

**DEVELOPING FUTURE  
POWER NETWORKS**

**PROJECT PROGRESS REPORT**  
**REPORTING PERIOD:**  
**December 2014 – May 2015**



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## Glossary

Term	Definition
DR5	The price control period covering 2010-2015.
DSM	Demand Side Management.
ESS	Electrical Energy Storage.
KC&D	Knowledge Capture and Dissemination
HST	High Speed Teleprotection.
IPSA	Network Analysis software provided by TNEI as the Network Modelling Tool within the SIM.
Netspan	This is Airspan's proprietary network monitoring tool for the WiMAX communications network.
NMT	Network Modelling Tool – the powerflow analysis software within the SIM.
Power On Fusion	Distribution Management System provided to WPD by GE and modified to form part of the TDMS for the FALCON Trials.
PRG	Project Review Group.
SDRC	Successful Delivery Reward Criteria.
SIM	The Scenario Investment Model is a new Network Modelling Tool being built specifically for the project.
TDMS	Trials Distribution Management System.

## 1 Executive Summary

FALCON is funded through Ofgem's Low Carbon Networks Second Tier funding mechanism. The project commenced in December 2011 and will be complete by 30<sup>th</sup> September 2015.

The project had a series of distinct phases and in previous reports we have indicated that there has been some parallel working for the final parts, this is now complete. Whilst additional data collection activity continues, the final six months have seen the finalisation of the trials, the completion of the load estimation work and the SIM. We are now undertaking the 28 various run of the SIM through to July.

This report details the progress of FALCON, focusing on the last six months, December 2014 to June 2015.

### 1.1 Business Case

As in previous reports, we forecast that there will be no significant benefits (either carbon or financial) during the course of the project trials, as there is no change to the existing DR5 plan. Our approach for capturing benefits for each technique has been documented and a process is in place to ensure any future benefits are captured.

### 1.2 Project Progress

FALCON completed its initial Design Phase in September 2012. The subsequent Build Phase took longer than planned but the Trials Phase took place in parallel with the Build and Consolidate and Share phases. Delivery of project tasks has taken longer than expected, but trials are complete in all of the techniques.

The Mesh Networks trials were behind schedule due to significant technical issues with the innovative telecommunications platform. The trials are now complete and further information is provided within this report.

Key Achievements during this reporting period are:

- Completion of all remaining trials
- Completion of the SIM, now running the 28 scenarios
- 100% Telecoms network coverage for the majority of the period
- Completion of load estimation analytics
- Successful completion of Commercial trials and compilation of the final reports
- Attendance and representation at a number of industry forums and events
- Planning for closure of the project well under way

### 1.3 Project Delivery Structure

#### Project Review Group

The FALCON Project Review Group (PRG) has met twice during this reporting period and the wider project team has been meeting regularly and progressing matters as they have occurred. As the project is approaching the final elements through to completion, the PRG's role is more focussed on the approvals of the reports. More information on this is provided in the overall project report.

#### Resourcing

No resourcing matters to report during this period.

#### Collaboration Partners

There has been no change to the collaboration partners during this reporting period.

### 1.4 Procurement

There has been no procurement activity during this reporting period.

### 1.5 Installation

No installation activity has been undertaken during this period.

### 1.6 Project Risks

Throughout the project the Project Office, Project Manager and Workstream Leaders have taken a proactive role in ensuring effective risk management for FALCON. Processes have been put in place to review whether risks still exist, whether new risks have arisen, whether the likelihood and impact of risks has changed, to report significant changes which adjust risk priorities and deliver assurance of the effectiveness of control.

In keeping with the last report, Section 8 contains the current top risks associated with successfully delivering FALCON as captured in our Risk Register along with an update on the risks captured in our last six monthly project report. **Error! Reference source not found.** provides an update on the most prominent risks identified at the project bid phase as we approach the final push a large number of them are now closed.

### 1.7 Project learning and dissemination

Project lessons learned and what worked well are captured throughout the project lifecycle. They are captured through a series of on-going reviews with stakeholders and project team members, and will be shared in lessons learned workshops at the end of the project.

During this reporting period we have continued to collate and share key areas of learning across the spectrum of the project. Notable key areas during recent months include:

- The successful completion and submission of our SDRCs.
- Our online workshop to share, consult and feedback on these SDRC milestones.
- The completion of the Commercial Trials Season 2 and preparation of final reports.
- Increased profile of FALCON across key industry events and publications.

Whilst knowledge capture continues to be one of the main aims of the project, we are increasing levels of dissemination during the final year, as information becomes available and consultation becomes more relevant.

We have shared our learning where possible, through several events as well as leading industry publications such as The IET's E&T Magazine and Transmission & Distribution World feature articles. Some of the key events are shown here.

Event Title	Information	Contribution
GEODE	The Voice of European Network Operators hosted a sharing event on Smart Grid Programmes in Europe.	Speaker
Utility Week 2015	FALCON used this event as an opportunity to engage a wide variety of stakeholders, as well as present findings on a number of our projects.	Exhibitor & Speaker
Demand Response & Future Networks Conference	Industry event attended by DNOs and regulatory bodies from across the UK.	Speaker
MK Future Cities	Hosted by the Transport Catapult, FALCON was invited to exhibit and present the work in Milton Keynes.	Exhibitor
Smart Grid GB	A joint dissemination event hosted by industry group Smart Grid GB was held to share findings from FALCON across a number of areas such as telecoms, energy storage and data management.	Speaker
The Mathematics of Demand Side Management	An academic audience at The Open University saw a presentation by the FALCON on the successes and challenges of using Electrical Energy Storage (ESS) for Demand Side Management (DSM).	Speaker

Table 1 - Contribution to knowledge sharing events hosted by other organisations

Alongside our ongoing normal dissemination channels including feature articles, our website and newsletters, we will be conducting more targeted events for the remainder of 2015 including a full dissemination event for the entire project after the end date.

Further information in respect of project learning and dissemination is provided in Sections 2 and 6.

## 2 Project Managers Report

### 2.1 Project Background

FALCON is now in its final few months. The aims were to facilitate the installation of low carbon technologies by delivering faster and cheaper connections of the HV network by complementing conventional reinforcement with smarter solutions. The trials will provide learning on the use of real time data to inform network planning rather than traditional indicators such as total demand and engineering guidelines. The learning obtained throughout the project will be shared with other DNOs and the wider industry. In addition to the engineering trials there are two commercial trials which have, over the course of the project, delivered significant new learning for WPD and its stakeholders.

