Review of Low Carbon Network Fund proposals

Report to Expert Panel

Electricity North West

ENWT2001: Northern Gateway Smart Grid

8th October 2010

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for project commissioned by Ofgem

Report Context

This report has been prepared for the Expert Panel with the aim of supporting them in their funding allocation decisions for the Low Carbon Network Fund.

Having reviewed the submission pro-forma and all of the supporting material, as well as answers to clarification questions we have put to the DNO, this report is intended to serve two purposes:

- it sets out any factual clarifications that we believe would be helpful to the expert panel when considering the submissions, based on information or data that is not immediately apparent or available in the pro-forma or Appendices A-E; and
- it highlights any concerns we have in any particular areas from, for example, either a technical, commercial or deliverability perspective, that the Expert Panel may wish to explore further with the DNO.

Consequently, the Expert Panel can assume that the factual content of the submission pro-forma to be sound unless noted otherwise in this report.

In writing the report we have avoided merely reproducing large parts of the submission, which stands on its own merits for the Expert Panels' consideration.

This report does not seek to assess the quality of this submission or rank it against any others. In particular, it does not provide any opinion as to whether the proposal should be funded. This is the role of the Expert Panel.

This report is not intended to be read in isolation and should be reviewed alongside the pro-forma and compulsory appendices.

Notice

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Project: Northern Gateway Smart Grid

Description of Project (summarised from pro-forma Box 1)

Smart Cities
Electricity North West with the Northern Gateway project is developing fully integrated Distributed Energy Management System to integrate Distribution Generation and demand side response into an actively managed network to optimise utilisation, including a superconducting fault current limiter and linking to building management systems.

Problem
The overwhelming majority of the distribution network is already installed and it is a challenge to transform it into a smart grid whereas any area of significant new build provides an opportunity to implement new approaches. The Northern Gateway is an area of major urban investment and redevelopment. Key features of this project are the large renewable generation and sophisticated building management systems.

To avoid the benefits of a low-carbon society being negated by increased costs of upgrading and operating networks, DNOs need to understand how to design and operate the future networks to meet these new requirements. Traditional network modelling tools cannot provide the capabilities necessary for analyzing smart networks, and techniques need to be developed to plan and operate them, particularly low voltage networks

Solution
The solution is to deploy new smart grid design integrated with the existing network. The intention is to install network monitoring devices, implement a Distributed Energy Management System to interact with Building Management Systems, implement HV distribution system automation, install a superconducting fault limiter to manage the fault levels, install and test a range of communication systems, develop smart network modelling tools, explore the commercial framework for generation and demand side response and investigate the commercial interactions with the provision of heat.

Method
The project will deploy a Distributed Energy Management System to provide a real-time view of the current network state along with appropriate trends. A range of communications technologies will be deployed for the necessary Distributed Energy Management System connectivity and system monitoring and control of the HV and LV distribution networks. A range of distribution network assets, generation, and building management systems will be integrated via the Distributed Energy Management System into the Electricity North West Distribution System Management Control centre.

Project
The Northern Gateway will transform the north east side of central Manchester. The Co-operative Group, who owns the land, will oversee the development of the Northern Gateway. In the first phase a new Co-operative Group headquarters, which is designed to be carbon neutral, and a 17MW biomass generation plant will be connected to the local distribution network. The aim of the Northern Gateway Smart Grid Project is to understand the future demands of the distribution network from a low carbon society and to trial tools and techniques for the design and operation of the network.

Key Project Figures

Project

Funding requested:	**£7.5M**
Total Project value:	**£10.3M**
Direct Benefit:	**£0.0**

Roll-out	**Proposal**
Total Carbon Benefit (discounted):	**£0.40B**
Total Other Benefits (discounted):	**£0B**
Total Costs :	**£45M**
Net Benefit :	**£0.36B**
Carbon Saved (undiscounted):	**9.0 million tonnes**

TOTAL WITHOUT CONTINGENCY	9,440,000
Percentages of total cost	
Contingency	9.5%
IT	2.4%
Equipment	40.0%
Staff	49%
Internal	*19%*
Contractors	*30%*
Payments to consumers	1%
Decommissioning	0.2%
Other	6%

