New Thames Valley Vision

PROJECT PROGRESS REPORT

Project Number	SSET2003
DNO	Southern Electric Power Distribution Ltd
Reporting Period	December 2013 to June 2014

1 Executive summary

Ofgem guidance: Executive Summary (This section should be no more than 4 pages) This section should be able to stand alone and provide a clear overview of the project's progress and any significant issues over the last period. All stakeholders, including those not directly involved in the project, should be able to have a clear picture of the progress. The DNO should describe the general progress of the project and include any notable milestones or deliverables achieved in the period. The Executive Summary should also contain two subsections: one for the key risks and one for the learning outcomes.

The New Thames Valley Vision (NTVV) is a Low Carbon Network Fund Tier 2 project selected by Ofgem, the UK's energy regulator, during the 2011 competitive selection process. This five year project is focussed on the Low Voltage (LV) network and aims to demonstrate how electricity distribution networks can better serve their customers by understanding, anticipating and supporting their energy use as they move towards low carbon technologies. The project explores a mixture of analytic, technological and commercial solutions.

The project has met all Successful Delivery Reward criteria milestones since inception and for this report period. During the past six months a number of new LV management tools have been commissioned and the first findings from data-based analysis of energy use on the local LV network have been presented. A short summary of delivery achievements against each of the core learning outcomes is given below:

Learning Outcome: Understanding

The project has collected over eighteen months of energy use data to give detailed insights in to how energy is used and produced at a local level. For domestic customers, the patterns of use have been analysed and shared with participants through the Your Energy Explained events. Initial analysis of energy use for non-domestic customers has revealed highly predictable patterns based on opening hours but has not yet observed effects related to other externally verifiable factors, such as number of employees, age of building or type of business. During this period, the volume of data points under observation has been increased by a second tranche of substation monitoring, with a third and final phase ready to install. The project adopted this phased approach to ensure efficient spend by only installing equipment where the research required it.

Learning Outcomes: Anticipating and Optimising

During this period the project commissioned and placed into service both the Network Modelling Environment (NME) and the Distribution Management System (DMS). These two tools demonstrate a new degree of visibility, design and operational control for the local LV network. The NME presents a graphical view of the LV network which can be interacted with to present load flow results for different situations and configurations. In combination with the project's work on forecasting, this tool departs from more traditional approaches of network design by considering forecasts of individual demands, without the effects of averaging or smoothing, to give an detailed assessment of equipment duty and modelling confidence. The Distribution Management System (DMS) takes the principles of SCADA management and control and applies it to the LV network. Consistency is maintained between the NME and DMS using CIM data exchanges (as per based on the IEC61968-11 with some local extensions). Analysis of data gathered to date has allowed the first report into the creation of short medium and long-term forecasts, and the aggregation of these forecasts to be presented.

Learning Outcome: Supporting Change

Extensive testing of demand response (load-reduction) is well underway with over 100 individual load shed events completed during this reporting period at an average participation rate of 98%. The project has completed agreements or installed 20 demand response installations in Bracknell. Work to configured and commission 25 Energy Management and Storage Units (ESMUs) is progressing at a pace; over the last six months, all cells have been produced, G59/3 type testing completed and training held with operational staff in the test area. The schedule to complete the manufacture and installation of ESMUs during the next reporting period is tight and a number of risks, whilst being actively managed, have the potential to cause delay. During this reporting period, the design of the platform to manage ESMUs via the DMS has been created, verified and built. Into the next reporting period, the project will construct its first software agents designed to reduce peak loads on the LV network. Also, over the last six months the NTVV has installed 31 units to divert peak solar generation into domestic hot water tanks to successfully demonstrate effective local energy use at times of peak solar production. The project has developed a new method for the deployment of cold thermal storage which modifies the quantity, size and recruitment approach to ensure relevant learning is generated with regards to the coordinated installation and operation of cold thermal storage.

Stakeholders

The NTVV project maintains an active programme of events designed to engage and inform the customers served by the network in the study area. The ‘Your Energy Matters’ low carbon community advisory centre operated throughout this reporting period opening daily from Tuesday to Saturday to host a wide variety of activities and events for the local residents of Bracknell. These events supported strong links with the community but also served to test the concept of a DNO and Local Authority working in partnership to support low carbon energy use. ‘Your Energy Matters’ has now closed after attracting nearly 3,000 visitors over the 18 month operating period.

1.1 Risks

Ofgem guidance: The risks section reports on any major risks and/or issues that the DNO encountered, including any risks which had not been previously identified in the Project Direction. The DNO should include a short summary of the risk and how it affects (or might affect) delivering the project as described in the full submission. When relevant, the DNO should group these key risks under the following headings:

a. recruitment risks – describe any risks to recruiting the numbers of customers to take part in the project as described in the full submission and how these will impact on the project and be mitigated;
b. procurement risks – describe any risks to procuring the equipment and/or services needed for the project, as described in the full submission, and how these will impact on the project and be mitigated;
c. installation risks – describe any risks to the installation of the equipment (including in customers' homes, and/or large scale installations on the network) and how these will impact on the project and be mitigated; and
d. other risks.

Project risk management is considered in detail in section 10 of this report; a high level summary is given here:

Risk Description (Category & specific activity)	**Further details and impact**	**Controls**
Recruitment		
'High-density' end-point monitoring	A second round of recruitment has set-out to achieve around 80% coverage of end-point monitors. This will require very significant acceptance and uptake rates from customers in limited geographic regions. There is a risk that the actual coverage is less than 80%; which would reduce the statistical confidence in the analysis of load aggregation methods.	A locally responsive recruitment approach is ongoing - consistent with the Customer Engagement Plan If only areas with less than 80% density can be formed, the project will seek to create more areas at lower densities as an alternative approach to this analysis.
Subsequent phases of hot-thermal storage trials	Subsequent deployments of hot thermal storage equipment are underway to test strategies for areas with concentrations of solar panels. There is a risk that customers within the identified areas do not wish to have an management unit installed. Whilst this would be disappointing from a technical demonstration perspective it would still represent valuable learning since customer acceptance is an essential part of the overall solution.	Areas with appropriate levels of solar panel concentration identified. Additional analysis of technical feasibility and customer acceptance supported by conversations with housing landlords and developers.
Cold thermal storage uptake in study area	Original method of Cold thermal storage deployment required sufficient customer uptake to enable studies on network impact. This customer uptake has not been observed.	New deployment approach developed to focus on DNO driven installation - under Change Request review.

Risk Description (Category & specific activity)	Further details and impact	Controls
Procurement	None	None
Installation	Potential software and manufacturing delays associated with the installation of Energy Management and Storage Units	Close interaction with manufacturer and advanced preparation of installation sites to minimise consequential delays
Other	None	None

1.2 Learning Outcomes

Ofgem guidance: The learning section reports on the learning outcomes outlined in the Full Submission. This section should include, but is not limited to:

a. a summary of the key learning outcomes delivered in the period;
b. a short overview of the DNO's overall approach to capturing the learning;
c. the main activities towards third parties which have been undertaken in order to disseminate the learning mentioned in a.; and
d. the DNO's internal dissemination activities.

Please note that these two subsections should only give an overview of the key risks and the main learning. They should not replace the more detailed information contained in the "Learning outcomes" and "Risk management" sections of the progress report.

Learning outcomes are considered in detail in section 8 of this report; a high level summary of outcomes delivered in this period is shown on the following page:

Key learning outcomes

The following pieces of work have been completed in this period and represent knowledge outputs:

- Low Voltage Network Modelling Environment (as reported in SDRC 9.6)
- Low Voltage Distribution Management System (as reported in SDRC 9.2c)
- Installation of EMMA thermal storage within domestic properties (as reported in SDRC 9.4b)
- Optimising Network Monitoring Installation (as reported in SDRC 9.2d)
- Short, medium and long term forecasts of Domestic Energy Loads (as reported in SDRC 9.5b)
- Aggregation and integration of short, medium and long term forecasts (as reported in SDRC 9.5c)

In addition, the following 'Learning Moments' (ad hoc and process related learning) are captured:

- Independent safety reviews and the benefits of pan-industry forums
- The relationship between energy awareness and readiness to engage
- Customer communication can be influenced by method of introduction
- Hot thermal storage and hot water storage temperature settings
- Record keeping
- Purchasing Energy Storage and Management Units
- M2M over GPRS/UMTS communications

Approach to learning capture

The NTVV project consists of a number of Packages of Work (PoW) which directly map to core learning outcomes and learning dissemination methods. Each PoW consists of number of components, where a component is defined as a:

> **Deliverable** – defined activity with clear stages of implementation and completion;
> **Trial** – aspects which require investigation and/or experimentation; or
> **Report –** produced to formalise project outcomes, to enable the sharing of learning and outputs related to a deliverable or trial, or to address a specific evidence requirement of an SDRC (Successful Delivery Reward Criteria).

The principal mechanism for formalised learning capture draws on the methodical testing strategy and analysis within each project trial.