In addition FALCON is building a prototype network modelling tool for 11kV planners, called the Scenario Investment Model (SIM) as well as a WiMAX telecoms network.

FALCON is a large complex delivery and whilst it has been challenging as the project prepares for the final few months it is clear that there is considerable learning.

FALCON has run from January 2012 and will complete its objectives on 30<sup>th</sup> September 2015 with the final SDRC due then.

### 2.2 Project Progress

The FALCON project is into the last three months of its lifecycle. This report focuses on the completion of the trials, and the work ongoing to finalise the load analytics, the SIM and the maintenance of the telecoms network undertaken during months December 2014 to June 2015.

As confirmed in the previous report, the High Speed Tele-protection (HST) requirements meant a rescope of the meshing trials and the consequent removal of the build of a complex mesh. We have completed a simple mesh network as planned.

Should the telecoms providers be able to improve the performance of their products to meet the engineering requirements then the complex meshing scheme may be revisited outside the scope of Project FALCON.

The construction and commissioning of infrastructure at the trial sites has been considerably more extensive than originally planned, but has provided learning which we will discuss in more detail within this report and in further depth throughout our suite of closing reports.

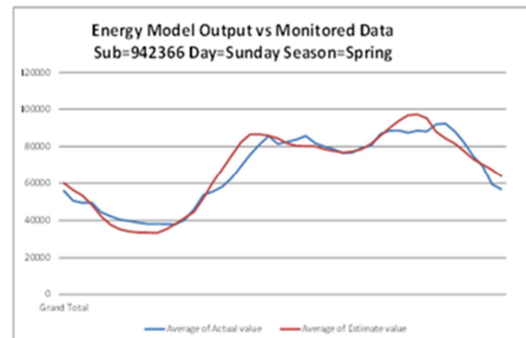
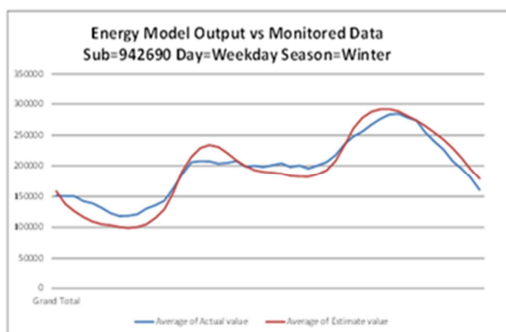
The Engineering trials started during 2014 with some of the techniques operational since December 2013, ensuring that a years' worth of data is available. Whilst some of the trials did run behind schedule we have ensured that data capture has been the focus of our



mitigating actions throughout. Data is the key requirement for the SIM and therefore been a constant factor throughout our planning and actions.

The SIM workstream is running well and to timescale. We have experienced some issues with the integration of the SIM Harness and the IPSA Network Modelling Tool, but these have been resolved. The SIM itself is now completed and the various runs are being undertaken. Significant time and effort has been spent making sure that the system works in the way that it was intended and therefore whilst there has been delays it was always seen as more important to make the system work. Early indications are that the SIM is indeed proving to be of value, but as the runs are completed the full value will become clearer.

SDRC 4 delivered our energy modelling findings that went into the SIM, as well as our consultation process, and we have followed this up with industry presentations on the FALCON model including Smart Energy Analytics in May and our dissemination event with Smart Grid GB in June. As the examples below show, our refined models can get excellent results when overlaid with actual data.



**FALCON Energy Model Actual vs Estimated 1**

As mentioned in the previous report, the Trials Distribution Management System (TDMS) built by GE for FALCON was delivered as part of their product release cycle. This would have allowed the functionality to be available within WPD and to other users of the system with immediate effect. However this approach has meant that extensive testing both within “business as usual” and the FALCON teams has been required which could have delayed data collection. We mitigated this project risk, by working on supplementary data collection solutions where appropriate to ensure that data for the trials and the SIM is captured.

The second set of revised Commercial Trials ran successfully over the winter period of 2014-2015 and the billing run was completed. The results have been analysed and the findings are being disseminated throughout the remainder of the summer. We have already begun to share findings at some of the events mentioned in the summary.

During the last reporting period we explained some of the challenges in the engineering trials that were exacerbated by issues with the new Telecoms WiMAX based network. Some ad-hoc periods of instability prevented some of the automated parts of the

engineering trials starting and we are now intending to run those parts of the ALT and Mesh trials over backup communications network solutions (using proven BAU solutions). We now have good connectivity across 192 sites with limited instability. We have discussed the telecoms installations in our last report and whilst this is new technology, we have learnt a huge amount in our work with the FALCON system and we will continue to learn from it as we go forward.

We have shared our findings on both the overall system and WiMAX alone with the industry and through our project partners. Our closing reports will provide more in depth detail and our final event will summarise key areas of learning.

Our high level plan for the remainder of the project is shown in Figure 1 and remains again unchanged from the last report:

