Review of Low Carbon Network Fund Proposals
Final Report to Ofgem and Expert Panel

Western Power Distribution (East Midlands)
FALCON

10th October 2011

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II Report Context

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

This report has been prepared from Western Power Distribution (East Midlands) (WPD) Low Carbon Network Fund Tier 2 Submission of 18th August 2011 and the supporting information received by the Consultants from WPD prior to their final presentations and clarifications to the Expert Panel and Ofgem on the 3rd October 2011.

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

- It sets out any factual clarifications that may 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 submissions; and

- It highlights any concerns 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 may assume that the factual content of the submission pro-forma to be sound unless noted otherwise in this report. For clarity in producing this report and the associated documents the Consultants have avoided reproducing large parts of the submission verbatim, which stands on its own merits for the Expert Panel's 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 report and any associated documents are not intended to be read in isolation and should be reviewed alongside the pro-forma and compulsory appendices.

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IV Circulation

Name	Role	Reason for Issue
Ofgem	Client	Final
Expert Panel	Stakeholder	Final

V References

Ref.	Details	Published by	Issue date
01	LCNF Governance Document Version 4	Ofgem	April 2011

IV Table of Contents

1. Summary

1.1 Project Description

Project summary	
Objectives	• Project FALCON is a Trial designed to facilitate the installation of Low Carbon Technologies (LCTs) by delivering faster and cheaper 11kV connections thereby contributing to the objectives of reducing carbon and reducing consumers' bills. • FALCON will generate learning applicable to all DNOs, shared through established LCNF dissemination channels.
Problem	• Technical constraints occurring on the 11kV network will intensify as the adoption of new LCTs accelerates alongside the predicted increases in demand and profile changes caused by the adoption of heat pumps and electric vehicles (EVs). • The 11kV network will require reinforcement to accommodate the connection of new renewable generation and growth in LCT demand. Overcoming network constraints using traditional reinforcement techniques involves high costs and delays.
Solution	• The proposed Method will remove constraints on the 11kV network faster and at less cost thereby removing barriers that may hinder the uptake of LCTs.
Method	• Project FALCON will Trial a Method which has two parts: ○ constraint decision support tool for deployment of intervention techniques – the Scenario Investment Model (SIM); and ○ a set of intervention techniques designed to overcome network constraints.
Cost	• Total project cost is £16,590k with external funding of £2,065k. • LCNF Second Tier Funding request is £12,750k.

1.2 Evaluation Summary

The Project tests a series of intervention techniques, supported by a planning and investment modelling tool, Scenario Investment Model (SIM), which will inform how and when each technique may be used to make the network design and operations more efficient. It is technically feasible. The Project has clear objectives and is focused on the 11kV network (other than the storage proposals). Much of the technology and techniques are already proven.

WPD and their partners can deliver this Project. The Project plan is feasible and the proposal includes a project schedule, risk register, governance regime, and reference to allocated resources and partnership agreements.

The successful implementation of the SIM can have real commercial impact by improving the investment decision, provisioning capacity in the most appropriate way. It is the decisions that are taken from the output of the SIM that will determine effectiveness the Method. The Project does not expect to deliver significant carbon benefits during the course of the Trial. Carbon benefits are realised on roll out across the UK.

Project costing is comprehensive including development of the SIM, deployment and operation of intervention techniques, and learning disseminations and is feasible within the total budget.

Whilst the intervention technologies are not especially innovative, the combination of the proposed set of techniques into one Project, delivering a set of tools combined with a decision-taking support system is new. In our view the effectiveness of the SIM will be the most valuable learning from the Project.

According to the proposal, the interventions may, in total, save on average 45% of the costs of traditional reinforcement of the 11kV network. Some interventions are significantly more valuable than others, and whilst the Method Cost in total may be exceeded by the benefits, we are not convinced that each intervention, if separately assessed, would deliver best value for money. In particular the battery storage module delivers only 10% saving, whereas the application of dynamic ratings will save 80%.

2. LCNF Criteria Evaluation

Acceleration of the development of a low carbon energy sector

- In our opinion the Project contributes to the Low Carbon Transition Plan (LCTP). It does this by improving the ability to rapidly evaluate multiple network solutions, comprising different combinations of technical and commercial techniques and testing these solutions against multiple future load scenarios. This will allow DNOs to reduce the risk of their investment decisions and deliver cost-effective, timely capacity where it is required and therefore greater uptake of LCTs.
- The Project estimates 680 thousand tonnes CO_2e can be saved through its implementation at roll out between 2016 and 2050. We believe that these savings are achievable and are very conservative as they do not include the Method's contribution to lower carbon by enabling earlier and lower-cost connection of LCTs. The calculation of savings assumes the Project applies to 90% of DNO networks and that reinforcement requirements remain approximately the same up to 2050.
- The Project will generate improved knowledge of the 11kV network compared to the status quo and thus the ability to make more accurate investment decisions more quickly.