Summary of Third Party targeted dissemination

(For further details please see section 7.2)

- Bracknell Heating and Plumbing Press Release
- Community Efficient Water Event
- Community Social Club Event
- Ranelagh School Event
- Presentation by Electrovaya on Energy Storage
- Bracknell and Wokingham College Event
- Low Carbon Day
- Your Energy Explained 1
- Ofgem Site Visit
- Your Energy Explained 2
- Paper: A Peak Reduction Scheduling Algorithm For Storage Devices On The Low Voltage Network
- Paper: The Real-Time Optimisation of DNO Owned Storage Devices on the LV Network for Peak Reduction
- Your Energy Matters – Closing Celebration
- Using maths to solve power problems
- Thames Valley Vision - The Future Energy Challenges
- Modelling the electricity consumption of small to medium enterprises

DNO Internal targeted dissemination

SEPD has taken an integrated approach to the delivery of NTVV. Other than a small group of staff dedicated to the project, the project makes use of a pool of in house experts. This approach seeks to draw on a wide body of knowledge whilst also disseminating findings through a natural process of persistent contact. It also enables a broad group of people to benefit from the close interaction with project partners. This approach is additionally supported through a series of rolling workshops designed to keep the general business engaged in the project.

2 Table of Contents

3 Project manager's report

Ofgem guidance: The project manager's report should be a more detailed version of the Executive Summary. This section should describe the progress made in the reporting period against the project plan. Any key issues should be drawn out and described in detail, including how these issues were managed. The DNO should also include details of deliverables and/or events, referring where necessary to other sections of the PPR. This section should also provide an outlook into the next reporting period, including key planned activities. It should describe any key issues or concerns which the project manager considers will be a major challenge in the next reporting period.

The New Thames Valley Vision (NTVV) consists of a series of related Packages of Work (PoW) which directly map to core learning outcomes and learning dissemination methods. Having established the majority of the proposed hardware and systems, the project has successfully identified and reported on the associated key findings. The project has now begun a detailed phase of trials which will test and evaluate the relative advantages and/or disadvantages of these technologies and systems. As the project progresses a number of key customer participation and engagement activities remain – these are being carefully managed to ensure successful outcomes and to also ensure learning is captured for future application.

The project is keen to share this information and during this reporting period it has held or actively participated in a number of dissemination events (as per section 8.3).

The NTVV has implemented all activities in accordance with the Project Direction and is progressing to plan. All Successful Delivery Reward Criteria (SDRCs) for this reporting period have been met, details of which are included in section 7. The following summary outlines the progress to date for each Package of Work and key activities in the next reporting period.

End point monitoring

(Core learning outcome: Understanding)

End point monitoring equipment records half-hourly energy usage at individual properties and securely transmits this data for analysis on a daily basis. Information gathered from the first batch of monitors over the past 18 months has informed the work on customer energy use categorisation, forecasting and aggregation. This analysis has revealed a number of new insights as to how different people use their energy - beyond the traditional metrics of volume of energy in between manual meter readings (as previously reported in SDRC Report 9.5a).

This early analysis has been practically tested by presenting it back to the customers who are taking part in the trials through the 'Your Energy Explained' domestic focus groups. During these events information was exchanged with participants through graphical and descriptive tools, with participants describing their own perception of energy use before seeing actual measurement-based analysis.

The 40 participants who took part in these focus groups presented a range of responses, with some customers clearly very aware of their energy use and time of peak consumption, whilst others demonstrating little or no perception of their energy use. From a DNO's perspective, network capacity design can be enhanced by identifying repeatable energy use patterns, the variability associated with these patterns and the allowances that are needed where no pattern can be identified.

End point monitoring data is being used to facilitate the Aggregation package of work, which ultimately aims to establish the minimal level of monitoring required for a given accuracy/application. However, to test these concepts requires areas of high monitoring 'density.' To achieve the highest level possible of consented monitoring, a second batch of end-point monitors will be installed later this year. It is planned to use Senical end point monitors for this round; these cut-out based devices have been undergoing a set of tests to ensure their safe operation in domestic installations with the final long-run thermal cyclic tests drawing to a close imminently. In preparation for the installation of cut-out based monitoring, the ICT hardware and systems have been installed and validated.

The process of engaging with enough project participants along a street to achieve a high density of coverage will require new developments in our engagement process. An early trial of the engagement approach necessary to achieve 70% uptake or better has proved to be as challenging as expected. Subsequent iterations will test the approach to its fullest extent as aligned to the installation of monitoring equipment.

A subsequent review of end point monitoring performance will be made during the next reporting period as per SDRC 9.8(a) part 1 this November.

Substation monitoring

(Core learning outcome: Understanding)

Substation monitoring equipment records electrical characteristics for each feeder and each phase within that feeder on a half-hourly and also five-second basis. During this reporting period, the second of three substation monitoring installation phases has been completed. This second phase has used the latest release of substation monitoring which has included an integrated modem. The software upgrades associated with this monitor have significantly improved the screening to avoid unnecessary data transmission. These software improvements will be retrospectively rolled-out to all earlier tranches of substation monitoring. At a number of installation locations the onboard modems, presently based on GSM standards, have not been able to provide the required coverage or performance and are being replaced with combined UMTS/GSM based modems. UMTS/GSM modems will be exclusively used in the future tranches.

NTVV has sought to minimise the amount of equipment installed where this is not required to deliver the stated learning objectives. Analysis based on installation of the first 100 substation monitors, reported as per SDRC 9.2d, has considered subsequent deployment strategies by a) building on the installation of the original 100 units to establish where units should be placed to meet project research needs b) considering linkages to aggregation work and considering what level of monitoring gives the right level of network observability and c) understanding what the wider asset management benefits of monitoring. To aid point (c), the project tabulated and presented a summary of available data to 'tease out' potential use from operations teams who have not had access to this quantity of data routinely before. This has been supported through the use of an embedded project expert to guide field staff. Over the next reporting period, a third tranche of substation monitoring will be deployed and the monitoring operations will be reviewed and reported as per SDRC 9.8(a) part 1.

Characterisation

(Core learning outcome: Understanding)

Using data from NTVV end-point monitors and other publically available sources the project has developed a unique mechanism for categorising customers by their patterns of energy usage. This method identifies usage types based on the likelihood of that category to create a peak in energy usage at differing times of day and season. During this reporting period the project has expanded this analysis to all monitored domestic customers and begun to analysis non-domestic energy usage to identify similar patterns.

At first inspection, non-domestic customer energy use appears more predictable and directly related to the facility's operational hours. No major linkages have been identified to the number of employees, type of business or age of buildings.

Network Modelling Environment

(Core learning outcome: Anticipating)

The Network Modelling Environment (NME) combines a geospatial records tool (Electric Office) with a power flow analysis tool (Cymdist) to enable the LV network to be studied and the effects of energy usage profiles to be calculated and presented. The NME presents a graphical view of the LV network which can be interacted with to present load flow results for different situations and configurations.

Load flows are based on individual half-hourly forecasts (as developed through the Forecasting package of work) for each point of connection, demand or generation, over a defined period up to 10 years. In a departure from more traditional ADMD (after diversity maximum demand) approaches the load flow methodology uses 'centre-case' forecasts of individual demands, without the effects of averaging or smoothing and simulates the effects of uncertainty and error by performing multiple parallel studies to give an overall assessment of confidence. Load flow studies are then presented to the user though a simple RAG (red, amber, green) colour scheme - where green represents a section of network which can be confidently assumed to always operate within limits, red represents a section of network which would be likely to operate outside limits (and as such, is a condition to be avoided) and amber represents a section of network which generally operates within limits but may depart from limits on occasion.

Following an intensive period of data preparation and system implementation, the NME was handed over to SEPD during December with core findings from this process reported as per SDRC 9.6. The NME acts as the data source of LV network connectivity and asset data from which data is sourced for use in the operational Distribution Management System. During the next reporting period the NME will be used to support other packages of work and will also be evaluated and reported on as per SDRC 9.8(a) part 8.

Distribution Management System

(Core learning outcome: Anticipating)

The Distribution Management System (DMS) takes the principles of SCADA management and control and applies it to the LV network. During this reporting period the DMS was established with key findings reported as per SDRC 9.2(c).

In a departure from the traditional approach which often treats mapping and control systems separately, the NTVV DMS considers the geographic NME to be the source of asset and connectivity data with updates shared between the two systems using CIM (Common Information Model) data exchanges (as per based on the IEC61968-11 with some local extensions). The source data in the NME was not originally captured for this new 'smart' purpose and the preparation of data suitable for exchange required a number of reviews. Since handover, the project team has worked to improve diagram clarity and presentation style.

The DMS also acts as the interface for new technologies to be deployed on the LV network. In particular, the DMS will be used to manage demand response through interconnection with the Honeywell ADR system, and for Energy Storage and Management Unit (ESMU) control. During this period good progress has been made in establishing both of these interfaces. ESMU connectivity has been successfully tested with analogue values and controls polled from a remote device. Likewise the ADR interface has been set-up and testing between DMS and the Honeywell managed Demand Response Automation Servers (DRAS) well underway. This work will continue into the next reporting period alongside a programme of trials with operational staff to assess the best method of DMS operation for report as per SDRC 9.8(a) part 7.

Aggregation and Forecasting of energy profiles

(Core learning outcome: Anticipating)

Aggregation analysis allows the use of relatively sparse data from only a handful of end points to be 'buddied' with unmonitored customers to predict their energy use, such that the power flows across an entire section of the LV network can be assessed – or conversely, substation level demands to be interpolated where only end point level data is available. Forecasting analysis runs a number of scenarios (varying in both timescale and application) to support forward looking power flow analysis.

During this reporting period a number of reports have been produced detailing initial methods and prototype code for short, medium and long-term forecasting and aggregation work: as per SDRC 9.5(b) based on the aggregation of loads associated with three distribution substation and the customers they serve; and SDRC 9.5(c) which considered short, medium and long term forecasting algorithms assessed using data from installed end point monitors.