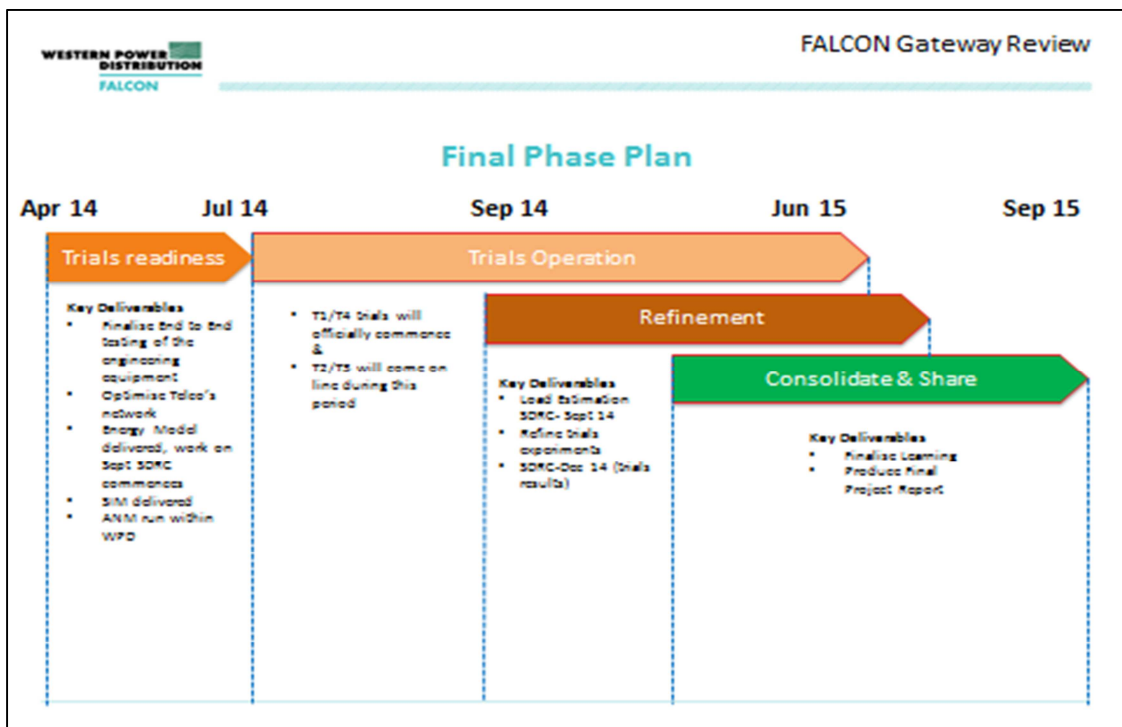


Figure 1 - Final Phase Plan

We have been planning the content of the final reports since January and have a number of drafts ready for completion once the final parts of the project have been completed. This has been a focus of the last few months in particular given the delays in some areas of the project and the need to map out properly how best to disseminate the learning to the relevant areas. In addition the planning of the final parts of the project has proven a useful opportunity to reflect on the project overall and produced some interesting additional learning that will part of the overall learning report.

The remaining sections of the report reflect the progress within each project area.

### 2.3 Progress against Knowledge Capture and Dissemination

The Knowledge Capture and Dissemination part of the project continues to make consistent and positive progress as we move into the final period of the project. The final reports will form the basis of our outputs in detail from each area of Project FALCON.

Further information is contained with Section 6 of this report however, some of the main achievements in this reporting period include:

- The on time completion of SDRCs 5 and 6 delivered at the end of 2014, with a follow up webinar presented on January 29<sup>th</sup>. Both of these items are readily available on our website.
- We took the FALCON display and our set of interactive models to Utility Week Live 2015, a major industry event, during the week of 20<sup>th</sup> April. We also have videos of these models in operation on our website and social media outlets.
- We complimented the above demonstrations by presenting findings from Season 2 of our Commercial Trials at Utility Week Live, also driving people to see our models in action.
- Our newsletter issued in April, was designed to share our findings from the Dynamic Asset Rating trials and offered updates on the other techniques. These are all available through our website.

We have completed a number of further speaking opportunities and our plans for our closing event in October following our final reporting period in September are taking shape. All of these reports and events will be made public both through our website and social media channels, as well as emailed to our existing key stakeholder list.

There are no risks with this work stream at the time of this report.

### 2.4 Progress against Installation activities

#### Engineering Techniques

The engineering trials are now complete. We have had some challenges throughout the project, but we have completed a set of trials that are robust. As stated in previous reports, issues were encountered during commissioning the trials equipment and the FALCON telecoms solution. These issues meant that the trials switchgear equipment could not be commissioned over the project WiMAX solution. Instead they were commissioned over legacy UHF telecoms.

The status of each of the trials is shown in Table 2 below:

Technique	Status
DAR - Technique 1 Overhead Line, cables, secondary transformers	Data collection undertaken and the thermal modelling validated against actual temperatures and a variety of operating circumstances.

<p>&amp; Primary Transformers</p>	<p>Initial learning from installation, commissioning, early operation and implications for the SIM have been reported in December 2014 SDRC report.</p> <p>Final reporting is expected to focus on:</p> <ul style="list-style-type: none"> <li>• Design, construction and commissioning of the technique</li> <li>• Thermal models and instantaneous ampacity assessments</li> <li>• Forward ampacity based on forecast ambient conditions</li> <li>• Application recommendations based on trials</li> </ul>
<p>ALT and Mesh - T2 and T3- remote control</p>	<p>Early operational instability of FALCON telecoms network led to plans being made for interim commissioning of remote control of the switchgear in these techniques via current policy UHF communications.</p> <p>Commissioned switchgear via UHF solution, and FALCON comms solution not used for control of plant under this project. Recommendations associated with this will be included in the final report.</p>
<p>ALT - Technique 2- Automated Load Transfer</p>	<p>Trials of network reconfigurations on the underground and overhead trial networks have taken place focusing on optimisation for network voltage and losses, and also on load balancing.</p> <p>Initial learning from installation, commissioning, early operation and implications for the SIM have been reported in December 2014 SDRC report.</p> <p>Final reporting is expected to focus on:</p> <ul style="list-style-type: none"> <li>• Design, construction and commissioning of the technique</li> <li>• Modelling and benefit assessment of potential changes to open points</li> <li>• Trials of revised open points &amp; evaluation of benefits</li> <li>• Application Recommendations resulting from the Trials</li> </ul>
<p>Mesh - Technique 3- Meshed Network</p>	<p>High speed signalling over the FALCON Telecoms network has not yet been satisfactorily achieved and the implementation programme has therefore been adjusted.</p> <p>Efforts have continued to improve high speed switching times whilst protection arrangements are implemented that allowed operation of the simple mesh network. Results of this are under way now and will form part of the final data collection activities.</p> <p>Commissioning of revised simple mesh trials were commissioned Q2 2015, with trials commencing monitoring and modelling the benefits of closed ring/mesh operation.</p> <p>Final reporting is expected to focus on:</p> <ul style="list-style-type: none"> <li>• Design, construction and commissioning of the technique</li> </ul>