EXPLICIT PROJECT MANAGEMENT LABOUR	
Project Working Days	715
Labour Days	3944
Full Time Equivalents	5.5
Project Management	£1,878,000
Relative to Project Cost	18%

		FUNDING PROPORTION OF TOTAL ITEM COSTS			
Key Items	**Total Cost**	**External**	**LCNF**	**DNO**	
				Compulsory	**Extra**
Labour	1,815,000	0%	52%	48%	0%
Equipment	3,776,000	7%	93%	0%	0%
Contractors	2,856,000	28%	72%	0%	0%
IT	229,000	20%	80%	0%	0%
IPR Costs	-	-	-	-	-
Travel & Expenses	52,000	0%	100%	0%	0%
Payments to users	109,000	0%	100%	0%	0%
Contingency	893,000	0%	100%	0%	0%
Decommissioning	20,000	0%	100%	0%	0%
Other	583,000	100%	0%	0%	0%
Total	**10,333,000**	**16%**	**75%**	**8%**	**0%**

Summary of independent analysis

General View:
The project brings together network solutions and demand-side engagement through the integration of building energy management systems and a17 MW controllable embedded biomass plant.

This project appears fairly straight-forward and deliverable however it is not very clear on whether this is really a low carbon network project or the integration of a single large development into an existing network. The roll-out is limited and therefore the value of this project to the wider industry less clear.
(DNO comment: this project is a blue-print for how to integrate future new build, or significant retrofit)

Significant Issues:
The absence of the Co-operative Group and IDNO from the partners/collaborators list could affect the delivery of the project. They will both be in a position to influence the project.
(DNO clarification: the Cooperative Group is an external collaborator and the absence from Box 23 was not intentional)

(DNO clarification: while the choice of the "IDNO is a commercial one for the Cooperative Group….it will retain the same aspiration for leading edge low carbon building, and is likely to choose an IDNO partner to help deliver that aspiration. Until an IDNO is identified, if any, is known, we cannot represent how the IDNO will play a part in the overall project". Electricity North West then goes on to lay out a clear agenda for the discussions with the IDNO)

Specific Issues:
- Service providers have offered to contribute 20% of costs of service and equipment. It is not clear how the equipment / services were originally costed and therefore the nature of contribution made

- While an MoU is in place with the Co-operative Group, the details of contracting strategy is not clear; further it is not clear if there is a risk of any delays once the Co-operative Group decides in Sept/Oct 2010 whether to use a IDNO

- The details of all suppliers are not yet in place and it is not clear the time required to secure further contributors. The proposal indicated that by 06/2011 commercial arrangements will be concluded; it is not clear for the reason for delay in concluding arrangements and implications on project delivery

- The scheme proposed to utilise a superconducting fault limiter which are still largely new technology especially at the voltage level and in the environment proposed

- The trial is based around a 17 MW controllable embedded biomass plant. We note that many of the learnings would equally apply to a conventional plant of the same scale but would not be "low carbon". We acknowledge ENW's point that any such plant would most likely be related to heat, which could be aligned with a low carbon future.

- The scheme is assumed to roll out to 9 other cities, but this does not happen in parallel meaning the final rollout does not finish until 2047/48.

1. Accelerates the development of a low carbon energy sector

Summary:
The project brings together network solutions and demand-side engagement through, for example, the integration of building energy management systems.

The carbon benefits are only based on displaced carbon of grid electricity by biomass generation.

The trial is based around a 17 MW controllable embedded biomass plant. We note that many of the learnings would equally apply to a conventional plant of the same scale, and acknowledge ENW's point that any such plant would most likely be related to heat, which could be aligned with a low carbon future.

The scheme is assumed to roll out to 9 other cities, but this does not happen in parallel meaning the final rollout does not finish until 2047/48.