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

- The FALCON Project will develop a Scenario Investment Model (SIM) to inform the selection of optimum interventions to provide the most timely, cost-effective and flexible increase in 11kV network capacity. The deployment of these interventions will result in direct cost savings so that all customers will benefit from lower than predicted DUoS charges.
- The Project will explore the potential for existing 11kV customers with controllable load/ generation to support the distribution network in return for agreed availability and/or utilisation payments. New connectees will benefit if new interventions can obviate the need for reinforcement.
- The FALCON proposal outlines the likely percentage uptake, effectiveness, cost saving and time implementation savings of the six intervention techniques. After normalisation across these six interventions, WPD calculates that the Method would result in gross savings of 35.6% of the cost of traditional reinforcement, equivalent to £659m.
- „The use of dynamic asset ratings is the most cost effective of the proposed interventions, accounting for 56% of gross cost savings. This is realistic given the low cost of implementation. .
- WPD predicts that the proposed electricity storage solution accounts for less than 1% of potential cost savings, due to limited uptake and high costs. It is recognised that batteries can provide quick response to network constraints, but are unlikely to be economic on roll out.
- FALCON has the potential to be replicated on a large proportion of the GB 11kV network.

Level of impact on the operation of the distribution system

- FALCON has implications for future planning standards, operational procedures and complexity as it challenges current best practice in the design, operation and utilisation of existing distribution network assets. The complementary new technology options and contract offerings will deliver significant benefits over traditional reinforcement techniques.
- The benefits of FALCON are primarily shared by customers seeking connection and consumers at large, through reduced use-of-system charges

Generates knowledge that can be shared amongst all DNOs

- The FALCON Project proposes a Method that is transferable to other DNOs and will deliver three outputs: 1) A Scenario Investment Model (SIM) which includes a Network Modelling Tool and a Decision Support Tool; 2) Applicability of six intervention techniques; and 3) A set of design rules and enhanced set of solutions that can be applied to 11kV network planning.
- The learning outcomes are focused and aligned with key aspects of the transition to the low carbon economy and will help the DNOs' facilitation of the reduction of carbon emissions.
- The learning is relevant, timely and is subject to robust governance and management with clearly defined responsibilities. The learning and dissemination workstream is tasked with ensuring that the right deliverables are made available to the right audience, through various methodologies including knowledge dissemination.
- The default IPR requirements of the LCN Fund Governance v.4 will apply on this Project

Involvement of other partners and external funding

- The Project will receive significant funding from Cisco, Alstom, Logica and its university partners (Aston, Cranfield and Bath).
- Project Partners have a good track record and appropriate to this Project. The IVHM Centre at Cranfield is relatively inexperienced within the field of electricity distribution, but brings transferable skills from other sectors.
- The Partners' proposed funding contribution is 12% of total Project costs and 16% of the Second Tier Funding Request.

Relevance and timing

- The Project will enable DNOs to make more appropriate 11kV network investment decisions using improved knowledge of potential future LCT scenarios (developed by the SIM).
- The Method, if successful, will, reduce the need for network reinforcement through the deployment of an optimised combination of alternative technologies onto the existing network. WPD proposes that the design and planning standards being delivered as part of the Project will inform the planning

and engineering opportunities for their own and other DNOs' networks.

- The Project seeks to inform the RIIO–ED1 review specifically in the areas of: settlement/ metered data comparison; final Trial design (Use Cases and benefits); modelling intervention techniques and analysis of load growth scenarios; simulating the investment ranges for the 11kV network.
- The Project spans four years and learning will be disseminated during its life. The focus of dissemination is specifically to influence the RIIO–ED1 proposal, although there is obligation towards other stakeholders to ensure that benefits of the proposal may be captured as quickly as possible.

Demonstration of a robust methodology and that the Project is ready for implementation

- The methodology and plans for this Project are clearly described in the proposal and are complete. The proposed partnerships will provide sufficient resources providing they are allocated as planned, although the risk of being under-resourced is under-stated. Please see Section 3.1.3.
- Customers and potential customers providing demand- and generation-side management services will be sought. The engagement process is sound.
- The methodology for running the Project is appropriate, although there is little indication of the additional work which will be necessary to extend the findings of the Project into roll out, e.g. commercialisation of software developments.
- The proposal provides a very clear and reasonable consideration of circumstances under which it may be appropriate to suspend the Project.

3. Detailed Assessment

3.1 Feasibility Assessment

Summary

- This Project is technically feasible, in that it can be delivered to test a series of intervention techniques, supported by a planning tool (SIM) which will inform how and when each technique may be used to make the network design and operations more efficient.
- Subject to having sufficient resources, it is feasible for WPD and their Partners to deliver this Project in order to test the Method.

3.1.1 Technical Assessment

Is the Project technically feasible?
• Yes, this Project has clear objectives and is focused (other than the storage proposals) on the 11kV network. It is our view that much of the technology and techniques are already proven or are being tested on other projects. • The SIM proposed in this proposal will be a pre-production application, and roll out beyond the Project will require further work.

Is it safe?
• The SIM evaluation of the use of the techniques being Trialled will include safety. WPD have confirmed that, they will be operating to their usual safety procedures and processes, which will take full account of safety risks.

Is it innovative? If so, how?
• Although this Project proposes similar interventions to those being Trialled elsewhere, the SIM is new.

How mature is the equipment?
• The equipment being attached to the network is relatively simple technology which has been used on the networks in one form or another in the past. • The SIM is new and its reliability, performance and indeed relevance will be tested on this Project.