	<ul style="list-style-type: none"> <li>• Modelling and benefit assessment of closed ring/mesh operation</li> <li>• Trials of closed ring/mesh operation</li> <li>• Application Recommendations resulting from the Trials</li> </ul>
T4 – Energy Storage	<p>Further trials in this period focused on the impact of combined sites operations on the feeder, and also on voltage influence. Initial learning from installation, commissioning, early operation and implications for the SIM were reported in December 2014 SDRC report.</p> <p>Final reporting is expected to focus on:</p> <ul style="list-style-type: none"> <li>• Design, construction and commissioning</li> <li>• Basic operation characteristics, including control system</li> <li>• Reliability and availability</li> <li>• Peak Shaving/potential to provide 11kV feeder capacity support</li> <li>• Frequency Response</li> <li>• Voltage response</li> <li>• Power Quality</li> </ul>
LVM	<p>Data is now being consistently captured from all the sites that FALCON comms have been connected to. This data is available via access databases and has positively fed into learning on substation profiles through comparison with the work of EST.</p> <p>Final reporting is expected to focus on:</p> <ul style="list-style-type: none"> <li>• Design, construction and commissioning</li> <li>• Basic operation characteristics, and reported data</li> <li>• Reliability and availability</li> <li>• Application Recommendations resulting from the Trials</li> </ul>

Table 2 - Engineering Trials status

## Telecoms

We have continued to support the network components installed and conduct monitoring of the health of the network overall. Over the current period we have seen a sustained level of availability and have been operating the network in a routine manner. We have also contacted the JRC to enquire about the future status of the trial WiMAX “licence to test” that we have been using and seeking their inputs for inclusion in the final report.

In the final network configuration we have 192 active locations (including the primary sites). These are returning both intervention technique data and LVM data files (158 sites). The network management activities include quick look analysis using the monitoring tools, routine inspection, occasional router reboots and proactive activities to improve radio statistics in a process of continuous improvement and optimisation.

For example, adjustments have been required at Marlborough Street Primary substation that connects via the site Newport Pagnell. The antenna for this was previously mounted in such a way it was directed at an adjacent pole and hindering the connection so minor physical adjustments have been required to maximise coverage moving forward.

We have also made further refinements to some local antennas to maximise our continuous coverage results which has improved some areas with seasonally patchy reception. These findings continue to be made as seasonal alterations bring alterations to items such as foliage growth and loss.

**Key engineering and telecoms risks**

Risk	Mitigation
Installations will not be complete by the end of the Build Phase	<p>A detailed installation plan has been developed and has been shared with all parties involved in the installation. The team have closely liaised with the team managers and Surf Telecoms team managers to ensure resources are available when needed.</p> <p><b>Update:</b> This risk came to fruition for the engineering techniques and telecoms– the installation activity wasn’t complete by the end of September 2013.</p> <p>This risk is now closed and implementation activity ceased early in 2015.</p>
The technology used in the Project doesn’t work - it may fail during testing	<p>Detailed designs, descriptions and testing plans are being created or have already been created. The equipment has been tested in the test lab before it has been deployed on the network. We have ensured that there has been and will continue to be close liaison between suppliers, partners and WPD to develop a deliverable solution. We continue to use the lab to test equipment and we remain confident that at the conclusion of installation activity it will work but have catered for some end to end testing to ensure it does.</p> <p><b>Update:</b>            There have been some issues with the CISCO and Airspan integration. Whilst they are adequate on our existing trial basis, there is still one issue to be resolved. We believe this is linked to a firmware issue and the issue has been escalated both within CISCO and Airspan. For this system to be rolled out on a wider scale, this would need resolving before it commenced and the issue remains with the supplier’s R&amp;D lab in San Jose for research and rectification</p>

	before any adoption of it on a wider basis.
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Table 3 - Key engineering and telecoms risks

## 2.5 Progress against Commercial Trials

The commercial trials were altered for season 2 in order to improve on the successes of the first trials and address some of the challenges.

On the whole the trials were successful with the initial impression of the changes over season 1 having a positive impact on the overall performance and value of Demand Response services. Most notably the reliability of the participants would appear to have been significantly improved from <70% in season 1 to >90% in season 2. Much of this is being initially related to the longer advance notice period for operation of the assets (week ahead notifications).

Previous trials were entirely formed of Distributed Generation, however, the second set of trials also saw some load reduction operated. As previously, only one site was contracted directly, with the remainder provided by commercial service providers.

Despite the doubling of the incentive payment and an open invitation to all aggregators to recruit there were none able to offer any load reduction capacity. This raises further concern that the volumes of reduction capacity hoped to be there in some industry forecasts are not yet there.

With the data from the customer sites, as well as on 11kV and 33kV transformers, we have also been able to determine the scale of the impact throughout the network. The analysis is near completion and results of this will be published in the T5&6 full report.

We have been actively sharing the findings of season 2 results across industry events, notably most recently at the co-hosted Smart Grid GB event. It was also included in our industry newsletter distributed to nearly 500 people and published online.

During July and August, we will also be issuing a targeted consultation paper to our industry colleagues to explain our findings and how we intend to continue.

### Key risks

Risk	Mitigation
Demand Turndown availability will not materialise	There is a risk that we will not have secured sufficient volume to fully demonstrate this aspect of the trial, but we are actively working with a number of prospects to ensure that we can operate this part of the trial.  <b>Update:</b> This risk came to fruition last winter and we

	<p>worked closely with partners in the Milton Keynes area to secure customers willing to take part in the winter 2014/15 trials.</p> <p>We secured a small amount of load turndown from a directly recruited participant who also provided generation. Whilst this was not as high as would be preferred, it was excellent for the trials.</p> <p>This risk is now closed.</p>
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Table 2-5 - Key Commercial Techniques risks

## 2.6 Progress against Scenario Investment Model

The SIM Workstream has delivered a working SIM and the “runs” are being undertaken now. This builds on the successful delivery of all of the previous SDRCs and deliverables. We finished integration and result validation testing with the NMT, IPSA. This took longer than planned due to the need for the NMT supplier to keep their product development and release schedules working to their own external schedule, and also because we had to conduct a long series of validation tests to ensure that we understood the SIM outputs.

Overall the SIM workstream produced few surprises and followed the path of a typical complex software integration which we are also documenting for the final report. We have been developing and integrating further components and completed this by the end of January 2014. A number of other matters have delayed completion but we were able to do some parallel work that has kept us on track. Since May we have been undertaking the various “runs” of the SIM (there are 28 in total, some of which are small, some much larger). These will be completed by the end of July. These runs form the basis of the network analysis from which we will draw out final report conclusions.