In to the next period, work will begin to improve the rigour regarding the confidence bounds for probabilistic forecasts and to improve short term forecasts with a particular focus on information required to operate smart control algorithms. During this time trials will continue to support analyses associated with SDRC 9.8(c) part 1.

Automatic Demand Response (ADR)

(Core learning outcome: Supporting)

The ADR demand response system under trial provides a machine to machine interface for instigating demand reduction events as agreed with the customer in advance and as directed by the DNO. The project is engaging 30 buildings for trials of the ADR system by summer 2015 and has presently completed/agreed 20 ADR installations in Bracknell. A further seven buildings are at an advanced stage of discussions with a further 15 candidate buildings under review.

During this reporting period, the NTVV project has completed a significant number of load shed events with over 100 individual events having been completed to date with an average participation rate of 98%. Adopting a co-factored design, the programme of ADR events has been designed to identify the underlying relationships between achieved demand shed and time of day, day of week, season, notice period and event duration, as well as their effect on post event demand 'overshoot' effects. These events will continue into the next reporting period and will support analysis and reporting as per SDRC 9.8(a) parts 2 and 3.

Energy Storage and Management Units

(Core learning outcome: Supporting)

The NTVV project is exploring the concept of an Energy Storage and Management Unit (ESMU) which combines power electronics and energy storage to help manage voltage performance, thermal limitations, efficiency and emergency response on the LV network. The project is to install these devices on the LV network and has agreed a revised deployment plan with Ofgem through change request (CR001) committing to a November 2014 delivery of all units as per SDRC 9.4c.

In recommending a revised installation deadline, the project was keen to ensure no wider learning or SDRC objectives were affected. As such the manufacture, configuration, integration and installation timelines do not have much (if any) contingency. To ensure the right products are delivered on time requires a carefully managed approach to testing and product review operating alongside wider manufacture and deployment works.

At the start of the reporting period factory acceptance testing (FATs) were underway in Canada (the project is working with the Canadian manufacture, Electrovaya). These tests were able to confirm essential operational performance alongside an inspection of the manufacturing and safety test facilities. However, full testing was only partially completed since the outer housings has not been assembled nor was a European test generator available at the time. Final aspects of these tests were deferred to allow the first units to be delivered to the manufacture's temporary UK facility. With the units in the UK, FAT testing was completed alongside G59/3 type testing to allow the units to be connected to a distribution network. Using these prototype units the project has completed training with all relevant operational staff in the test area. This has focused on developing and refining installation procedures and also ensuring emergency and operational actions are widely understood.

As a side piece of practical learning, it should be noted that there are additional factors to consider when handling the import of foreign equipment – in this case, SEPD chose to use the services of a specialist import handling agency to ensure timely customs release.

The evaluation of these first units has proceeded to consider the integration and control aspects in the Distribution Management System. This has identified a number of protocol and other software related issues which are being address as they are identified. However, whilst good progress is being made to address these issues, to expedite the process it has been agreed for an SEPD expert to attend Canada and work alongside the manufacture's staff to ensure satisfactory resolution in time for the assembly of the remaining units. This will also allow the project to support and assure the successful assembly of the whole units.

The manufacture has made good progress in establishing the production of cells, assembly of control systems and the supply and integration of interfacing inverter unit. However concerns regarding timely delivery of outer housings remain. The project and manufacture are jointly working on a phased delivery schedule to avoid delays to site works. At this stage it remains practical for all units to be manufactured and installed to schedule however the risks associated with software and final assembly remain and have the potential to cause delay.

Smart Control

(Core learning outcome: Supporting)

Building on the related energy use categorisation, aggregation and forecasting analysis, Smart Control seeks to dispatch Energy Storage and Management Units in the most optimal manner. Control instructions will be sent and received to ESMU devices via the NTVV DMS, however the more advanced nature of the control algorithms require a different platform for computation. During this reporting period, the design of the platform has been created, verified through architectural review and a test system built with the required servers interfaces and database schema implemented. The design of the platform has been built with scalability and replicability in mind such that it can either scaled-up to support a mass deployment of ESMU – or – scaled-down to act as a distributed control system hosted in individual ESMUs.

With the work to build the environment now complete a process of requirement establishment and subsequent coding design will continue into the next reporting period to assemble the Java based programs that will implement the smart control algorithms. Each ESMU and control related function has been designed as an agent which communicates with each other via a defined series of database points. Into the next reporting period, the project will construct its first software agents designed to reduce peak loads on the LV network and use the outputs of these agents to manage physical devices on the network. The project will also develop a ‘safety agent’ to prevent the issue of inappropriate commands that would otherwise drive the onboard safety features of physical devices into operation.

Hot Thermal Storage

(Core learning outcome: Supporting)

The NTVV project is exploring the use of EMMA management units to divert peak solar power into customer hot water tanks as an efficient way to enable the connection of large volumes of solar panels onto the existing network. The control algorithm balances the need to give the customer predictable hot water production with the need to manage peak export whilst adjusting to variations in daily solar energy production. During the project period, the NTVV has installed 31 EMMA units and reported early installation based findings as per SDRC 9.4b. The devices have already successfully demonstrated that peak energy can be successfully managed. However, limitations on the temperature that water can be stored at without modifying the hot water plumbing to install additional regulating valves mean that customer may need to make significant changes to their conventional water heating habits – these potential effects will be considered in the next reporting period. The production of energy from the solar panels at an individual property is unlikely to be limited by network constraints, however where there are sufficient concentrations of solar panels then power flow may begin to be constrained. In the Bracknell area the NTVV project has identified the potential for 11 circuits (phases of a feeder) to exhibit regular reverse power flow resulting from solar installations (based on monitoring of approximately one third of substations in the study area). Having reviewed the initial performance of these units and further explored the opportunities these units present, the project has identified three anticipated deployment scenarios to manage the effect of solar panels amongst: a) existing private housing where naturally occurring concentrations are beginning to cause constraint; b) existing social housing where the landlord plans to roll out a programme of installations; and c) new housing built with highly concentrated solar. To confirm the technical performance units under these scenarios, the existing units will be supplemented by further units to establish performance under concentrated solar situations. These deployments will also support the analysis of uptake/propensity to participate amongst domestic customers.

Ongoing work with Registered Social Landlord’s (RSL’s) and other new-build developers is ongoing and will establish the technical factors and potential for uptake amongst commercial bodies. However, as previously identified there may be limited opportunity to complete physical equipment installations with RSL and new-build developers in the study area. Given that the technical performance and domestic customer interaction with these units is already under evaluation through the first 31 units and will be augmented by considering performance under concentrated installations, it may not be necessary to install further units. Instead, it could be sufficient to evaluate RSL and new-build preferences though dialogue alone. In which case, the project will propose to deploy no further units and return the resulting savings to UK customers. However, there remains the potential that this activity may require a longer deployment timescale and/or be deployed in an alternative comparable location.

Aside from customer engagement, the subsequent roll-out of 70 units is dependent on the findings of a separate project which seeks to confirm that there will be no other unexpected network issues associated with at scale deployment – such as switching frequency related distortion. Whilst this work is ongoing, initial work indicates there is a small chance of adverse effect should large number of these units work in coordination on a lightly loaded network. As such the NTVV project will only install next generation units with feature an alternative power electronic design in concentrated areas.

Cold Thermal Storage

(Core learning outcome: Supporting)
The NTVV is exploring the use ice cooling storage units to defer the peak daytime demand associated with air conditioning units. The full submission envisaged that these units would be funded by customers in Bracknell as a naturally growing market for these devices formed in the UK. This would have allowed the project to monitor and interact with these devices through incentive-like payments. However work to date has not identified any such units deployed in Bracknell or likely deployment across the UK.

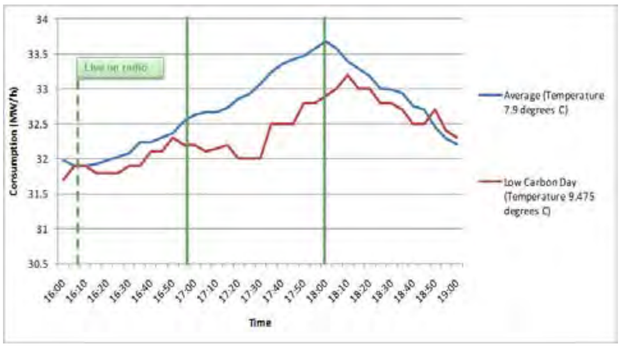
In response to an analysis of the current uptake of cold thermal storage in the study area and drawing on insights from successful large scale deployments in the United States of America and Canada, the project has developed a new deployment approach for cold thermal storage which modifies the quantity, size and recruitment approach. This deployment approach has been designed to ensure relevant learning is generated with regards to the coordinated installation and operation of cold thermal storage. It is believed this revised approach will successfully demonstrate a mechanism which will ensure targeted and efficient installations that will deliver predictable and reliable reductions in peak demand.

The revised approach deploys a smaller number of larger units fully funded by the DNO. This would replace the previous approach which expected customer-funded/market driven deployment of units with a statistical number of these units opting to take part on any particular day in return for an incentive payment. This approach reflects US developments in network reinforcement driven energy storage. In essence, customers would receive a fully funded replacement of their old chiller plant, six hours of ice storage and additional demand response capacity. In return the customer would commit to always participate in demand response which, due to the size of the storage, would not have any effect on cooling capability. Since these units would be fully funded and larger, the unit rates are more expensive – however, the larger size and guaranteed participation means the DNO benefit per unit is greatly increased. As such, it is predicted that a significant reduction in demand can be achieved through a smaller number of units at the same overall price. Change Request 002 associated with this revised approach is undergoing review with Ofgem.