What is the technical impact on customers?
• Customers willing to offer demand- or generation-side management services will need to consider how the services may affect their business e.g. the number of times the DNO will require demand or generation to be changed to meet the needs of the network. • There is a requirement to interrupt supplies to customers to install monitoring equipment. It is estimated that 10,000 customers will be without power for approximately two hours each.

What is the technical impact on normal operations?
• There will be a slight increase in risk of supply failure at the Trial sites due to the very nature of applying new techniques, although this is a small risk compared with the benefits of Trialling the proposed Method. • If the Project proves the worth of the Method, then it can be expected to have a very significant impact on network operations, as new design and control processes and policies will be applied alongside the traditional approach to network design and operation.

3.1.2 Assumptions

Assumption	Comment
It is assumed that intervention techniques developed in this proposal and deployed as informed by the SIM, will deliver faster and lower-cost connections as network use is improved.	The Project aims to develop these techniques and test them. Providing they work, then network reinforcement will be avoided in many cases where it would be otherwise feasible. The size of the benefits will be dependent upon the number of constraints which may arise. In any case, the availability of new intervention techniques "in the toolbox" will be beneficial for flexible network management, and the Project value is ensuring they can be developed and deployed successfully.

3.1.3 Project Delivery Assessment

Is the Project plan robust?
• Yes, the proposal includes a project schedule, risk register, governance regime, and reference to allocated resources and partnership agreements.

Is the Project schedule credible?
• There is a high level plan and a detailed schedule in the proposal. These are credible.

Are resources adequate?
• WPD are currently delivering two of the four Second Tier projects submitted last year and have another proposal in this year. All of this activity requires resourcing in addition to those resources which will be required on this proposal. We note however that WPD only consider the probability of shortage of resources to be a score of 1 (scale of 1 to 5). We understand that the reason for the low score is the increasing confidence in resource being available now that the WPD/ Central Networks re-organisation has been completed, but in view of the potential scale of Future Networks activity, we would have expected that the resource risk would have been higher. We note the impact of resource shortages is only scored a 3.

How do partners add value, how are they tied in to the Project, and is their contribution appropriate?
• Partners will bring their expertise to this Project. We note that the Cranfield IVHM Centre is not experienced in DNO-related work, but brings a set of skills and expertise from other sectors. • A Memorandum of Understanding has been agreed with the partners. The Project plan indicates that contracts will be signed in March 2012 (Project kick off January 2012). This is within the mobilisation phase of the Project. • The partners' proposed funding contribution is 12% of total Project costs and 16% of the Second Tier Funding Request. These contributions are relatively high compared with other Second Tier submissions.

Is the customer/stakeholder communication plan appropriate?
• Yes, this Project is easier to communicate compared with some of the other Second Tier proposals currently being evaluated. There is little direct relationship with customers, other than those to be approached for demand- and generation-side response agreements.

Are successful delivery criteria appropriate?
• Five of the seven criteria are related to the technical design and deployment of the hardware and the SIM. Each success is measured by evidence criteria and each contains some learning output. The sixth criterion relates to the success of the deployment and the seventh assesses the suitability for mainstream adoption into the network, explicitly testing the results against the optimised business plan. • Each criterion is mapped to the Project Plan and it is considered that the SMART objectives are met.

Have key risks been identified and mitigated? Is contingency appropriate?
• WPD's response to this question is as follows "If, in project delivery, a risk materialises into an issue, the issue will be escalated to the appropriate level in the governance structure and actions to resolve the issue will be implemented. These actions may invoke the implementation of contingency plans." • We consider that WPD's approach to risk mitigation and contingency is appropriate to a project of this nature.

3.1.4 Assumptions

Assumption	Comment
This Project is sufficiently well-resourced and good project management practice is in place	Our view is that this assumption is reasonable and the risks are manageable

3.2 Commercial Assessment

Summary

- This is an overarching SIM that will help to indentify current and future network constraints and model future network constraints, and six technical and commercial intervention technologies.
- We believe that the SIM should facilitate better investment decisions and resource use and it can add commercial value.
- The SIM is supported by six workstreams: 1) Dynamic Asset Rating; 2) Automatic Load Transfer; 3) Mesh Networks; 4) Storage; 5) Distributed Generation; and 6) Demand Side Management.

3.2.1 Nature and Scale of Commercial Impact

Does the project involve innovative commercial arrangements? If so, how?

- WPD claim that the successful implementation of the SIM can have real commercial impact by improving the investment decision, provisioning capacity in the most appropriate way. We believe that it is the decisions that are taken from the output of the SIM that will determine how innovative the overall Project is, the key elements are:
- **Dynamic Asset Rating**: This will deliver operational changes rather than commercial changes.
- **Automated Load Rings**: This is making good use of capacity; it does not involve innovative commercial arrangements.
- **Meshed Networks** do not involve innovative commercial arrangements.
- **Storage on the network**: Successful implementation of storage on the network could be aligned to new commercial networks but these are not described as part of the Project.
- **Distributed Generation**: It is planned to developed new commercial arrangement to support DG.
- **Demand Side Management**: It is planned to developed new commercial arrangement to support DSM.

How does the Project impact upon the customer (demand and generation)? What is the nature of this impact and does it endure beyond the Project?