CGI managed the SIM aspects of the project because of their expertise in systems integration activities. This has proven to be invaluable during the complex integration and validation testing aspects and whilst it has been challenging, there have been many lessons that have been learnt about the development of this type of complex IT within a DNO.

We are extremely pleased with the progress of the SIM workstream and the quality of the work being undertaken. This has validated the approach undertaken throughout and pointed the way to future development which is currently being planned.

One of the key aspects of this workstream has been the reliance on TNEI as the providers of the Network Modelling Tool. It has been clear throughout that trying to develop a new type of software solution with a core piece of industry software at the centre, has been more challenging than we thought it would be, but in mitigation the solution is new, as is the way that we are using IPSA. In addition of course, we have to recognise that IPSA also has its own release schedule for TNEI’s many other clients that we have had to work around.



Development of the SIM further will need to factor in these lessons.

**Key risks**

Risk	Mitigation
TNEI and IVHM Centre can't make the SIM work as a whole	Cranfield University's IVHM Centre, TNEI, CGI and WPD are working closely together to ensure requirements, roles and responsibilities are clear (and reflected contractually, where appropriate) as well as ensuring a common understanding. Interface documents between the NMT and the SIM Harness are being developed as part of the detailed design to ensure the two elements can work. This of course remains a risk to an extent, but we are increasingly confident that the SIM project will deliver to requirements and therefore intend to only monitor this risk moving forward. <b>Update:</b> Risk is closed.
Validation/Verification of Results	There is a risk that we might be able to make the SIM work but the results will not be meaningful. This requires a vigilant eye on the work-stream to ensure that the overall design is in line with expectations and that its core functions are doing what we envisaged. We will report on this risk more in the next report as it will become clearer over the next period whether the SIM is doing what we intended. <b>Update:</b> This risk will be closed once real data is run through and results validated which we believe to be shortly as the SIM runs will be completed by end of July.

Table 2 5 - Key SIM risks

**2.7 Progress against Load Estimation**

Recent work relating to the Energy Model has focussed on creating the many output files containing the load data that will be used by the SIM. This work is progressing well. As well as the four main load scenarios which were the subject of a consultation with other DNOs, there is a need to create variations of these scenarios to allow for sensitivity testing. Data from UK Power Network's Low Carbon London project has been adapted for use in sensitivity tests around Electric Vehicle charging. Other values have been determined to test sensitivity to clustering factors.

Previously, the EST modelled values have been compared to values obtained by substation monitoring. Where large differences were found these tended to reflect issues with customer data being missing or out of date. The majority of the substations included in the Energy Model are not monitored and so another validation check has been performed using estimates that are based on the settlement process. Where unusually high or low values are found a correction factor has been applied.

There is no change to the previous position of risk and mitigation.

Risk	Mitigation
Risk that the Energy Model does not deliver the quality of results that we expected	<b>Update:</b> This is now closed as the Energy Model output has been validated against the monitoring data. The change to peak demand for the demand scenarios as seen in 2050 has been compared to similar estimates and is within a credible range.
Risk that the NMT is not capable of handling the volumes of data	Have run early DAR technique through NMT and SIM and used NMT for SDRC in September 2013 to test capability. We have no concerns moving forward on this risk.  <b>Update:</b> Risk is now closed

Table 2-5 - Key Load Estimation risks

### 3 Business Case Update

We forecast that there will be no significant benefits (either carbon or financial) during the course of the project trials, as there is no change to the existing DR5 plan. Our approach for capturing benefits for each technique has been documented and a process is in place to ensure any future benefits are captured.

## 4 Progress against Budget

A revised budget has been submitted to Ofgem to reflect the updated project plan. For the purposes of this report, progress against the previous budget is shown below whilst the change request is under consideration. We have though provided some commentary and background below on the background behind the change to the budget.

	Total Budget	Forecast Spend May 2015	Actual Spend May 2015	Variance £	Variance %	Comments
<b>Labour</b>	<b>2281</b>	<b>1724.8</b>	<b>1210</b>	<b>515</b>	<b>-43%</b>	
Project Management Costs (WPD)	813	601	477	-124	-26%	Contractors being used to cover internal resources. Budget Change Request addresses this.
WPD Design Team	1468	1124	733	-391	-53%	Contractors being used to cover internal resources. Budget Change Request addresses this.
<b>Equipment</b>	<b>1679</b>	<b>1664</b>	<b>2009</b>	<b>345</b>	<b>17%</b>	
Solution Design - Use Cases Review and finalise use cases	8	7	4	-2	-56%	
Solution Design - Use Cases Detailed desktop network design	56	44	29	-15	-52%	
Solution Design -Method infrastructure scenario investment model Design	8	7	4	-3	-73%	
Deploy intervention techniques Intervention technique 1 - Dynamic Asset Management	61	61	63	2	3%	
Deploy intervention techniques Intervention technique 2 - Automatic Load Transfer	12	12	11	-1	-7%	
Deploy intervention techniques Intervention technique 3 - Meshed Networks	138	138	129	-9	-7%	
Deploy intervention techniques Intervention technique 4 - Storage	1388	1388	1762	374	21%	Budget change request addresses this- costs within this category contain other items.
Operate Scenario Investment Model Deploy learning from intervention techniques to SIM	8	8	8	0	-5%	
<b>Contractors</b>	<b>6012</b>	<b>5622</b>	<b>5449</b>	<b>-173</b>	<b>-3%</b>	
Project Management Costs (Logica)	736	604	1097	493	45%	WPD Resources