Low Carbon Promotions

(Core learning outcome: Supporting)
The NTVV is assessing how a selection of customer based low carbon technologies can impact the local LV network and what, if any support a DNO can give to the promotion of these technologies,

appropriate to the role and obligations of a DNO. A programme of events has continued through this reporting period, including the high profile Bracknell Low Carbon Day on the 6th March. This event encouraged residents to reduce usage residents in Bracknell and the Thames Valley to reduce their energy at the peak network times from 5 - 6pm. This achieved a noticeable reduction in use as the following graph from Bracknell primary substation demonstrates:



This event used a variety of media and was supported though school promotions, a local music event (which was mentioned on breakfast television) and an impromptu interview on local 'drive time' radio.

Local Authority

(Core learning outcome: Supporting)

In additional to the advisory work at the Your Energy Matters centre, the NTVV is looking at how Bracknell Forest Council, the Local Authority, and a DNO can best work together to maximise low carbon opportunities. This work is now fully scoped and will begin start during the next reporting period with analysis designed to support reporting as per SDRC 9.8(a) part 8

Industry Governance & analysis of Commercial impacts

(Knowledge dissemination)

Further to the review of industry governance the project has begin to establish an appropriate range of commercial drivers from non-domestic customer and to consider how similar messages could be shared with domestic customer too. Initial work has focused on evaluating the marginal cost of reinforcement at LV and HV and developing the range of annual 'OpEx' costs that would be proportionately equivalent to traditional 'CapEx' equivalents. In to the next reporting period, an approach for sharing reinforcement related signals with domestic customer is being developed. Initial thoughts on this area are to explore the magnitude and validity of the 'red-amber-green' type signals presently given to half-hourly metered customers when applied to profile classes 1, 2, 3 and 4 customers, should future metering allow this.

Low Carbon Community Advisory Centre, www.thamesvalleyvision.co.uk website and Stakeholder Engagement

(Knowledge dissemination)

The 'Your Energy Matters' low carbon community advisory centre operated throughout this reporting period, opening daily from Tuesday to Saturday to host a wide variety of activities and events for the local residents of Bracknell. These events supported strong links with the community but also served to test the concept of a DNO and Local Authority working in partnership to support low carbon energy use. 'Your Energy Matters' has now closed after attracting nearly 3,000 visitors over the 18 month operating period.

In addition to the advisory centre, the NTVV employs a variety of channels to engage with stakeholders and disseminate knowledge, including the www.thamesvalleyvision.co.uk website.

Transition into 'business as usual' – development of policies and training materials

(Knowledge dissemination)

A full review of the NTVV project trials and deliverables has now been completed and the initial set of exemplar policies/procedures and training for end of project has been prepared. The process being adopted by the NTVV project is to hypothesis and test throughout the learning phases of the project to ensure a) materials and evidence are efficiently collected and b) to establish a refined understanding of the key areas to be cascaded forward into UK DNO 'business as usual'

Learning & Dissemination

The outputs of activities in association with this Package of Work are covered in detail in section 8.

Project Governance

The Project Partner Review Board and Project Steering Group[1] met on:

- 10th January 2014 Project Steering Group
- 30th January 2014 Project Partner Review Board
- 7th February 2014 Project Steering Group
- 27th February 2014 Project Partner Review Board
- 7th March 2014 Project Steering Group
- 27th March 2014 Project Partner Review Board
- 4th April 2014 Project Steering Group
- 24th April 2014 Project Partner Review Board
- 2nd May 2014 Project Steering Group
- 29th May 2014 Project Partner Review Board
- 6th June 2014 Project Steering Group

[1] The Project Steering Board meets as part of an overall SSEPD Innovation Steering Board

4 Consistency with full submission

Ofgem guidance: The DNO should confirm that the project is being undertaken in accordance with the full submission. Any areas where the project is diverging or where the DNO anticipates that the project might not be in line with the full submission should be clearly identified. The DNO should also include, where appropriate, references to key risks identified under "Risk Management".

The New Thames Valley Vision is being conducted in accordance with the full submission. To ensure all commitments from this submission are completed in a timely and efficient manner, the project has developed a comprehensive Package of Work structure with clear linkages to the text of the full submission.

The project is aware of two potential variances, which are currently being monitored. Mitigation measures have been provisionally identified:

No.	Package of Work	Variation & Mitigation	Risk Register
1	Supporting: Cold Thermal Storage	The full submission envisaged that these units would be funded by customers in Bracknell as a naturally growing market for these devices formed in the UK. This would have allowed the project to monitor and interact with these devices through incentive-like payments. However work to date has not identified any such units deployed in Bracknell or likely deployment across the UK. In response to an analysis of the current uptake of cold thermal storage in the study area and drawing on insights from successful large scale deployments in the United States of America and in Canada, SEPD have developed a new deployment approach for cold thermal storage which modifies the quantity, size and recruitment approach. This deployment approach has been designed to ensure relevant learning is generated with regards to the coordinated installation and operation of cold thermal storage. It is believed this revised approach will successfully demonstrate a mechanism which will ensure targeted and efficient installations that will deliver predictable and reliable reductions in peak demand. Change Request 002 is undergoing review with Ofgem.	S5-a and S5-b
2	Supporting: Hot Thermal Storage	The first 31 thermal storage management units to divert peak solar panel export have been installed as planned. Having reviewed the initial performance of these units and further explored the opportunities these units present, the project has identified three anticipated deployment scenarios to manage the effect of solar panels amongst: a) existing private housing where naturally occurring clustering is begin to cause constraint b) existing social housing where the landlord plans to roll out a programme of installations c) new housing built with highly concentrated solar. To confirm the technical performance of these units, the existing 30 units will be supplemented by further units to establish their performance under concentrated solar situations. These existing and planned deployments will also	T4-d

		support the analysis of uptake/propensity to participate amongst domestic customers. Ongoing work with Registered Social Landlord's (RSL's) and other new-build developers is ongoing and will establish the technical factors and potential for uptake amongst commercial bodies. However, as previously identified there may be limited opportunity to complete equipment installations with RSL and new-build developers in the study area. Given that the technical performance and domestic customer interaction with these units is already under evaluation through the first 31 units and will be augmented by considering performance under concentrated installations, it may not be necessary to install further units. Instead, it could be sufficient to evaluate RSL and new-build preferences though dialogue alone. In which case, the project would propose to not deploy any further units and return resulting savings to UK customers. However, there remains the potential that this activity may require a longer deployment timescale and/or be deployed in an alternative comparable location.	

5 Risk management

Ofgem guidance: The DNO should report on the risks highlighted in box 26 of the full submission pro forma, plus any other risks that have arisen in the reporting period. DNOs should describe how it is managing the risks it has highlighted and how it is learning from the management of these risks.

The project risk register is a live document designed to identify actual and potential barriers to the satisfactory progress of the NTVV. The register is used to target resources and to develop control measures and mitigations. The NTVV risk register is a single log of risks as identified by SEPD, GE, The Universities of Oxford and Reading, Honeywell, DNV GL, EA Technology and Bracknell Forest Council. The register is reviewed at the monthly Project Partner Review Boards with key risks reported to the SSEPD Innovation Strategy Board. Risks are assessed against their likelihood and impact, where the impact considers the effect on cost, schedule, reputation, learning, the environment and people. Risks are scored before (inherent) and after (residual) the application of controls. Risks which are closed are removed from the live register, with any learning captured through the Learning Moments and Project Trials described in section 7.

Increased focus is placed on risks with amber or red residual scores and also on all risks with a red inherent score (to ensure there is no over-reliance on the controls and mitigation measures). At present, there are four risks that fall into this category, two further risks are also listed below which are referenced by section 4 of this report:

		Inherent									Residual							
		Impact									Impact							
#	**Risk Description**	**Cost**	**Schedule**	**Reputation**	**Learning**	**Environment**	**People**	**Likelihood**	**Score**	**Risk Control/Mitigation Actions**	**Cost**	**Schedule**	**Reputation**	**Learning**	**Environment**	**People**	**Likelihood**	**Score**
S3-a	Availability/readiness of Energy Storage and Management Units – Order now placed and initial units installed. Ongoing manufacturing and testing concerns (software response and supply of outer housing) present potential delays		5		2			3	15	1. Change Request defining new deployment approach agreed 2. Equipment testing and manufacture operating in parallel 3. Additional recourse, DNO expertise deployed to assist manufacturer on site 4. Site installation works readied		5		2			2	10
S5-a and S5-b	No current awareness of cold thermal storage units in Bracknell. Whilst the project anticipated customers would want to have and to pay for these units, a suitably mature market for commercial action does not appear to have evolved	2	3		3			5	15	1/2. Evaluation into Bracknell and UK deployments complete 3. Review of international/USA experience complete and proposal to implement a new deployment method with utility-funding established. Supplier selected 4. Presently under going Change Request review to establish if new deployment approach represents best use of LCNF T2 funds.	1	3		2			2	6