- WPD anticipate that all customers will benefit from lower DUoS charges by mitigating the need for reinforcement. If successful this is reasonable.
- Those customers with 11kV controllable load and or generation should benefit from more flexible arrangements.
- New customers will benefit if their connection would have required additional network capacity but, thanks to this Project, do not.
- For all of this work the benefits should endure beyond the Project.

How does the Project impact upon the broader electricity and technology supply chains? What is the nature of this impact and does it endure beyond the Project?
• The SIM can have a real effect upon the reinforcement decisions of the network going forward. If successful this will endure beyond the Project.

Within current regulatory frameworks, where will financial benefits accrue within the supply chain (suppliers, DNOs, customers etc.)?
• The major savings will be to the DNO in reduced reinforcement costs which should be passed on to existing and new-connection customers and connectees in reduced DUoS charges and lower connection charges. • Customers with controllable load or generation may benefit from better commercial arrangement reflecting their willingness to be flexible.

Are these commercial arrangements replicable across the GB distribution network on roll out?
• Yes. In general GB 11kV networks are built and operated to very similar designs and levels of loading. • **Dynamic Asset Rating**: WPD claim this is replicable across 50% of the cables in their Midland Network. • **Automated Load Rings**: This is replicable across 90% of the WPD 11kV Midland network. • **Meshed Networks**: This is replicable across 90% of the WPD 11kV Midland network. • **Storage on the network**: Across the 11kV network. • **Distributed Generation**: Can be used for customers with flexible generation who are willing to share this flexibility with their DNO. • **Demand Side Management**: Can be used for customers with flexible demand who are willing to share this flexibility with their DNO.

3.2.2 Assumptions

Assumption	Comment
The main Project SIM assumes strong learning from the six subsidiary projects.	The success of the SIM is not only dependent upon the SIM work but also how successful the six projects are.
The Distributed Generation and Demand Side Management elements are dependent upon good uptake of users.	If the Project does not find enough customers to sign up to these arrangements then these two will not be commercially successful.

3.3 Wider Context Assessment

Summary

- Project FALCON estimates that the reduced network infrastructure requirement saves an overall 680k tonnes of CO_2.
- Project FALCON will evaluate estimated industry demand profiles against actual data and will inform other key industry activities such as settlement. The concept is extendable. It is applicable to other voltage levels within the network and is a stated future goal for FALCON.

To what extent will the Project overcome current obstacles to the future low carbon network?
• Project FALCON, if successful, addresses obstacles to a low carbon network by enabling faster and lower-cost connections to the network than provided by traditional methods of reinforcement.

To what extent will the Project Trial new technologies that could have a major low carbon impact?
• Project FALCON will deliver a flexible SIM that can incorporate network models of new and emerging low carbon technologies into the network predictive modelling. • Project FALCON indicates that there is a direct carbon benefit from the reduction in infrastructure reinforcement as the additional network capability is provided through alternative methods.

To what extent will the Project demonstrate new system approaches that could have widespread application?
• Project FALCON can demonstrate that the approach has wide impacts across the 11kV network and the GB as a whole as well as the potential to extend into other networks.

3.4 Carbon Emissions Reduction Assessment

Summary

- The aim of FALCON, in terms of carbon, is to improve the ability to rapidly evaluate multiple network solutions, comprising different combinations of technical and commercial techniques and to test these solutions against multiple future load scenarios. This will allow DNOs to reduce the risk associated with investment decisions and deliver cost-effective, timely capacity where it is required and, therefore, greater carbon emissions abatement.
- The proposal outlines how its SIM will enable carbon reductions of 680,000 tonnes on roll out. These carbon emissions reductions are due to reduced network losses and avoidance of asset upgrades but do not include carbon benefits from facilitated LCT uptake, which, we anticipate, could be significant.
- Carbon emissions reductions are realised through improved 11kV network visibility which is anticipated to significantly reduce the need for 11kV network reinforcement. This will provide carbon benefits through a more informed investment process that identifies the most appropriate technologies but also through reducing wasted investment.
- The Project does not expect to deliver significant carbon benefits during the course of the Trial. Carbon benefits are realised on roll out across the majority of the GB network. This is a fair reflection; however, significant further benefits from facilitated LCT uptake are possible. These have not quantified by the DNO.

3.4.1 Nature and Scale of Carbon Emissions Reduction

Does the Project align with the Low Carbon Transition Plan? If so, how?
• The Project will develop the ability to rapidly evaluate multiple network solutions, comprising different combinations of technical and commercial techniques which will be tested against future load scenarios. This will allow DNOs to reduce the risk associated with investment decisions and deliver cost-effective, timely capacity where it is required. This will enable multiple Low Carbon Transition Plan (LCTP) targets to be met as a result, whilst also avoiding unnecessary investments. • These outcomes are in line with and supportive of the LCTP.

What is the nature of claimed carbon emissions reductions and what is the balance between the technological and behavioural change?
• The proposal states that on roll out 90% of carbon emission reductions will be seen from reduced distribution losses and 10% from reduced network reinforcement. These changes are a mixture of both technical changes as well as DNO behavioural changes, specifically in terms of their future network investment decisions.