						filled by Contractors, budget change request addresses this.
Solution Design - Use Cases Review and finalise use cases	<b>240</b>	215	219	4	2%	
Solution Design - Use Cases Detailed desktop network design	<b>287</b>	287	466	179	38%	
Solution Design -Method infrastructure scenario investment model Design	<b>325</b>	277	283	6	2%	
Scenario Investment Model Build Scenario Investment Model Software Development	<b>244</b>	233	237	5	2%	
Deploy monitoring equipment infrastructure Deploy IP infrastructure	<b>6</b>	262	6	-256	-4177%	
Deploy intervention techniques Intervention technique 1 - Dynamic Asset Management	<b>3</b>	3	3	0	2%	
Deploy intervention techniques Intervention technique 2 - Automatic Load Transfer	<b>1671</b>	1683	1717	35	2%	
Deploy intervention techniques Intervention technique 3 - Meshed Networks	<b>73</b>	66	67	1	2%	
Deploy intervention techniques Intervention technique 4 - Storage	<b>336</b>	153	156	3	2%	
Deploy intervention techniques Intervention technique 5 - Distributed Generation	<b>44</b>	34	35	1	2%	
Deploy intervention techniques Intervention technique 6 - Demand Side Management	<b>86</b>	71	73	1	2%	
Operate trials Intervention technique 2 - Automatic Load Transfer	<b>24</b>	23	23	0	2%	
Operate trials Intervention technique 3 - Meshed Networks	<b>7</b>	7	1	-6	-488%	
Operate trials Intervention technique 5 - Distributed Generation	<b>90</b>	87	50	-37	-75%	
Operate trials Intervention technique 6 - Demand Side Management	<b>90</b>	87	50	-37	-75%	
Operate Scenario Investment Model Gather intervention technique results	<b>218</b>	241	201	-40	-20%	
Operate Scenario Investment Model Assess Results	<b>397</b>	414	198	-216	-109%	
Operate Scenario Investment Model Deploy learning from intervention techniques to SIM	<b>245</b>	240	212	-28	-13%	
Operate modified trials Assess Results	<b>56</b>	56	10	-46	-488%	
Learning dissemination Market research with stakeholders	<b>28</b>	441	311	-130	-42%	Contract with Bath University terminated, more cost effective alternative for K,C&D now being
Learning dissemination Electronic media	<b>49</b>	10	0	-10	-4245%	
Learning dissemination Workshops / seminars	<b>302</b>	35	5	-30	-539%	

Learning dissemination FALCON Dissemination conferences	73	3	0	-2	-1072%	deployed compared to original spend profile
Learning dissemination Academic dissemination	120	35	9	-26	-280%	
Learning dissemination Other media	41	3	0	-2	-1016%	
Learning dissemination Reports	132	31	16	-15	-99%	
Learning dissemination Training	91	21	2	-19	-980%	
<b>IT</b>	<b>2914</b>	<b>2476</b>	<b>2553</b>	<b>77</b>	<b>3%</b>	
WPD IT Costs - Hardware and connection	72	61	54	-7	-13%	Recently re-forecast Telecommunication s expenditure has been reallocated within 'IT'; this will be reflected by a subsequent decrease in the 'Labour' & 'Other' categories once the re-forecast costs have been re-submitted via the change request process.
Solution Design - Use Cases Detailed desktop network design	247	210	302	92	30%	
Scenario Investment Model Build Hardware/Software purchase	97	82	134	52	39%	
Deploy monitoring equipment infrastructure Deploy IP infrastructure	1620	1377	1002	-375	-37%	
Deploy intervention techniques Intervention technique 1 - Dynamic Asset Management	133	113	163	50	31%	
Deploy intervention techniques Intervention technique 2 - Automatic Load Transfer	133	113	163	50	31%	
Deploy intervention techniques Intervention technique 3 - Meshed Networks	133	113	163	50	31%	
Deploy intervention techniques Intervention technique 4 - Storage	133	113	163	50	31%	
Deploy intervention techniques Intervention technique 5 - Distributed Generation	135	115	165	50	30%	
Deploy intervention techniques Intervention technique 6 - Demand Side Management	173	147	221	74	34%	
Operate Scenario Investment Model Assess Results	35	30	22	-8	-34%	
Learning dissemination Market research with stakeholders	2	2	1	0	-26%	
<b>IPR Costs</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0%</b>	
<b>Travel &amp; Expenses</b>	<b>329</b>	<b>280</b>	<b>290</b>	<b>9</b>	<b>3%</b>	
Phase 1 - Solution Design	157	127	138	10	8%	
Phase 2 - Solution Build	124	108	118	10	9%	
Phase 3 - Trial Implementation	21	20	25	5	21%	
Learning Dissemination	28	25	8	-17	-199%	
<b>Payments to users</b>	<b>240</b>	<b>228</b>	<b>127</b>	<b>-101</b>	<b>-79%</b>	
Operate modified trials Gather intervention technique results	240	228	127	-101	-79%	The remainder of budget to be spent over the 2014/15 Winter trials
<b>Contingency</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0%</b>	
<b>Decommissioning</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0%</b>	
<b>Other</b>	<b>668</b>	<b>635</b>	<b>701</b>	<b>67</b>	<b>9%</b>	
Phase 1 - Solution Design	421	400	366	-34	-9%	

Phase 2 - Solution Build	<b>95</b>	90	136	45	33%
Phase 3 - Trial Implementation	<b>106</b>	101	94	-7	-7%
Learning dissemination	<b>46</b>	44	105	62	58%
<b>TOTAL</b>	<b>14123</b>	<b>12630</b>	<b>12340</b>	<b>-291</b>	<b>-2%</b>

Table 4 - Progress against budget

During the lifecycle of the project it has become increasingly apparent that the original budget structure was not suitable. It doesn't allow stakeholders to ascertain the underlying costs of each technique and some of the key elements were "bucketed" together with other line items making it complex for what was budgeted and where.

Clarity on costs is vital for the validation contained within the SIM so therefore we took a decision to construct a new budget based on the actual costs of each technique and what we had learnt to date. This has proven to be a large and time consuming exercise and whilst the new budget remains under discussion, we are confident that it is in the best interests of the project and stakeholders.

## 5 Successful Delivery Reward Criteria (SDRC)

We had two SDRCs due in this period delivered on time at the end of 2014 – SDRC’s 5 and 6.

SDRC	Status	Due Date	Comments
The Engineering Intervention Technique trials 1-4 will be deployed onto the network and the results loaded on the SIM ( <i>the outcomes of the trials will be used to modify the model, which feed into the SIM</i> ). The results will be analysed and available for dissemination by December 2014.	Green	31/12/2014	This was delivered on time.
The Commercial intervention technique trials will be deployed onto the network. The results will be analysed and dissemination by December 2014.	Green	31/12/2014	This was delivered on time.

Table 5

### 5.1 Future SDRCs

Table 5-1 captures the remaining SDRC for completion during the project life cycle. Work is well under way to plan out the various constituent parts of this SDRC as detailed in the tables below.