		Inherent									Residual							
		Impact									Impact							
#	Risk Description	Cost	Schedule	Reputation	Learning	Environment	People	Likelihood	Score	Risk Control/Mitigation Actions	Cost	Schedule	Reputation	Learning	Environment	People	Likelihood	Score
U1-e	Smart meter installation programme (by others) delayed. Suppliers unable/unwilling to share data	2	3		3			5	15	1. Regular engagement with supply companies - though all project-level requests declined to date - often on the basis of resources fully deployed to achieve UK roll-outs. Note: at least one supplier remains very engaged but has had minimal deployment in target area to date. 2. Escalate the level of request to all suppliers highlighting the shared benefits of combined use of data. 3. Mitigate impact on learning and schedule by targeting end-point monitoring to support analysis 4. Support through access to existing data flows Note: with project deployed monitoring already in place and plans to increase this degree of monitoring underway, the impact on learning is restricted to reductions in granularity and depth of analysis.	1	1		1			5	5
U1h	Customer recruitment for second phase of monitoring not available in high-enough densities		2		3			4	12	1. New engagement approach agreed 2. Trial of new approach underway with target zones selected 3. Review uptake success and assess against analytic requirements 4. Review uptake success and identify areas for improvement		2		3			3	9
U1-d	Cut-out based end-point monitoring equipment inadequate or product unavailable	2	3		3			3	9	1. Rigorous review of hardware testing – enhanced testing underway due to location of installations. Testing progressing well 2. Alternative is to use previous end-point monitor solution for second round of sites	2	3		3			2	6
T4-d	The envisioned deployment of PVs with a local RSL will not materialise - due to a change of the RSL's development plans and ideas limiting options to test hot thermal storage.	3	3		3			3	9	1. Technical aspects of thermal storage established through existing 31 units in domestic properties. 2. Adapt engagement with RSL to include wider pool of RSLs (and equiv) to identify drivers - explore propensity for alternative options (for example solar tiles) 3. Explore options with other volume building suppliers, for example new build housing developers.		2		1			2	6

6 Successful delivery reward criteria (SDRC)

Ofgem guidance: The DNO should provide a brief narrative against each of the SDRCs set out in its Project Direction. The narrative should describe progress towards the SDRCs and any challenges the DNO may face in the next reporting period.

The NTVV has identified eight Successful Delivery Reward Criteria (SDRC) which span both the objectives and the lifecycle of the project. Each SDRC is split into a number of sub components and each component has defined criteria, evidence and a target date for completion. The following table lists the individual SDRC components in chronological order and details the project's progress towards their achievement for those due to be completed in this reporting period (up to December 2012) and into the next reporting period (up to June 2013).

	Completed (SDRC met)		Emerging issue, remains on target		SDRC completed late
	On target		Unresolved issue, off target		Not completed and late

SDRC	Due	Description	Status
SDRC 9.3a	29/2/2012	Start Consumer Consortia element of customer engagement programme	Complete – as noted in previous Project Progress Report
SDRC 9.3b	29/2/2012	Arrange and hold the first "Energy Efficiency" focus group	Complete – as noted in previous Project Progress Report
SDRC 9.1a	31/5/2012[2]	First ADR Agreement negotiated and signed with Commercial Customer	Complete – as noted in previous Project Progress Report
SDRC 9.1b	31/7/2012[3]	Install the Honeywell/ SSEPD interface equipment, programme the Building Management System (BMS) and implement a manual Peak Load Shedding event, via the Demand Response Aggregation Server (DRAS), and track the actual kW shift in Peak Load	Complete – as noted in previous Project Progress Report
SDRC 9.4a	31/7/2012	Develop problem statement, hypothesis and test deployment programme for coordinated energy storage and power electronics on the Low Voltage distribution network - building on previous and current battery installation tests	Complete – as noted in previous Project Progress Report
SDRC 9.2a	31/1/2013	250 In house end point monitors installed & learnings presented	Complete – as noted in previous Project Progress Report
SDRC 9.3c	28/2/2013	Produce customer engagement lessons learnt Report	Complete – as noted in previous Project Progress Report
SDRC 9.7	28/2/2013	Successful establishment of all aspects of the Low Carbon Community Advisory Centre –including display material at various locations, the associated interactive website, and the method and means of capture of stakeholders views on the learning outputs…	Complete – as noted in previous Project Progress Report
SDRC 9.2b	30/4/2013	100 Substation monitoring installations installed	Complete – as noted in previous Project Progress Report
SDRC 9.5a	30/11/2013	Establish a unique, reliable method for customer segmentation based on individual behavioural energy consumption. Produce first version of the universal customer categorisation vocabulary for DNOs	Complete – as noted in previous Project Progress Report

[2] The Project Direction placed additional requirements on SSEPD - these requirements have now been met. In placing these requirements, Ofgem agreed that SDRCs that the target date for this SDRC should be set at two months later than the date originally published in Section 9 of the full submission pro-forma.

[3] The Project Direction placed additional requirements on SSEPD - these requirements have now been met. In placing these requirements, Ofgem agreed that SDRCs that the target date for this SDRC should be set at two months later than the date originally published in Section 9 of the full submission pro-forma.

SDRC 9.6	31/12/2013	Build, Install and Commission the Low Voltage Modelling Environment component of the Distributed Solutions Integrator System (DSI).	Complete – report submitted on creation of LV Network Modelling Environment
SDRC 9.2c	31/1/2014	Install and commission the Network Management component of the Distributed Solutions Integrator System (DSI)	Complete – report submitted on creation on LV Distribution Management System
SDRC 9.4b	31/3/2014	Install 30 thermal energy storage devices as defined in (9.4a)	Complete – report submitted on installation of 31 EMMA units
SDRC 9.2d	30/4/2014	Develop and trial method of optimising network monitoring based on installation of first 100 substation monitors	Complete – report submitted optimal method for deployment based on first 100 units
SDRC 9.5b	30/4/2014	Produce first report on the testing of the various mathematically rigorous methods used, develop and produce accurate half hour resolution short, medium and long term rolling forecasts of domestic energy loads	Complete – report submitted detailing methods for short, medium and long term forecasting.
SDRC 9.5c	30/4/2014	Aggregate and integrate the short, medium and long term forecasts and produce first report on the modelling LV load profiles	Complete – report submitted regarding the aggregation of short, medium and long term forecasts.
SDRC 9.4c	30/11/2014[4]	Install 25 LV connected batteries as defined in (9.4a)	On track – though tight delivery schedule does not allow for any delays in site activities
SDRC 9.8a	30/11/2014	Prepare final reports on the trials carried out on the subjects listed in "Evidence 9.8" as well as an end of project report	(1) End Use and Network Monitoring Evaluation – on track
			(2) Demand Side Response Evaluation – on track
			(3) Network controlled Automated Demand Response evaluation & Energy Efficiency – on track
			(4) LV Network Storage – on track other than section on cold thermal storage subject to change request (CR002)
			(5) EV Chargers Usage Evaluation and Issues – on track
			(6) Smart Meter performance – on track
			(7) Integration Solution Control Evaluation – on track
			(8) Overall Proven Benefits (both financial and customer service) – on track

Beyond the next reporting period, the following table lists the remaining SDRCs in chronological order:

SDRC	Due	Description
SDRC 9.4d	31/3/2015	Produce learnings from energy storage and power electronic deployment to assess the hypothesis as defined in (9.4a)
SDRC 9.1c	30/4/2015	30 Customers signed up to Automatic Demand Response (ADR) programme and host customer event-renew new arrangements
SDRC 9.8b	30/11/2015	Prepare final reports on the trials carried out on the subjects listed in "Evidence 9.8" as well as an end of project report
SDRC 9.8c	30/11/2016	Prepare final reports on the trials carried out on the subjects listed in "Evidence 9.8" as well as an end of project report
SDRC 9.8d	30/4/2017	Hold a project review seminar to discuss the learning from the project. Attendees will be invited including Customers, Ofgem, DNO's, product suppliers and other stakeholders to discuss the way forward

[4] Change Request CR001 as approved by Ofgem revised the completion date of SDRC 9.4c to 30th November 2014

7 Learning outcomes

Ofgem guidance: The DNO should briefly describe the main learning outcomes from the reporting period. It should update Ofgem on how it has disseminated the learning it generated as part of the project over the last six months

The principle aim of the NTVV is to demonstrate that understanding, anticipating and supporting changes in consumer behaviour can help DNOs to develop an efficient network for the low carbon economy. The NTVV is structured around five Learning Outcomes (LOs) which act as the defining research questions to be answered by this project.

LO-1: **Understanding** - What do we need to know about customer behaviour in order to optimise network investment?

- LO-1.1 What is the optimum level and location of network monitoring?
- LO-1.2 To what extent can customers be categorised in order to better understand their behaviour?

LO-2: **Anticipating** - How can improved modelling enhance network operational, planning and investment management systems?

- LO-2.1 How could network headroom change as customers react to low carbon stimuli?
- LO-2.2 How can modelling outputs be fed into operational systems and processes in a meaningful manner?
- LO-2.3 How can modelling outputs be fed into planning systems and processes in a meaningful manner?
- LO-2.4 How can modelling outputs be fed into investment systems and processes in a meaningful manner?
- LO-2.5 How can network modelling outputs be fed into town planning systems and processes and vice-versa?
- LO-2.6 What changes are required to industry governance and documentation to facilitate a modelling based approach to network monitoring?

LO-3: **Optimising** - To what extent can modelling reduce the need for monitoring and enhance the information provided by monitoring?

- LO-3.1 To what extent can modelling be used in place of full network monitoring?
- LO-3.2 How might modelling assumptions change over time?

LO-4: **Supporting Change (technologically)** - How might a DNO implement technologies to support the transition to a Low Carbon Economy?