Nature of emissions reductions

	Type of reduction
Facilitate LCT uptake more quickly & lower cost	
Avoidance of asset upgrades	x
Network effeciency	xxx
Efficiency of use	

xxx - Main focus
x - Secondary focus

What is the size of claimed carbon emissions reductions?
• The Project estimates 680k tonnes CO2e can be saved through its implementation at roll out. This was calculated by Project partner Logica. • We anticipate these estimates to be achievable, if not slightly conservative. • Significant further carbon emissions reductions are anticipated to be achievable through a facilitated uptake of LCTs. These have not been quantified by the DNO.

Roll-Out at Scale

	tonnes CO_2	Base case emissions	Method emissions	Net carbon emissions reduction
Trial / Method	FALCON - SIM	0	-680,000	680,000
	Total	**0**	**-680,000**	**680,000**

When will the carbon emissions reduction occur?
• No carbon emissions reductions have been claimed for the Project itself as the learning that is generated throughout the Project will enable future network investment decisions to be made more effectively. • Carbon emissions reductions have instead been calculated for roll out across the UK which is defined as between 2016 to 2050.

3.4.2 Carbon Emissions Reduction Assessment

How comprehensive are the carbon emissions reduction estimates?
• The proposal captures the important emissions reductions, making reasonable assumptions. • The savings estimates are based on data from WPD Midlands, much of which has formed the basis for previous regulatory proposals to Ofgem. • Line losses on the 11kV network have been taken as 0.67% of total demand. The proposal states that savings from reduced line losses arising from the implementation of meshed networks are estimated to be 40% where the SIM is used. It estimates that meshed networks will give this level

of savings across 5% of the network, giving an estimate for reduction in 11kV line losses of 2%.

- Overall, the assumptions that underlie the carbon calculations are well identified in the proposal. Estimates up to 2050 of 680k tonnes of CO_2 are a relatively small amount, considering the length of time that is involved.
- The carbon calculations are verifiable, but also a little conservative. This is perhaps due to the lack of network load understanding of the 11kV network (also stated in the proposal), which is anticipated to be improved during the Trial, thus after this point (i.e. in 2015) a more precise carbon emissions reduction could be provided.
- The savings estimate does not include any increase in installation of LCTs; it only looks at improved network performance. Not including the benefit from any potential increase in LCT installation rates means that WPD may be underestimating the broader carbon-saving potential.

Are carbon emissions reduction estimates additional to business as usual?
• We believe that the carbon savings are additional to business as usual as they are realised through more informed investment decisions that would not have otherwise occurred. • The proposal uses Ofgem's LENS report as a baseline to calculate potential carbon emissions benefits. Specifically, the „Big Transmission & Distribution' scenario has been used. Of the five scenarios, the chosen one results in a more favourable carbon emissions reduction outcome as it is based around large scale, HV networks, as opposed to microgeneration and LV networks. Lower savings would be produced if a different scenario were used.

Are carbon emissions reduction estimates realistic?
• The SIM has been designed to enable more effective investment solutions to be made, at a faster speed thereby delivering greater carbon emissions reductions. These have been calculated using a methodology that is based on publicly available sources from government and academia. • The proposal makes reference to the claimed carbon benefits being an underestimation due to an assumed fixed network reinforcement requirement per year. This reinforcement need, as is stated in the proposal, is anticipated to increase over time and thus, we estimate the carbon emissions reductions claimed are likely to be greater than is stated.

3.4.3 Assumptions

Assumption	Comment
Savings estimates based on data from WPD Midlands.	On roll out, the requirement for each DNO's 11kV network is anticipated to be different, though some similarities will be found.
Used annual projections from Ofgem LENS Report.	The scenario used as a baseline is able to provide the greatest potential for network efficiencies and

	therefore carbon benefits may be lower than claimed.
Network Investment Model considered applicable across 90% of network with 40% gross savings possible.	This has not been validated.
Practicality issues likely to reduce the 40% to 32%.	This acknowledgement indicates carbon benefits have been considered using wider principles.
Projections assume reinforcement requirements remain approximately the same up to 2050.	This is a key assumption that may increase of decrease over time. It is anticipated that this will change up to 2050.
Dynamic asset ratings can be deployed up to 60% uptake.	There may be technical constraints to this level of uptake.

3.5 Project Costs and Cost Benefits Assessments

Summary

- Project costing is comprehensive and includes the development of a SIM, deployment and operation of intervention techniques, and learning disseminations.
- The costs of the Project are realistic, although the value of the battery storage is questionable.
- The methodology used to calculate Method costs is realistic given the level of uncertainty. However the extrapolation from a high level view is therefore not as robust as a bottom up approach, particularly for the Trial area.
- „Dynamic asset ratings' appears to be the most cost effective intervention, accounting for 56% of gross cost savings. There may, however, be a technical limit to the potential uptake of this technique.
- There are likely to be significant financial benefits from roll out of the FALCON Solution across WPD and GB networks.