SDRC	Status	Due Date	Comments
Assess the suitability of the Method for mainstream adoption and produce an optimum investment plan by 30th September 2015.	Green	30/09/2015	We are well on track to complete this SDRC. There are a number of key milestones and deliverables contained within it and a summary is provided below for clarification

Table 5-1 - SDRCs to be completed

Milestone	Status
An optimised future business plan for the trials area will be developed. We will be able to compare this plan with the results of the updated run of the SIM outlined in criterion 9.4.	Work to complete this is underway.
We will obtain an understanding of key sensitivities of low carbon uptake rates in a defined area and discuss these with Ofgem to assist in the design of suitable regulatory mechanisms.	Will form part of the final report on data and load estimation.

Milestone	Status
As the intervention technique data becomes available the SIM will be refined with multiple intervention techniques deployments and iterations of the SIM.	Work on the future of the SIM and options in under discussion
We will continue to develop the future low carbon update data, taking into account latest developments in government policy and low carbon technology.	Will form part of the final report on data and load estimation.
The industry data will also continue to be enhanced including the introduction of data from smart meters installed in the trials area.	Will form part of the final report on data and load estimation.

Table 5-2 - Milestones to be completed

Criterion	Status
Improved Industry data will be documented and shared with the industry.	Document under construction.
An investment plan will be developed and operational manuals for each intervention technique will be developed and available for dissemination.	Document being developed.
A final report consolidating learning and the recommendations from the SIM will be developed and available for dissemination.	Document being developed.
Workshops will take place with other DNOs and Government to explore how the SIM can inform network investment and policy (Milestone DE5).	Under planning.
A final report consolidating all the learning from the project will be produced. This will included recommendation for follow on projects, if appropriate and lessons learnt from each phase of the project.	Document being developed.
A final project symposium to share the outputs of the SIM will take place (Milestone DE6) and the findings and the outputs of the whole project will be shared.	Under planning.

Table 5-3 – Criterion to be met



## 6 Learning Outcomes

Knowledge Capture and Dissemination (KC&D) continues to collect at the same pace as each workstream, with regular reviews continuing with key internal stakeholders and the Project Leads. Each Project Lead is now in the phase of collation of the final 6 months of learning all to be compiled and reported at the end of the project.

With the final few months now ahead of us, the emphasis remains on appropriate consultation and dissemination. We have a phased output of relevant and targeted reports and events to cover each workstream, as well as engaging in similar consultations with our colleagues in the industry to support collaborative industry efforts. We have already conducted the presentations and workshops presented in Section 1.7 of this document and aside from our main closing event, expected to be in October, after project closure, we will continue to remain engaged in appropriate events.

In terms of reporting, we are analysing the last pieces of data and continuing with the SIM runs in order to offer a complete suite of reports for each project area. The commercial trials results will be published first as they were drawn to a close early this year. We expect to issue these trials results in July, to compliment the interim report we issued the same time in 2014. The commercial techniques themselves will be included to some extent in the SIM final report as a potential modelling tool.

Internally, we have embarked on a period of dissemination to provide closing outputs for the project across the business. We also expect to produce a final piece in the company magazine Powerlines later this year which goes to all WPD staff, past and present. We are also arranging a business display of the interactive models at our two main sites, to ensure internal coverage of the project is at a maximum. This will also support the transition of both FALCON and newer low carbon alternatives into business as usual procedures.

Our learning outcomes have been collated and reflected under the seven broad categories as shown below:

### **Customer Engagement**

This period has required limited customer engagement from the project outside the commercial trials. Much of our engagement in the past has been in relation to the build phases of the engineering trials and this was completed some time ago.

We have continued to work closely with local I&C consumers however, mainly those who were trials participants, both directly and indirectly recruited.

Some of our local stakeholder engagement does stretch to customer engagement as the nature of the local activities sees FALCON exposure to regional bill payers. For example, local Universities and Government bodies.

### **Project Management, Procurement & Legal**

We have learnt a lot about Programme and Project Management from FALCON. As our procurement and legal activities were complete in 2014, this reporting period does not have any new information to report, however, we will be producing a lessons learnt section on Project Management coming from FALCON which we will make available to interested stakeholders as part of the final reporting suite.

### **Construction Process**

This period has seen little or no construction and focussed on trials activities alone.

### **Technology & Equipment**

By the very nature of this project, we are always learning from technology and equipment. We continue to refine the telecoms infrastructure as new situations arise that are unpredictable. For example sudden extremes of weather or the development of new buildings not previously in line of sight, can affect individual signals. These are recorded and dealt with on a case by case basis to maintain maximum coverage.

We experience rare pieces of downtime on our storage sites, again, recorded and addressed on a case by case basis.

All of our learning will be shared in our closing reports.

### **People & Culture**

We have a much higher awareness of FALCON across both the business and the industry now. Not only has our engagement spanned the UK industry, but we have also begun sharing information with interested parties from South East Asia (TNB – Malaysian electric utility), Turkey, Australia and North America.

Our last few months on the project will see more engagement with stakeholders and the summary of this document touches on some examples. We will also be continuing to consult with our colleagues in the DNO industry and policy makers as is necessary for our final SDRC.

### **Industry Processes & Regulations**

The findings from FALCON are being used across two key areas – academia and industry. Both the academics involved directly on the project from Aston University, Cranfield University and The Open University have benefited, as well as industry groups, such the Energy Storage Operators Forum and the DSR Shared Services Group.

The findings from FALCON have also been used in the UK wide Good Practice Guide for storage on a DNO network.

## IT & Telecommunications

We have already provided some feedback on telecoms and our largest piece of IT software will be the SIM. The SIM is completing its final runs and we look forward to sharing the results in more depth as they become complete.

## 7 Intellectual Property Rights

There is no IPR generated or registered during this reporting period and it is not expected that we will register any IPR in the next period.

## 8 Risk Management

As stated in previous Reports, our risk management objectives are to:

- ensure that risk management is clearly and consistently integrated into the project management activities and evidenced through the project documentation;
- comply with WPDs risk management processes and any governance requirements as specified by Ofgem; and
- anticipate and respond to changing project requirements.