1.1. The proposal is closely aligned to priorities outlined in the current Low Carbon Transition Plan	The project brings together network technologies, both monitoring and control to allow better utilisation of the network. The scheme also involves customers though demand side initiatives and the integration of control aspects of distributed renewable generation and linking to building demand management systems. The scheme also seeks to understand the role that third parties can play in the low carbon future.
1.2. The calculations for carbon savings are robust (audit of calculations only)	The carbon benefit savings appear to be robust.
1.3. The carbon benefits of the project are credible	The carbon benefits are claimed on the basis of the relative carbon intensities of avoided grid electricity and replacement biomass generation for a 17.4 MW installation, and appear to be credible. We note that no carbon benefits are claimed for other aspects of the project, such as demand-side response or loss reduction, and that this is a conservative assumption. The benefits have been valued using DECC's traded price of carbon.
1.4. Extrapolation for roll-out is both statistically and technically sound, reliable and/or verifiable.	The extrapolation appears to be robust, and is based on rolling out the solution to 9 other cities. We note that this roll-out takes four years for each one but that none are completed in parallel, meaning the final roll-out is not completed until 2047/48

1.5. Total energy system consideration as well as for DNO	There are no further assumptions on other player behaviour outside those within the trial.
1.6. Assessment of Method's credibility	The Method has limited applicability with respect to biomass generation, with only 9 other cities being identified as suitable for a roll-out. Other aspects of the trial should be scalable, for example the role of Demand Side Management (DSM) through building management.
1.7. Significance of the Deliverable	The project brings together a number of different network and demand-side solutions. While we acknowledge that the trial includes 17 MW of controllable embedded biomass generation, we note that such embedded generation need not be biomass and could be, for example, gas fired and many of the learnings would still be valid.
Re-estimation of carbon benefits on the basis of "correcting for erroneous assumptions" or re-baselining	

2. Has the potential to deliver net benefits to existing and/or future customers

Summary: The project has the potential to deliver net benefits to consumers through carbon reductions.

2.1. The calculations for net benefits are robust	The calculations of net benefits appear to be robust.
2.2. The benefits claimed are credible	There are no other benefits claimed in addition to the carbon benefits discussed above.
2.3. The costs are credible	The costs of rollout are credible. They are based on replicating the cost of the project in 9 other cities with a 20% reduction due to the learnings having already been made. Costs and Benefits have been inflated to 2015/16 prices.
Re-estimation of net benefits on the basis of "correcting for erroneous assumptions" or re-baselining	

3. Has a Direct Impact on the operation of the distribution system

Summary:
The project seeks to develop experience with integration of external Building Management Systems (BMS) with DNO Energy Management Systems (EMS). It will develop modelling and planning techniques for future networks with higher levels of low carbon technologies. It will evaluate HV (High Voltage) automation and different communication methods.

The project includes network automation as well as energy management elements. It is not clear who will be managing the BMS and what exactly will be done as part of this integration.

The operationally philosophy will be around managing HV network and integrating with an individual BMS.

3.1. Directly contributes to the planning, development and operation of an efficient distribution system.	There is a question as to whether BMS integration with DNO EMS is a necessary activity or whether this would actually in general be done with suppliers. *(DNO comment: purpose of LCNF is to encourage DNOs to seek out and develop their role in achieving decarbonisation of electricity, highest value will be in respect of balancing/managing/protecting the local distribution network, suppliers second, national balancing third.)* Unclear what the value of the superconducting fault current limiter is given the cost of this equipment relative to the remainder of the project *(DNO clarification: provides operational experience of the technology following on from the IFI Super-conducting Fault Current Limiter project installation experience)*
3.2. The size of benefits that can be attributed to the Distribution System, taking into account the level of funding requested.	No partners or collaborators involved on the energy supply or aggregator side of things – The Co-operative group has decided to manage the Supplier relationship. No clear idea on what will be done on the commercial tariffs or equivalent engagement aspects. *(DNO clarification: trial is to enable development of effective commercial arrangements and potentially tariffs. Electricity North West's previous demand side contractual experience will be utilised)* The actual philosophy is quite unclear, it appears to be very much about providing flexibility and optionality into the network. The risk is that there is no guarantee that the problem is sufficient to test and therefore provide knowledge and learning.