3.5.1 Project Costs

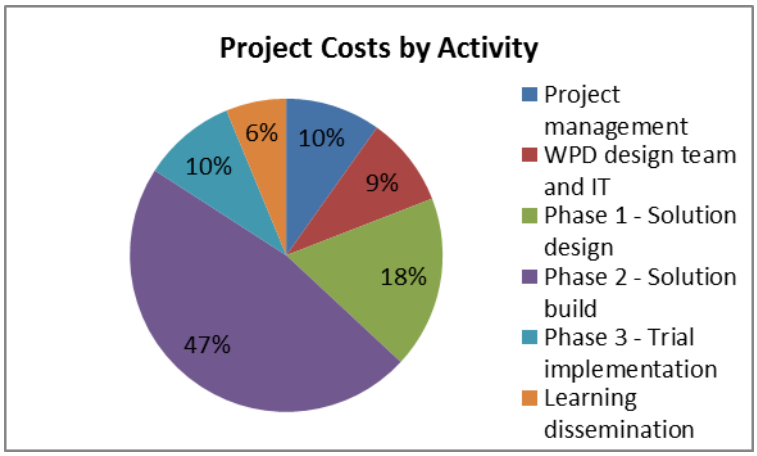
Project Funding

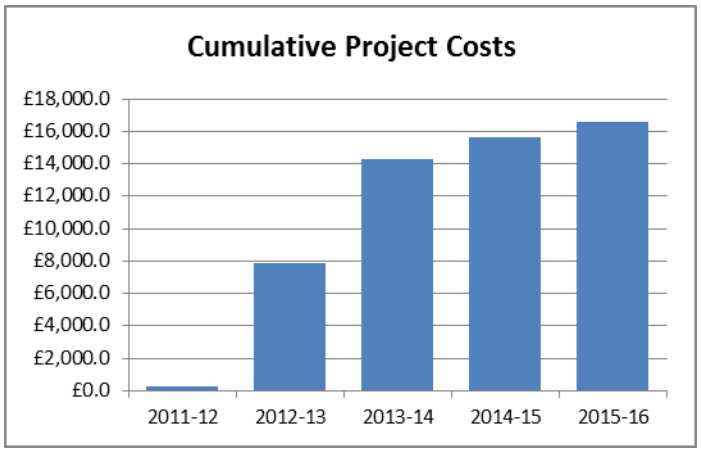
		Total
Project Participants Contribution (£'000s)	Logica	[redacted]
	Alstom	[redacted]
	Cisco	[redacted]
	Cranfield University	[redacted]
	Aston University	[redacted]
	University of Bath	[redacted]
	DNO Extra Contribution	£0
	DNO Compulsory Contribution/Direct Benefits	£1,453
	Outstanding Funding Required	**£13,072**
	Total Project Costs	**£16,590**

[redacted]

Project Costs by Activity and Year

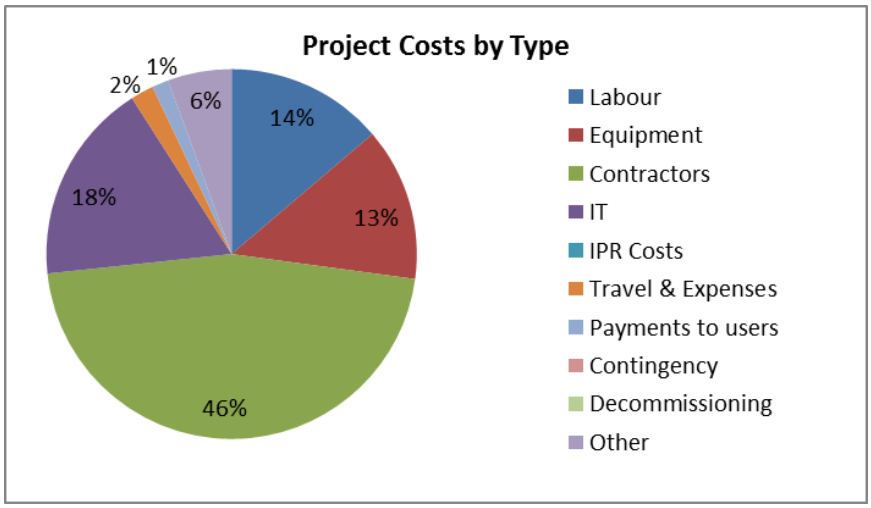
		Year					
		2011-12	2012-13	2013-14	2014-15	2015-16	Total
Costs of activities (£'000s)	Project management	£119	£356	£380	£380	£396	£1,632
	WPD design team and IT	£141	£422	£369	£304	£304	£1,540
	Phase 1 - Solution design	£0	£2,955	£0	£0	£0	£2,955
	Phase 2 - Solution build	£0	£3,406	£4,422	£0	£0	£7,827
	Phase 3 - Trial implementation	£0	£0	£1,040	£561	£0	£1,600
	Learning dissemination	£0	£504	£140	£175	£217	£1,036
	Total	**£259**	**£7,643**	**£6,351**	**£1,420**	**£918**	**£16,590**
	Cumulative total	**£259**	**£7,902**	**£14,253**	**£15,673**	**£16,590**	**£16,590**





Project Costs by Type and Year

		Year					
		2011-12	2012-13	2013-14	2014-15	2015-16	Total
Costs by type (£'000s)	Labour	£187	£561	£555	£489	£489	£2,281
	Equipment	£0	£378	£1,843	£1	£3	£2,224
	Contractors	£68	£3,877	£2,549	£816	£348	£7,658
	IT	£5	£1,994	£876	£36	£18	£2,927
	IPR Costs	£0	£0	£0	£0	£0	£0
	Travel & Expenses	£0	£239	£62	£32	£2	£335
	Payments to users	£0	£0	£240	£0	£0	£240
	Contingency	£0	£0	£0	£0	£0	£0
	Decommissioning	£0	£0	£0	£0	£0	£0
	Other	£0	£594	£228	£46	£57	£925
	Total	**£259**	**£7,643**	**£6,351**	**£1,420**	**£918**	**£16,590**



Direct Benefits

Are the Direct Benefits of the Project realistic?
• The Project is not expected to deliver significant Direct Benefits over its duration. This is because there will be elements that may reduce losses such as Demand Side Management (DSM) and elements that may increase losses such as Dynamic Asset Rating. • Minimal Direct Benefits will come through reduction in customer minutes lost (CML) and customer incidents (CI), driven by increases in network security through network meshing and automation.