- LO-4.1 How could distributed solutions be configured into the DNO environment
- LO-4.2 How could a network management solution integrate with building management systems
- LO-4.3 How can the DNO best engage with customers to encourage demand reduction, and where on the network is each most effective
- LO-4.4 How would network storage be used in conjunction with demand Response

LO-5: **Supporting Change (commercially)** - Which commercial models attract which customers and how will they be delivered?

- LO-5.1 Large commercial
- LO-5.2 Light commercial (SMEs)
- LO-5.3 Domestic

7.1 Approach to learning capture

Packages of Work aligned to Learning Outcomes

The NTVV consists of a number of Packages of Work (PoW) which directly map to core learning outcomes and learning dissemination methods. Each PoW consists of number of components, where a component is defined as a:

Deliverable – defined activity with clear stages of implementation and completion;

Trial – aspects which require investigation and/or experimentation; or

Report – produced to formalise project outcomes, to enable the sharing of learning and outputs related to a deliverable or trial, or to address a specific evidence requirement of an SDRC (Successful Delivery Reward Criteria).

The principal mechanism for formalised learning capture draws on the methodical testing strategy and subsequent analysis within each project trial. The 'Packages of Work' (PoW) summary documents have now been reviewed by the leads on each PoW..

Learning Moments

Ad-hoc or 'process' learning from project staff continues to be captured using a learning log which partners are requested to contribute to on a monthly basis. New entries on the log for each month are discussed as 'Learning Moments' at the Project Partner Review Board. This provides an opportunity to share lessons across the different project activities, raising awareness of pitfalls to avoid/learning points to take into account and allows partners to provide advice/insights in relation to the learning.

7.2 Formal Learning Capture

Low Voltage Network Modelling Environment (as reported in SDRC 9.6)

This report identifies the requirements, use-cases and business process for the modelling environment employed in the NTVV (consisting of Smallworld Version 4.3.3 Geographical Information System and Cymdist modelling tool). The analysis identifies a number of insights regarding preparation, creation, commissioning and initial operation of this environment. The network modelling tool requires a fully populated power flow model, the creation of which is a significant exercise that must make practical use of existing network data. Existing network data would have been typically captured for a different purpose and it re-use for power flow analysis requires careful preparation. For the NTVV project, a physical survey of substations and link boxes significantly increased confidence in source data. Key insights include:

- Existing records are typically designed to identify location and asset-type data. Additional data regarding electrical connectivity may be incomplete or assumed, particularly regarding the electrical phase of connection.
- Asset-type labelling, particularly associated with cables, does not have a universally recognized naming convention. Though, in the majority, this can be achieved through automatic and manual processes based on rules created from local network knowledge.
- Plant records are generally accurate for ground mounted transformers, but are not necessarily complete for pole mounted transformers. Power flow analysis requires at least the rating and impedance of these assets which can be collected from site surveys or based on typical

values established on the number and type of connected customers.

- Existing customer databases link customer addresses, MPAN and network information. For network modelling, this data must be enhanced by linking records to geographic position. The NTVV used Address Layer 2 (as supplied by Ordnance Survey) to provide a geographic reference, but which does not necessarily match customer provided or legacy Postcode Address File (PAF) sourced data sets. Trials were carried out using up to 15 matching criteria to increase the number of automatically achieved matches. It was recognised that 9 of the proposed criteria gave more reliable and correct matching.
- The NME allows a user to display all equipment on the LV network, and the symbols, while not important to the underlying functionality for power flow analysis, are what the user relates to. There is a need to converge on a standardised approach to symbology (consistent with legacy systems, as well as the project related Distribution Management System.

Low Voltage Distribution Management System (as reported in SDRC 9.2c)

This report identifies the requirements, use-cases and business process for the creation Distribution Management System employed in the NTVV (consisting of PowerOn Fusion 5.2.2.1.2). The analysis identifies a number of insights regarding HV network data migration from the existing SSEPD Supervisory Control and Data Acquisition (SCADA), its use in supporting end point and substation monitoring, integration with the Network Modelling Environment (NME), Automated Demand Response (ADR) and management of Energy Storage and Management Units (ESMU). Key insights include:

- Core use cases include: Monitoring of the LV network in the DMS; Management of the LV network in the DMS; Importing the LV network via CIM exported data in the DMS, and; ADR to reduce load on a substation feeder
- The DMS must be scaled to meet expected demands. Under NTVV an average 4 feeder substation monitor, streaming data every 5 seconds will send 1,157,760 data values through the DMS every day. This has an impact on the design and setup of the FEP (Front End Processor) servers. For comparison, in the project study area there were only 130 pre-existing HV data points. The inclusion of the LV monitoring has added a further 31,652 points. From practical experience, to avoid congestion no greater than 60 substation monitors should be placed on a secondary DNP3 FEP line.
- The NTVV DMS represents LV networks geographically to allow site operations to be correctly reflected. Map backgrounds must be detailed enough so that communication between operational staff working on the LV network and the LV network controller is clear. Likewise, scaling must allow for the LV network controller to manually manipulate and interact with the diagram to perform operations. A compromise must be made between the usability for the LV network controller and the strict accuracy of geographic representation.
- Sizing, scale and orientation of symbols are important considerations when designing an effective tool for users to operate. Particular when non-geographic symbols are overlayed onto a map background. Without care objects and symbols can overlap with the potential to cause confusion. Following an initial automated import the project has found it takes between 15-20min per substation to manually tidy a diagram

- Data exchanges between the NME and DMS use the CIM standard (based on the IEC61968-11 CIM extensions for distribution, with some GE extensions). However, this does not reflect all types of object on the LV network (for example link boxes only have one CIM class which only reflects the geographic nature, not the other aspects required for operational use).
- It is not until the data from the NME is extracted, transformed and loaded into another system that the appropriate quality of the source data is made apparent and the mapping of objects in configuration of the DMS are highlighted – specifically, data originally collected for managing a GIS system may require further modification to re-purpose it for use in a DMS.
- The development of an automated method to add new symbols (i.e. substation monitors) has ensured that all substation monitor objects are created in an identical manner within the DMS and ensure that the technology can easily be transferred from the project to BAU in a seamless fashion.

Installation of EMMA thermal storage within domestic properties (as reported in SDRC 9.4b)

This report identifies field based experience associated with installation of EMMA controlled use of thermal storage (standard domestic hot water tanks) to manage the peak export from solar panels employed in the NTVV to consider customer engagement, installation and early operation of these units. It is anticipated that these devices would be installed to mitigate the effects of peak power export from solar panels by helping customers make effective use of the energy they have produced themselves.

There are three expected situations: a) amongst existing private housing where naturally occurring clustering is begin to cause constraints b) amongst existing social housing where the landlord plans to roll out a programme of installations, and c) amongst new housing built with highly concentrated solar.

- Under the first situation (a), effective customer engagement is important and an understanding of the following response rates (~18%) will determine the applicability of this technology amongst naturally occurring clusters. From a practical experience, to achieve 31 installations the project sent material to 174 properties with solar panels, visited 156 and booked surveys with 57. It is interesting to note that of the customers contacted, 5 already had equivalent equipment and 36 had no hot water or already had solar hot water schemes.
- During the survey stage, it was found that not all of the properties visited would be suitable for an EMMA installation. The main reasons why the properties did not qualify for installation were: the micro generation system (PV system) was too small (less than 1.5Kw); the water tank did not contain an immersion heater; the property did not have an immersion heater circuit, or; the EMMA could not be located in a safe/suitable place (typically next to the distribution board, protection from mechanical damage and other ingress)
- The installation/commissioning and revisits to the 30 EMMA units were largely without issues, although some properties required minor electrical works to enable connection of the EMMA to the property, the immersion heater circuit and subsequent electrical accessory relocation and connection.

Optimising Network Monitoring Installation (as reported in SDRC 9.2d) Based on the first 100 substation monitors installed before April 2013, analysis has considered site selection against the original selection criteria to recognise if these criteria usefully inform the selection of future substations to be monitored; compared with aggregated end point data to understand if the availability of smart meter data in the future can influence the substations that need monitoring, and also reviewed in terms of operational relevance and input to network planning decision making. The following observations are made: • From a network operations perspective, substation monitoring should be considered at: new substations built to provide new supplies to customers; existing substations with known problems, particularly relating to load, but not necessarily significantly overloaded on three phases; existing substations feeding a very dynamic customer base (those where customers frequently change), more likely in non-domestic, or; mixed use areas existing substations where the take up of low carbon technologies is already advanced or forecast to be problematic. • At this stage there has been no correlation observed between feeder demand and customer criteria to support a substation monitoring selection criteria based on substation categorisation • Assessment of Virtual Monitoring has started and will continue for large quantities of substations throughout the project. The generalised expectation that substations regarded as predictable and with reasonable headroom available may not require monitoring, and those where the demand is volatile and close to limits will require monitoring does remain reasonable. Whilst buddying and aggregation of customers' energy profiles has been seen to work, the judgement of precise criteria for when real monitoring is required cannot be made at this stage.
Short, Medium and Long Term Forecasts of Domestic Energy Loads (as reported in SDRC 9.5b) This first report considers the testing of the various mathematical methods associated with the development of short, medium and long term rolling forecasts; assessment of accuracy and error estimates, and; comparison of techniques. • Short term forecasts for individual households can be produced from historic data using a number of methods, and these can forecast the peak demand more accurately than simple average and persistence forecast methods. The Maximum Likelihood (ML) forecast performs particularly well. The versatility of the method also allows for further refinements (such as adding weather variables) and can be calibrated to improve the network peak reduction by the smart control algorithms. Unfortunately this method is quite computationally intensive and may be impractical for large numbers of customers. In this case the Permutation Merge (PM) forecast is preferred since it retains modest accuracy but it is very quick computationally. For a DNO, computational efficiency and reliability may be more important than absolute accuracy. • It was found that medium term forecasts at a local level can become inaccurate where large numbers of commercial customers change their technology [and hence energy use]. However, more work is required in this area since analyses to date only considers of non-

domestic data.