4. Generates new knowledge that can be shared amongst all DNOs

Summary:
The Project will have a website with progress and access to data from the project. It will provide public seminars targeted at both the general public as well as industry audiences. Additional reports and analysis will be provided through to the relevant formal bodies.

All learnings will be coordinated and delivered via the Joule Centre. The intention is to push learnings through formal industry structures such as BSC and DCUSA

The programme shows regular outputs over the course of the project.

Learning Chain Summary:
Data will be gathered from a limited number of network sites. This will be analysed during the development of the modelling and planning procedures into Information and possibly Knowledge. The operation of the HV network will provide some learning.

The limitation of this will be whether the network will actually be stressed sufficiently to robustly test the developments and prove that the automation, monitoring and BMS integration is actually required.

4.1. Robust methodology to capture the results from the Project	The risk is that this is conducted by a third party and as such is one step removed from the project.
4.2. Applicability of the new learning to the other DNOs.	These can be very lengthy processes
4.3. Effective plans to disseminate learning from the Project	A very extensive programme has been laid out, but the dissemination budget appears limited. There is a concern that this will not be able to be delivered effectively.
4.4. Knowledge generated is novel including innovative plans, tools and techniques which will be shared openly and easily with DNOs.	Unclear what the "Cyber Security" system is and whether this is a generic principle that can be applied by others or proprietary SAIC technology. *(DNO clarification: Cyber Security is not proprietary but generic and replicable)*
4.5. Effective treatment of IPR. (Where a DNO wishes to deviate from the default requirement for IPR)	Default conditions

5. Involvement of other partners and external funding

Summary:
Key parties involved in the project are summarised below.

	Equipment providers	***Comms. providers***	***Energy retailers***	***Academic organis-ations***	***Project managers/ consultants/advisors***	***Public sector players***
Collaborators	GE Digital Energy BPL Global	Alcatel-Lucent Arqiva		Joule Centre	SAIC	Joule Centre
Partners					Manchester City Council Association of Greater Manchester Authorities	
Others mentioned						

Collaborators
All Collaborators are under different ownership to Electricity North West. They all appear to have commercial dependence/exposure on the success of the project to varying degrees:
- While the equipment/software/communications collaborators appear to function as key suppliers to the project, they are also actively involved in driving specific aspects of the trials.
- The level of effort committed by the Joule Centre was unclear;
(Clarification stated that the Joule Centre will provide the equivalent of five full time researchers in support of the Project … the equivalent of 0.5 of a full time resource will be funded by the Joule Centre and the additional 4.5 full time resources funded by the Project)

The project consists of a large team and key skills required are present. Key points to consider:
- It is not clear what explicit UK utility experience is held by the "program manager", specifically with reference to the comment in the proposal: “Benefits of SAIC include insight of working with a DNO, developing their Smart Grid Practice, and ...demonstrate credentials to GB utility industry”.
(Clarification questions responded with case examples of strong track record in USA based projects and “working with a UK oil company over the last 7 years to develop intelligent smart systems for its offshore field operations.)
- For BPL Global - this is an initial deployment to be achieved by a DNO. While the general track-record is obvious, specific experience of working with other energy partners, especially in the UK is not clear.
- It is noted that the project was unable to secure (a cost-effective) collaborator for network storage devices.

Partners
The project has strong local/regional support from public organisations. Nevertheless the project has a complex team structure. Several of the collaborators such as BPL Global could be classified as partners;
(DNO comment: all collaborators are “partly funding their services”)
The Co-operative Group is an important player in the proposal and an MoU between Electricity North West and the Co-operative Group is included within the appendices, however they are not listed as a collaborator or partner in the proposal.