These objectives will be achieved by:

- ✓ defining the roles, responsibilities and reporting lines within the team for risk management
- ✓ including risk management issues when writing reports and considering decisions
- ✓ maintaining a risk register
- ✓ communicating risks and ensuring suitable training and supervision is provided
- ✓ preparing mitigation action plans
- ✓ preparing contingency action plans
- ✓ regular monitoring and updating of risks and the risk controls

### 8.1 Current Issues

There are no current issues to report and the project is now closing down many outstanding matters as we move into the closing months of the project.

### 8.2 Current Risks

The FALCON risk register is a live document and is updated regularly. There are currently 29 live project related risks. Mitigation action plans are identified when raising a risk and the appropriate steps then taken to ensure risks do not become issues wherever possible. In 8-1, we give details of our top five current risks by category and also those risks that we have been actively tracking since the last report. For each of these risks, a mitigation action plan has been identified and the progress of these are tracked and reported.

No new risks have occurred within the last reporting period.

Risk	Risk Rating	Mitigation Action Plan	Progress
There is a risk that when TDMS is delivered that it will not work in the way that the team envisaged.	Minor	We have a mitigation to get data back for the trials. Whilst TDMS was initially set out to be a single system solution, we have recognised that it is	Now that we are not progressing with a multi-platform TDMS this risk no longer presents a potential threat to the delivery.

Risk	Risk Rating	Mitigation Action Plan	Progress
		harder to integrate it seamlessly in the timescales required. We ensured that we could obtain data by alternative mechanisms so as not to delay the trials and impact the SIM.	<b>Update:</b> Risk now closed
We are currently experiencing server maintenance matters for the Netspan system. The Netspan system provides an overview of the signal strength of the radio network .There is a risk that some data may be lost in the event of a failure at the data centre.	Minor	The FALCON Comms Network is relatively new and establishing the appropriate support arrangements is crucial. We are actively engaging with the internal stakeholders to ensure the level of support is provided for the trials.  Data loss will be small in the event of an outage as the Project Team take backups periodically.	Steady progress has been made to make sure that the relevant support arrangements are in place and this is now under control. <b>Update:</b> Risk reduced and contingency measures have been in place. Network stable.
Requirements misunderstood or misinterpreted. There is a risk that the SIM requirements may have been misunderstood and that when the system goes live that this will only come to light then.	Moderate	Continual dialogue throughout the project with Users and other parties as well as ensuring that the team remains consistent throughout should mitigate this risk	This is always a risk in projects such as this, but we are confident that given the approach to date that this is being managed. We are using specialist consultants from CGI to treat this risk. User Acceptance Testing will also act as an early warning.
If trials equipment needs to be commissioned over WiMAX at a later date, the project will incur time additional resource costs and potentially additional support costs from Cisco	Minor	Ensure that Surf Telecoms are engaged so that handover from Cisco to Surf is achieved.	Cut over to the WiMAX solution for mesh operation will happen beyond FALCON timescales if justified.

Risk	Risk Rating	Mitigation Action Plan	Progress
(unless Surf have built up technical knowledge)			
The Energy Storage Systems may emit a noise, which is of a pitch that is unacceptable to customers in the vicinity of the installation.	Minor	We initially selected one site where we can test the devices and make any impact on the local community minimal.	<p>We are installing and commissioning one site at a time to fully assess the impact of the noise. Three of the five sites chosen are away from customer premises, and therefore will have minimal impact.</p> <p>The remaining two are close to residential houses; these are now installed and we continue to monitor the situation.</p> <p>In parallel, we are looking at sound cancelling methods. More information will be provided on this in the final report, but this is now closed.</p>
The technology used in the Project doesn't work	Minor	As the equipment is installed it may not deliver what we expect or it fails during testing	Detailed designs, descriptions and testing plans are or have been created. The Technical Design Architect owns the whole design and it's 'deliverability'. The test lab functionality ensures that we are able to test the equipment to be deployed on the network before field testing commences. We have ensured that there has

Risk	Risk Rating	Mitigation Action Plan	Progress
			<p>been and will continue to be close liaison between suppliers, partners and WPD to develop a deliverable solution. We will not know this for certain until we have carried out our End to End testing.</p> <p><b>Update:</b> This risk is now very much under control, but is still monitored whilst we collect final bits of data.</p>
<p>The whole solution does not integrate effectively (For clarity, the whole solution may not integrate at a suitable level of quality in the time and cost constraints of the project)</p>	<p>Minor</p>	<p>There are a number of solutions within the overall design and there is a risk that the whole solution might not work.</p>	<p>Detailed requirements and designs have been developed in conjunction with impacted parties e.g. Cranfield University, TNEI and WPD IR. Interface specifications are being developed and reviewed as a technical community – members from project partners, the core project team and WPD. As stated previously the Technical Design Architect owns the whole design and it's 'deliverability'. Our testing and integration planning should ensure that this is tested robustly.</p> <p><b>Update:</b> Risk is under monitoring as this may well come to fruition during the trials.</p>

Risk	Risk Rating	Mitigation Action Plan	Progress
Little or no uptake in commercial trials (techniques 5 & 6)	Minor	There is a risk that, even with the expertise now recruited into the project team, customers are not interested in taking part in the trials, either due to not enough financial incentive or just not interested in the concept.	Risk for T5 – demand turn down came to fruition in 2013 despite our best efforts. Generation customers (T6) had been very responsive, but demand response customers have failed to materialise for the last trial period. <b>Update:</b> Risk closed
Costs exceed the budget	Minor	There is a risk that as the technical design becomes more detailed and clearer, costs could increase	Continuous dialogue is taking place between all the technical partner/suppliers to ensure a common understanding of requirements, scope, budgetary constraints and the potential impact of scope creep. Keeping costs under a tight rein is crucial and so scope is considered as part of the Change Management process and, if costs could be impacted, it's escalated to the PRG for consideration and decision. We continue to keep this under monitoring.  <b>Update:</b> the budget is well under control and whilst there is a change request under discussion this does not change the overall total. It is extremely unlikely that the budget will be exceeded.

Table 8-1 - Top five current risks (by rating)



## 9 Consistency with Full Submission

The project remains consistent with the original submission for this period.

## 10 Accuracy Assurance Statement

This report has been prepared by the Future Networks Manager (Roger Hey), recommended by the Policy Manager (Paul Jewell) and approved by the Operations Director (Philip Swift).

All efforts have been made to ensure that the information contained within this report is accurate. WPD confirms that this report has been produced, reviewed and approved following our quality assurance process for external documents and reports.