- Energy demand at the low voltage network level (substation bus bar) can be very volatile compared to the demand at higher voltages and therefore uncertainty estimates are required. However, demand at the substation level can be successfully predicted to create probabilistic forecasts
- Agent based modelling methodology has provided plausible long-term scenario results for three scenarios of random EV uptake (low, medium, high – based on localised assessments of DECC trends). Agent based models can be relatively easily updated with the additional data (such as socio-demographics, GIS etc) and is scalable to tens of thousands of households. Early observations from long term scenario simulations show that overnight peaks due to EV charge (the highest demand during 24 hours) might occur in summer, and in winter midnight peaks are comparable with the highest daily peaks. Charging behaviour might vary for a larger sample, so the observations made are not conclusive. Based on preliminary results, if the uptake of EVs is clustered, its impact on the low voltage network will be felt faster than predicted by DECC scenarios. More simulations on different feeders are needed to be able to quantify confidence bounds of this result.

Aggregation and integration of short, medium and long term forecasts (as reported in SDRC 9.5c)

This report considers the aggregation and integration of end point profiles to fill gaps in available network data where either substation of individual end-pint data is not available.

- Using the 'genetic algorithm,' 'buddied' customer profiles (where individual monitored data is not directly known) have been used to simulate a feeder demand and identify losses. A comparison with real feeder readings reveals that a close correlation can be achieved. The analysis also reveals that this network operates within the load and voltage limits, as is consistent with real monitoring data. Initial observations suggest that accuracy improves as the number of properties on the feeder increases. It was also observed that while buddying can be made to work effectively, the presence of real (smart meter) data will improve the load estimate in the future.

7.3 Learning Moments

The following 'Learning Moments' have been recorded during this reporting period.

Independent safety reviews and the benefits of pan-industry forums

Energy Storage and Management Devices are proceeding through manufacture and installation. During this time they have also been undergoing an independent document review of the Safety Case, which has emphasised the benefit of independent review and also the growing body of knowledge being established through LCNF projects and the Energy Storage Operators' Forum.

The relationship between energy awareness and readiness to engage

Site based observations indicate that domestic customers who own solar panels tend to be quite aware of their energy needs. Some of these customers already manually managing their loads to maximise on site generation. Based on the engagement work associated with the installation of equipment to manage peak exports from solar panels, it appears that the readiness to engage or

participate increases as awareness is raised. At a commercial customer level, recent ADR engagements highlight how different drivers are important to different customers – for example, one potential participant saw their future involvement as about being a being a good neighbour.
Customer communication can be influenced by method of introduction During the recent engagement of customers on to trials of hot thermal storage, there appears to have been a good result from follow-up visits performed by bicycle. Not only was this felt a more personable way to arrive but is 'greener' and often quicker than driving.
Hot thermal storage and hot water storage temperature settings During installation works for hot thermal storage trials it was noted that the majority of homes used a gas boiler to heat their hot water storage tank to a temperature of around 55°C with their immersion heater thermostat set at a higher temperature to allow top-up as required. With an EMMA device installed the immersion heater is used on a daily basis during times of peak PV generation' using the immersion heater more often than previously has lead to hotter overall tank temperatures. The latest best practice, and a requirement of the current Building Regulations for newly constructed homes, necessitates the installation of a device to limit the temperature of the water used to fills bath(s) to 48°C. Whilst the homes where we have retro fitted an EMMA unit do not need to meet these regulations, we do not want to risk customers being scalded from water which is too hot therefore immersion heater temperature setting have been reduced to match the gas boiler (approximately 55°C). Note: to maintain healthy, water cannot be stored below 52°C Reducing the immersion heater settings help protect customers from the risk of scalding. However, it also reduces the amount of PV energy that can be store within the tank on a daily basis. To increase the amount of PV energy stored, customers have been advised to consider further reducing the amount they use their gas boiler - either by reducing the boiler temperature, reducing the 'on' time, or through a combination of both. We recommend customers only consider increasing the immersion heater thermostat temperature after having a temperature limiting device installed to make sure that water delivered to taps is automatically mixed with enough cold water to keep the temperature safe.
Record Keeping Three instances highlight the benefits of maintaining accurate records, which use well defined categories: 1) There is a fairly involved series of steps to commission a substation monitor. Each step draws from a number of data sources (field surveys, asset registers etc.) to establish the right communications and DMS templates. In one case, it appears that the count of feeders was incorrectly recorded and when the substation monitor was set to report, the bus bar and feeder values did not match each other. Having identified this, the systems and records have been corrected and a new test has been added at commissioning to ensure bus bar values sum correctly. 2) Whilst compiling evidence for a recent SDRC report on the establishment of the NME, it took time to reassemble a precise log of every data transfer. A formalised log of transfers would have aided this process. The project maintains a log of security related transfers and there may be scope to widening this to record all actions. Maintaining accurate event logs will become increasingly important as we move into a trial phase. 3) Whilst looking at the Half-Hour (HH) substation monitor data it was noted that the HH just after midnight was time-stamped as the day after but referred to energy use the day before. Once understood, this is easily considered but without a degree of understanding, results could be misinterpreted.

In addition, there were two further learning moments from the previous reporting period:

Purchasing Energy Storage and Management Units The energy storage market at the street level scale for the ESMU device is relatively immature. As a result other DNOs should be careful if procuring a device of this scale to allow additional time above and beyond what would normally be expected to procure products. In our experience this additional time will need to be spent undertaking a fuller global market search to find suppliers who can provide such product at an affordable price, also in multiple rounds of technical clarifications to ensure the product will actually meet the issued specification as they will likely be integrating Commercial Off The Shelf (COTS) products in a new manner. DNOs should also be careful of scaling assumptions (up or down) around price when budgeting, it is not simply a matter of taking a price per MW/h and multiplying/dividing the cost to meet the scale required since fixed costs and other related factors may be relevant as unit sizes varies.
M2M over GPRS/UMTS communications At present, the project uses GPRS/UMTS (i.e. 2G/3G) communications for substation and end-point monitoring applications. The device failure rates are as follows: • 12 substation monitoring sites out of 135 installed have consistent GPRS communication issues (8.8%) • 10 end point monitors out of 249 installed have consistent GPRS communication issues (4%) This leads to a combined failure rate of 7.8% for all devices. This 'better' level of performance results from one environmental factor and three technical choices/measures. Environmentally, Bracknell is a semi-urban area where mobile connectivity is inherently higher than some other similar LCNF projects (for example, communications are harder to achiever in trial involving Welsh valley regions). Technically, performance gains have been achieved by: 1) selecting SIM cards that are able to roam onto any UK mobile provider network for use in end-point monitors, and managing connection availability, 2) setting up substation monitor GPRS routers to send a 'ping' every 15 mins to internal time servers in order to keep the network link live and 3) setting up substation monitor GPRS routers to be able to be remotely rebooted via SMS to reinitialise the GPRS tunnel by manual intervention.

7.4 Dissemination Activities

A dissemination log is maintained to capture details of activities project staff have undertaken to share learning from the project. Staff are encouraged to record details of outcomes and recommendations from the activities they participate in. The dissemination log is reviewed at monthly Project Partner Review Boards in the same way as the learning log. The table below shows the main dissemination activities which have been completed in this period and highlights are noted for some activities to give an overview of dissemination impacts:

Leading Partner	Date(s)	Description
SSEPD	17/01/2014	**Bracknell Heating and Plumbing Press Release** A picture for the local press with the winner of Bracknell Heating and Plumbings competition winner at the Your Energy Matters Centre. An external event aimed at local community members
SSEPD	31/01/2014 - 01/02/2014	**Efficient Water Event** Event run in cohesion with South East Water, supporting low carbon behaviours and community reductions in energy (reduced water use has an impact on water production energy requirements). An external event aimed at local community members
DNV GL	13/02/2014 - 15/02/2014	**Social Club Event** Part of the wider Low Carbon Promotion social trials. An external event aimed at local community members