3.5.2 Project Costs Assessment

How comprehensive are the project costs?
• Project costing is comprehensive and includes the development of a strategic investment model, deployment and operation of intervention techniques, and learning disseminations.

Are the Project costs realistic?
• Development and operation of the SIM account for [redacted] of the total costs of the Project (£16.59m). The intention is to develop a prototype SIM model which needs to be produced beyond the Project. • The build and implementation of the six intervention techniques cost a total of [redacted] with Automatic Load Transfer and Storage accounting for [redacted] and [redacted] of these costs respectively. The proposal provides outline details of the four technical and two commercial intervention techniques, including the installation of 40 sodium metal halide batteries across 10 secondary substations at a cost of £[redacted] • The Project team believe that despite high potential cost savings expected with some techniques, for example, „Dynamic asset ratings' and low cost savings with others such as batteries, it is important to develop a SIM that includes a spectrum of network design options. • Cisco will supply communication components designed for the substation environment and IEC 61850 compliant (£[redacted] It is assumed that this figure includes the costs of telecommunications and IP infrastructure which are listed without costs in the proposal. • Learning and dissemination costs are £[redacted] including £[redacted] for market research which appears to be a high cost. • It is understood that partners have been selected through and RFI process and workshops held with selected partners to develop specifications. MoUs are expected to be signed by mid-September. • Overall the costs of this Project are realistic, although the value of the battery storage is questionable.

Does the Project provide value for money?
• FALCON has the potential to deliver significant cost savings for HV networks in the transition to a low carbon economy. • Project costs appear to be realistic in light of the scope of the Project.

Is the Project feasible within the budget?
• The Project appears to be feasible within the total budget.

3.5.3 Assumptions

Assumption	Comment
Prices are firm or could possibly be reduced through negotiation.	Bilateral MoUs yet to be signed.

3.5.4 Cost Benefits Assessment

Financial Benefits

- The SIM will inform the selection of optimum interventions to provide the most timely, cost-effective and flexible increase in network capacity. The deployment of these interventions will result in direct cost savings so that all customers will benefit from lower than predicted DUoS charges.
- The Project will explore the potential for existing 11kV customers with controllable load/ generation to support the distribution network in return for agreed availability and/or utilisation payments.
- New connectees will benefit from the Project if new interventions can obviate the need for reinforcement.
- FALCON provides an opportunity for equipment suppliers to demonstrate new products such as communication terminals for substations which may increase future sales.

Non-Financial Benefits

- DNO learning benefits cited including imparting technical learning regarding the practicalities of the technical interventions and evaluation of the security of the infrastructure required for future networks.

Method Costs

Are the unit Method costs calculated on an appropriate basis and are the unit Method costs realistic?
• Method costs for the selected Trial area are based on reduction in reinforcement costs that may be achieved to 2030. WPD has estimated this reduction by reference to the recent Imperial College/ ENA report[1] on the economic benefits of active control compared to passive reinforcement of GB LV and HV networks. WPD contributed to the base data used in this report including actual network capital investment costs. • WPD has used the 50% combined penetration of EVs and HPs scenario from the Imperial College/ ENA report, at which point the Smart HV network reinforcement is forecast in the report to cost £1.9bn less than traditional reinforcement for the entire GB HV distribution system (£3.7bn). • WPD has worked on the basis that 50% of alternative techniques would be used instead of

[1] Benefits of Advanced Smart Metering for Demand Response based Control of Distribution Networks, Summary Report V2.0, April 2010.

traditional reinforcement in the 50% EVs and HPs penetration scenario in the Imperial College/ ENA report.

- The FALCON proposal outlines the likely percentage uptake, effectiveness, cost saving and time implementation savings of the six intervention techniques. After normalisation across these six interventions, WPD calculates that the Falcon Method would result in gross savings of 35.6% compared with traditional reinforcement, equivalent to £659m.
- Dynamic Asset Ratings appear to be the most cost effective intervention, accounting for 56% of gross cost savings. This would appear to be realistic given the low cost of implementing this intervention. There may, however, be a technical limit to the potential uptake of this technique.
- WPD predicts that „Battery' intervention accounts for less than 1% cent of potential cost savings, due to limited uptake and high costs. It is recognised that batteries can provide quick response to network constraints, but are unlikely to be economic on roll out.
- The Method Cost for the Trial area is scaled relative to the GB case by number of customers (55,000 Trial areas vs. 28.7m UK).
- The methodology used to calculate Method Costs is realistic given the level of uncertainty. However the extrapolation from a high level view is not as robust as a bottom up approach, particularly for the Trial area.