(DNO clarification: the Co-operative Group is an external collaborator and the absence from Box 23 was not intentional)

The relationship with a potential IDNO is not clearly discussed in the proposal.
(Clarification stated: If the Co-operative Group decides to use an IDNO for the provision of connections to its headquarter premises and the large biomass generation plant, Electricity North West will agree with the IDNO the interface arrangements (ie technical and commercial) for the connection of their new distribution network to Electricity North West's existing distribution network……The first step will be to ensure a connection offer is provided that fulfils our obligations ….The second step will be to engage the IDNO and The Co-operative Group in tripartite discussions on how to develop the technical interfaces and commercial arrangements to facilitate demand and generation management integration with Electricity North West's distribution network…. The Co-operative Group is expected to decide whether to procure connections provision via an IDNO in September/ October 2010.)

External Funding
Service providers have offered to contribute 20% of costs of service and equipment. It is not clear how the equipment / services were originally costed and therefore the nature of contribution made.

Several external collaborators benefit by gaining insight and credentials in Smart Grid. They have contributed 20% of their costs. The exception is Arqiva which is contributing 74% of total costs - this is reasonable given the value of being able to report on performance.

Additional funding has not been sought and the project is not dependent on further sources of funding

6. Relevance and timing

Summary:
The project is closely linked to a parallel development which has low carbon technology features and provides test opportunities.

No specific mention has been made of how this project will affect DCPR6 plans, but mention is made of incremental knowledge and adopting and changing. It is intended to feed into the review of current design policies and the incorporation of other learnings.

Mention is made during this section discussion of domestic metering and commercial arrangements with NGT and aggregators, but this is not strongly discussed elsewhere in the project proposal.

The results predominantly start to appear towards the back end of 2012.

6.1. The timing of the project is appropriate	The project is in parallel to a major redevelopment which will incorporate low carbon technologies. There is no description of the Building Management System (BMS) functionality and so it is hard to assess how the integration of this system into a DNO Energy Management System (EMS) will contribute to a low carbon transition path.
6.2. Use of solution as part of their future business planning and how it would impact on its business plan submissions in future price control reviews, including DPCR6.	Additional detail has been provided in response to ENWT034.
6.3. Focus on developments associated with a move to a low carbon economy that are more likely to happen.	Unclear whether the superconducting fault current limiter is an appropriate development or is just related to a specific aspect of the generation connection.
6.4. Time to tangible results	It is unclear what the 25% deployment means on this project in terms of the relative scale.

7. Demonstration of a robust methodology and that the Project is ready to implement

Summary:
The detailed plan appears credible with key internal interdependencies identified within the Gantt chart. The key technical resources for the project are available for the project, though Co-op and a potential IDNO is are not listed. Activities prior to start up are detailed in Gantt chart. There is still some finalisation of suppliers indicated in the chart. A Memorandum of understanding in place for main collaborators/contractors

The risk is low as the scheme as it largely impacts on the HV networks only and generally uses existing technology in a new application for DNO networks. The scheme does however propose to utilise a superconducting fault limiter which does carry a limited risk as these are still largely new technology especially at the voltage level and environment proposed. The connection of the embedded generator onto the system is dependent on the installation of the fault limiter.

Risk procedures and processes are in place. A risk register is in place and mitigation and contingency applied. The Project management side is being managed by a third party rather than directly by the DNO.

Uncertainty is not explicitly discussed however average figures for equipment; and contingency items suggest it has been considered.

The proposal suggests exploring interface arrangements with IDNO network and development of new generating operating regimes

The success criteria match against project tasks and elements.

7.1. Detailed Project plan, with responsibilities clearly established and inter-dependencies identified.	The project plan does not make explicit links to the plans for related projects. In particular, it does discuss the critical path for the Co-op building/biomass project. *(DNO clarification: This linkage was an omission from the Project Plan; the Co-operative Group headquarters will open in August 2012 and the 17MW generator in August 2013)* Concerns were raised on the timing for public engagement, with the first major milestone in 2011; these issues were addressed in response to questions: "*Our first public engagement is scheduled for August 2011, which will be first in a series of conferences that the Project…… We will continuously engage with our stakeholders predominately through the proposed Project website"*
7.2. Resources to deliver the Project are of a sufficient size and quality to be reasonably expected to ensure its delivery.	While the key resources are available, it is noted some of them are not UK-based. All key collaborators are sufficient in scale and track-record to suggest they are appropriate. The absence of the Co-operative Group and the IDNO from the partners/collaborators list could affect the delivery of the project. They will both be in a position to influence the project. *(DNO clarification: the Co-operative Group is the main external collaborator in the delivery of this project although the admission as a collaborator was unintentional, a detailed profile for the Co-operative Group was included in the proposal)* *(DNO clarification: the choice of the IDNO is a commercial one for the Co-*

