshire Council. The project has senior management buy in, and MoUs or partner agreements have been signed with all project partners.

EPN has provided a detailed risk register, including appropriate mitigations, and has already initiated work in a number of areas to mitigate risks or put in place contingencies. As mentioned, it has begun planning consent work and is due to submit a planning consent application shortly. A major risk is the non-delivery of the battery storage, which is the key item in the project. A123, the preferred battery supplier, is in financial difficulty. This could pose a significant risk to project delivery. However, EPN has confirmed that a reserve supplier is in place that can deliver the battery to the same time scales and within budget. EPN has also proposed an approach to mitigating flood risk, which the Environment Agency consider acceptable. EPN has put in place appropriate processes to identify circumstances to halt the project.

The Expert Panel had some safety concerns due to international incidents with storage devices, but was comfortable that safety considerations have been fully addressed. EPN has explained the safety procedures in place within the battery should there be a fault. It also clarified the safety track record for the technology.

There may be a customer impact as there could be an unplanned interruption during the installation of the battery at the substation due to the higher risk of fault outages. We consider this potential interruption necessary for delivery of the project and consider that EPN have identified mitigations to minimise the risk and impact of interruptions.

The project is technically feasible, as it is building on existing storage knowledge from within EPN and GB more widely. The key work would be on the commercial arrangements, and we are pleased to see detailed breakdown of the plan for the development of such arrangements. We also note that EPN has confirmed that work on these commercial arrangements would commence from the start of the project.

EPN would manage costs through governance procedures and project management arrangements including a steering group, monthly reporting arrangements and risk reviews. It has also included an appropriate level of contingency. As set out

previously, we have some questions over the estimation of the benefits, particularly in terms of the reduction in first of a kind costs, but consider that costs have been reasonably estimated.

The SDRC are SMART, linked to the project plan and relate to significant project milestones.

Appendix 2 - Glossary

A

Active Network Management (ANM)

Authority

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

C

Combined heat and power (CHP)

D

Demand side response (DSR)

Demand side response is any mechanism that allows a customer's demand to be intelligently controlled in response to events on the power system. Such events would include lack of network capacity or insufficient generation.

Department of Energy and Climate Change (DECC)

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

Distributed Generation (DG)

Any generation which is connected directly into the local distribution network, as opposed to the transmissions network, as well as combined heat and power schemes of any scale. The electricity generated by such schemes is typically used in the local system rather than being transported for use across the UK.

Distribution Network Operator (DNO)

Distribution Network Operators operate the electricity distribution networks in GB. The term covers six companies operating 14 licence areas.

Distribution Price Control Review 5 (DPCR5)

This price control is expected to run from 1 April 2010 until 31 March 2015.

Distribution Use of System Charges (DUoS)

The charges levied for using the distribution assets to transport electricity from the transmission system through to the end customer who uses the electricity.

E

Electric Vehicles (EVs)

Energy Networks Association (ENA)

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

G

Great Britain (GB)

Grid Supply Point (GSP)

H

High Voltage (HV) Network

I

Initial Screening Process (ISP)

The Initial Screening Process is a pass/fail evaluation of second tier LCN Fund bids that takes place before the full submission process. The purpose of the ISP is to prevent DNOs spending money to fund project bids which do not meet the LCN Fund criteria.

Innovation Funding Incentive (IFI)

Scheme established under SLC 46 and CRC10 of the licence. The IFI is intended to encourage DNOs to invest in appropriate research and development activities that are designed to enhance the technical development of distribution networks (up to and including 132 kV) and to deliver value (i.e. financial, supply quality, environmental, safety) to end consumers.

Intellectual Property Rights (IPR)

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

L

Low Carbon Networks (LCN) Fund

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

Low Voltage (LV)

M

Memorandum of Understanding (MoU)

N

National Electricity Transmission System Operator (NETSO)

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

Net present value (NPV)

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

Network Innovation Competition (NIC)

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

R

RIIO

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

S

Short term operating reserve (STOR)

Specific, measurable, attainable, relevant and time-bound (SMART)

Successful delivery reward criteria (SDRC)

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

T

Technology readiness level (TRL)

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

Appendix 3 - Feedback Questionnaire

1.1. Ofgem considers that consultation is at the heart of good policy development. We are keen to consider any comments or complaints about the manner in which this consultation has been conducted. In any case we would be keen to get your answers to the following questions:

1. Do you have any comments about the overall process, which was adopted for this consultation?
2. Do you have any comments about the overall tone and content of the report?
3. Was the report easy to read and understand, could it have been better written?
4. To what extent did the report's conclusions provide a balanced view?
5. To what extent did the report make reasoned recommendations for improvement?
6. Please add any further comments?

1.2. Please send your comments to:

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