Base Costs

Are the unit base case costs calculated on an appropriate basis and realistic?
• The Base Case costs are taken from Table 6.1 of the Imperial College/ ENA report at 50% combined penetration for EVs and HPs. • It is understood that WPD contributed to the base data used in this report including actual network capital investment costs.

Summary of Net Benefits of Roll Out

		Base Case Cost	Method Cost	Net benefit
Trial / Method	Trial area (six primary substations)	£7m	£5.8m	£1.2m
	GB roll out	£3,700m	£3,041m	£659m

Are the forecast benefits of roll out realistic?
• Forecast benefits depend on a number of key assumptions which are highlighted below. There are likely to be significant financial benefits from roll out as forecast in the Imperial College/ ENA report which arise from interventions such as those tested in the FALCON Project. A more careful

analysis is required to determine these benefits with greater certainty.

3.5.5 Assumptions

Assumption	Comment
Interventions tested in FALCON mirror those in Imperial College/ ENA report.	Broad similarity but unlikely to be an exact match.
50% combined penetration of EVs and HPs is achieved.	May be a fair assumption. Impact of PV not modelled in report.
Interventions tested in FALCON are replicated across GB.	Different DNOs may take somewhat different approaches.
Trial area is representative of GB as a whole.	Several South Midlands sites included.

3.6 New Learning Potential

Summary

- The Project includes a credible plan that defines the learning areas and the processes for gathering data, analysis and managing the knowledge dissemination. The Project has a clearly stated objective to share the knowledge and actively influence the uptake of low-carbon technologies.
- WPD have clearly defined the roles and responsibilities amongst the Project Partners regarding learning, analysis, modelling and knowledge dissemination, which mitigates the potential risks associated with the large number of parties, including the six Project partners, the seven Project suppliers and two Project supporters.

3.6.1 New Learning Assessment

What is the potential for new learning?
• The Project identifies an interesting and potentially valuable feature in using settlement data as an input to modelling loads and power flow. • The Project seeks to inform future investment decisions and identify whether one or more techniques may be applied as alternatives to traditional reinforcement. • As most of the DNOs have networks with similar characteristics for network connection and reinforcement, the Consultants expect that much of what is learnt on this Project will be applicable elsewhere.

What are the plans for disseminating such learning?
• WPD propose to not only share what they learn from this Project but, in doing so, aim to influence the uptake of LCTs and will thus be able to influence demand on the network. • In addition to its role in network strategy and design, the SIM has a key part to play in knowledge capture and dissemination. If the development of the SIM is delayed or the modelling is ineffective there is a risk that the associated learning will also be delayed or less effective. • WPD have proposed an extensive programme for communicating with many interested parties and includes an audit process to check that knowledge capture and transfer are effective.

What is the IP management strategy and does it deviate from the default IPR conditions? If so, how?
• The default IPR arrangements will apply.

Are the IP benefits to partners adequately reflected in the proposal?
• Each Project partner contributes expertise to the Trial and will share in the learning and benefits from the deployment of the Method. • The Consultants' view is that the foreground IPR will satisfy the LCNF default conditions, some elements of the scheme will benefit contributors and may be applicable to other initiatives.

3.6.2 Assumptions

Assumption	Comment
Knowledge is captured and successfully managed within SIM.	Success depends on the performance of the SIM algorithm and the quality of SIM inputs. The risks associated with the delivery of the SIM are captured on the Project Risk Register whilst the use of the Settlement Data as a basic data feed for the SIM allows all DNOs to tailor the model.
Knowledge is transferred by providing information and promoting discussion of the findings from the Project.	In the Consultants' view there is a relatively low risk of ineffective communications across the stakeholders. The high-level communication plan is clearly defined, and diverse opportunities for communication are already established. There is a risk that consumer engagement takes longer than anticipated.
Knowledge will be gained by the stakeholders and contributors, for whom it will provide value.	The knowledge is disseminated under a defined policy and programme structure and is shared between the stakeholders and available to the wider community.

3.7 Risk Assessment

Summary

- The technical interventions proposed by the DNO are feasible subject to the successful deployment of the Method, including the SIM.
- WPD have a high-level Project Risk Register with mitigation plans in place. The six highest scoring risks are summarised in the Project Risk table below
- Three additional risks are identified by the Consultants and are set out in the Further Risks table.

WPD FALCON				
PROJECT RISK				
Index	**Type**	**Risk**	**Mitigation Plan**	**Contingency**
1	Project	The Project delivery team does not have the knowledge required to deliver the Project.	Yes	Not stated
2	Project	Partner perceptions on their Project scope may change as we move from MoU to signing a formal contract.	Yes	Not stated
3	Project	A partner may withdraw from Project or have oversold their solution.	Yes	Not stated
4	Project	The overall Project scope and cost could creep.	Yes	Not stated
5	Project	The SIM software cannot be designed within the required timescales.	Yes	Not stated
6	Project	Aston University together with Birmingham University are unable to deliver against their scope.	Yes	Not stated

WPD FALCON				
FURTHER RISK				
Index	**Type**	**Risk**	**Mitigation Plan**	**Contingency**
1	Project	Insufficient customer engagement and too few I&C demand-side or generation-side contracts.	Yes	No
2	Project	SIM and option selection is ineffective.	Yes	No
3	Project	Improved predictions of demand profile and magnitude identify insufficient capacity headroom.	No	No