	operative Group….it will retain the same aspiration for leading edge low carbon building, and is likely to choose an IDNO partner to help deliver that aspiration. Until an IDNO identity, if any, is known, we cannot represent how the IDNO will play a part in the overall project. A clear agenda for the discussions with the IDNO is also provided)
7.3. Demonstration that the Project can be started in a timely manner.	The proposal indicated that by 06/2011 commercial arrangements will be concluded. It is not clear for the reason for delay in concluding arrangements and implications on project delivery. *(DNO clarification: this is the "latest date" and we are currently working on commercial arrangement as part of the pre-award phase of the work.)* The details of all suppliers are not yet in place and it is not clear the time required to secure further contributors. While an MoU is in place with the Co-operative Group, the details of its contracting strategy is not clear; further it is not clear if there is a risk of any delays once the Co-operative Group decides in Sept/Oct 2010 whether to use a IDNO or not.
7.4. Risks to costs and benefits of the Project have been reasonably estimated.	Contingency has been included but no breakdown has been provided. Key risks to timing of the project are identified in the risk register and possible delays have been identified. Circumstances for DNO to apply for additional funding from Ofgem are not discussed.
7.5. Assessment of proposed cost overrun percentage (if non-default?)	Electricity North West concluded risks can be managed and does not seek protection for overruns.
7.6. Assessment of Direct Benefit protection (if non-default?)	No direct benefits identified
7.7. Identification of appropriate risk mitigation processes	Risk procedures and processes in place, risk register in place and mitigation and contingency applied. The Project management side is being managed by a third party rather than directly by the DNO. General high level risks have been listed but they have specifically highlighted the risk that equipment failure could lead to loss of supply to customers.
7.8. Direct Impact on Distribution Networks on roll-out has been correctly identified	Increased monitoring will lead to increase visibility of the network conditions in real time and when combined with both the new modelling tools and techniques and active management of the network will have an impact on the planning, design, operation and maintenance of the network. The successful trial of the fault limiter will reduce constraints on such generation in other urban areas

7.9. Immediate Project impacts on the proposer's network have been correctly identified	The scheme impact on the HV networks only. Installation of equipment is intrusive and will require system outages. A move from passive to active control of the network will be undertaken. The connection of the embedded generator onto the system requires the installation of a fault limiter.
7.10. Customer Impact and change required have been correctly identified	The scheme is mainly involved at HV network level, with large industrial & commercial customers and requires either direct control of demand via customer BMS or indirect control through tariff and other commercial arrangements
7.11. Technology Viability	The scheme proposes to utilise a superconducting fault limiter which does carry a moderate risk as these are still largely new technology especially at the voltage level and generation environment proposed. It is recognised that this is the second installation of this technology for Electricity North West, although the first as a generation connection. Low technology risk (other). The scheme uses existing technology but in a new application. The project proposes generally utilises new monitoring equipment and automated control of HV switchgear (retrofit) , combined with demand side management (generally through interface with BMS) all connected to central management platform (DEMS) via a range of communications systems combining UHF radio and fibre optic cables The project includes the trial of different communications type hence there is little risk of communications failure. Generally high level risks have been listed but they have specifically highlighted the risk that equipment failure could lead to loss of supply to customers.
7.12.Successful Delivery Criteria	Revised successful delivery criteria align with project milestones and timescales provided.
7.13. Contractual proposals	The contractual arrangements for exploring interface arrangements with IDNO network are not expanded; However it is noted that the required commercial arrangements are a deliverable of the project rather than an input. Discussion of new operating regimes to support the network do not discuss specific relationships with DG providers/ end customers. This will be developed in conjunction with the Co-op group as a combined demand and generation customer.

7.14 Derogations and exemptions	