SSEPD	26/02/2014	**Ranelagh School Event** Discussion of energy use and project ambitions with local school members. An external event aimed at local community members
Electrovaya	02/03/2014	**Presentation by Electrovaya on Energy Storage** Presentation by manufacturer of ESMU at Acumen 2014. An external event aimed at industry and manufacturers
SSEPD	03/03/2014	**Bracknell and Wokingham College Event** Discussion of energy use and project ambitions with local school members. An external event aimed at local community members
DNV GL	07/03/2014	**Low Carbon Day** Wide scale event arranged as part of the wider Low Carbon Promotions social trials. Leaflet, press and radio coverage discussing energy use, network impacts and asked customers to demonstrate their participation by reducing energy using between network peak times. An external event aimed at local community, commercial customers and wider industry stakeholders.
SSEPD	22/03/2014	**Your Energy Explained 1** Invitation only event to update project participants on project progress; share raw data on personal energy use; explore customer understanding of their own energy use; and to test the appropriateness of initial project categorisation work. An external event specifically for domestic project participants.
SSEPD	10/04/2012	**Ofgem Site Visit** Site visits and small group review of project findings and technology progress including: the Your Energy Matters low carbon community advisory centre; categorisation and forecasting of customer energy use; interactive demonstration of Network Modelling Environment; substation monitoring installation and operational training on Energy Storage and Management Units. An external event to brief regulatory stakeholders.
SSEPD	03/05/2014	**Your Energy Explained 2** Invitation only event to update project participants on project progress; share raw data on personal energy use; explore customer understanding of their own energy use; and to test the appropriateness of initial project categorisation work. An external event specifically for domestic project participants.
University of Reading	05/2014	**A Peak Reduction Scheduling Algorithm For Storage Devices On The Low Voltage Network** IEEE Transactions on Smart Grid VOL. X, NO. X, MAY 2014
University of Reading	05/2014	**The Real-Time Optimisation of DNO Owned Storage Devices on the LV Network for Peak Reduction** Open Access energies www.mdpi.com/journal/energies
SSEPD	09/05/2014	**Your Energy Matters – Closing Celebration** Final day of operation from fixed advisory centre
University of Oxford	13/05/2014	**Using maths to solve power problems** Podcast as part of the Powering up the National Grid series http://www.thenakedscientists.com/HTML/content/interviews/interview/1000711/ Pod cast for general public, academics and training providers.
SSEPD	29/05/2014	**Thames Valley Vision - The Future Energy Challenges** Presentation to IET Local Berkshire Network
University of Oxford	09/06/2014 - 13/06/2014	**Modelling the electricity consumption of small to medium enterprises** Presentation at ECMI 2014, The 18th European Conference on Mathematics for Industry. An external event aimed at industry and mathematicians.

7.5 NTVV Website

Web traffic for the website during this reporting period (06/12/2013 - 26/05/2014) was:

Total visits:	1060
Unique visitors:	1578
Pageviews:	5452
Pages per visit:	3.46
Avg visit duration:	2 minutes 49 seconds
% New Visits:	64.3%

8 Business case update

Ofgem guidance: The DNO should note any developments or events which might affect the benefits to be gained from the Second Tier project. Where possible the DNO should quantify the changes these developments or events have made to the project benefits compared to those outlined in the full submission proposal.

SSEPD's core purpose is to provide the energy people need in a reliable and sustainable way. To achieve this, our delivery priority is to deliver upgraded electricity transmission networks, operational efficiency and innovation in electricity and gas distribution networks as they respond to the decarbonisation and decentralisation of energy. Through its learning outcome approach NTVV has been designed to feed into and update this business plan by:

- In the short term providing a benchmark network in which the implications of disruptive technologies can be assessed and scaled.
- Allow us to cost and plan the monitoring of our network with the optimal level of low cost equipment and communications infrastructure taking full account of the longer term input from Smart metering data.
- Allow us to produce short, medium and long term models of investment requirements for a range of disruptive technology penetration levels
- Provide us with an evaluation (technical, economic and commercial), of a range of innovative network management tools releasing capacity on the network.
- Provide a template into which solutions from other SSEPD and other DNO projects can be fed to allow comparative evaluation and inform solution selection for inclusion in our business plan.
- Quantify and define resource requirements including staff and contractor skill sets to support the roll out of the business plan.
- Generate new processes, standards and procedures that are required to implement the NTVV approach as business as usual.

Our experience shows us that whilst individual technical and commercial solutions may be challenging, the real challenges emerge when these solutions are scaled up. This is the driver behind the creation of a network operations and planning environment, which in essence performs three critical functions:

- Creates the environment in which planners, operational staff and business systems will interact with the data derived from and solutions implemented in the project.
- Allows the flow of information from DNO legacy systems to the new solutions to reap the benefit of existing system information e.g. connectivity, circuit ratings, system operational state.
- Seamless integration of new solutions into core business and real time system allowing control alongside traditional systems using the same staff infrastructure e.g. control rooms, planning tools.

SSEPD has not noted any developments or events which might affect the wider business case outlined above and as detailed in the full submission proposal but as an individual project, focussed on delivering learning outcomes, SSEPD has not at this stage identified any direct financial benefit likely to be gained through delivery of this specific project.

9 Progress against budget

Ofgem guidance: The DNO should report on expenditure against each line in the Project Budget, detailing where it is against where it expected to be at this stage in the project. The DNO should explain any projected variance against each line total in excess of 5 per cent.

Project expenditure is within the budget defined in the Project Direction. The table below details expenditure against each line in the Project Budget and compares this with planned expenditure to date[5]. Projected variances are also listed for changes >5%.

	Budget	Expenditure ITD (£K)	Comparison with expected expenditure	Projected Variance (at project conclusion)		
				(£K)	%	#
LABOUR	**5,932.76**	**2,837.37**	**-4.7%**	**160.00**	**2.7%**	
Project and ICT management	1,236.45	784.60	-5.5%	0.00	0.0%	
Project engineering (monitoring, energy management & network design)	1,387.60	938.77	4.7%	0.00	0.0%	
Network Field Resources	610.00	80.42	-37.9%	0.00	0.0%	
Customer, commercial and knowledge management	826.10	368.82	-6.5%	160.00	19.4%	3
ICT architecture	358.13	223.85	0.8%	0.00	0.0%	
ICT field resource	1,514.48	440.92	-12.8%	0.00	0.0%	
CONTRACTORS	**8,710.71**	**5,318.87**	**-12.2%**	**153.15**	**1.8%**	
LV network monitoring installation	718.00	342.33	-11.2%	0.00	0.0%	
HV network monitoring equipment	65.00	0.00	-	0.00	0.0%	
Battery storage installation	458.00	14.40	1.6%	0.00	0.0%	
Communications	100.00	0.00	-	0.00	0.0%	
Smart analytics	1,926.80	660.02	-8.4%	0.00	0.0%	
Integration of monitoring, modelling and management	3,844.07	3,515.42	-12.5%	171.35	4.5%	2
Automatic demand response	333.88	252.55	-20.0%	-18.20	-5.5%	1
Learning dissemination, website and low carbon community centre	203.00	154.10	0.6%	0.00	0.0%	
Integration activities to support DNO business as usual	785.70	144.74	-31.2%	0.00	0.0%	
Real-time systems and information technology equipment	122.76	101.51	-6.4%	0.00	0.0%	
Customer, commercial and knowledge management	80.00	59.69	0.1%	0.00	0.0%	
ICT field resource	73.50	74.11	0.0%	0.00	0.0%	

[5] Expenditure is compared with a dynamic assessment of project phasing which reflects the nature of specific contract payments and physical delivery milestones. A comparison of expenditure with phased budget will often indicate a payment lag due to the nature of invoicing processes.

EQUIPMENT	**4,526.44**	**2,845.59**	**-10.9%**	**-219.92**	**-4.9%**	
LV network monitoring equipment	1,318.92	1,009.98	-11.4%	34.05	2.6%	2
HV network monitoring equipment	111.20	0.00	-	0.00	0.0%	
Communications	417.00	129.72	-27.9%	0.00	0.0%	
Battery storage equipment	1,100.00	598.78	-22.0%	0.00	0.0%	
Integration of monitoring, modelling and management	435.75	234.99	0.0%	-200.76	-46.1%	2
Automatic demand response	755.87	562.12	0.0%	-53.21	-7.0%	1
Thermal storage	80.00	24.68	-3.4%	0.00	0.0%	
Real-time systems and information technology equipment	307.70	285.31	0.2%	0.00	0.0%	
IT	**4,043.53**	**1,171.28**	**-21.2%**	**288.99**	**7.1%**	
Integration of monitoring, modelling and management	2,650.37	702.53	0.0%	217.59	8.2%	2
Automatic demand response	909.44	229.27	-51.5%	71.41	7.9%	1
Learning dissemination, website and low carbon community centre	1,432.97	91.24	-23.5%	0.00	0.0%	
ICT Field Resource	328.92	148.26	-22.9%	0.00	0.0%	
TRAVEL & EXPENSES	**335.22**	**38.28**	**108.6%**	**-222.22**	**-66.3%**	
Integration of monitoring, modelling and management	222.22	0.00	-	-222.22	-100.0%	2
General	113.00	38.28	-11.6%	0.00	0.0%	
PAYMENTS TO USERS	**591.00**	**0.00**	**-**	**0.00**	**0.0%**	
Payments to Users	591.00	0.00	-	0.00	0.0%	
DECOMMISSIONING	**392.00**	**0.00**	**-**	**0.00**	**0.0%**	
Network field resources	50.00	0.00	-	0.00	0.0%	
LV network monitoring decommissioning	332.00	0.00	-	0.00	0.0%	
Customer, commercial and knowledge management	10.00	0.00	-	0.00	0.0%	
OTHER	**988.38**	**329.53**	**-14.7%**	**-160.00**	**-16.2%**	
Land	160.00	0.00	-	0.00	0.0%	
Learning dissemination, website and low carbon community centre	272.60	145.33	-23.5%	0.00	0.0%	
Real-time systems and information technology equipment	423.03	148.07	-7.6%	-160.00	-37.8%	3
ICT field resource	132.75	36.14	0.0%	0.00	0.0%	

Notes:

1 Movement of cost allocations within the activity “Automatic Demand Response” to better reflect the nature of project costs/milestone payments. No substantive change in overall in cost of activity.
2 Movement of cost allocations within the activity “Integration of monitoring, modelling and management” to better reflect the nature of project costs/milestone payments. Travel & Expenses not treated as exceptional items within the performance of this activity. No substantive change in overall in cost of activity.
3 Detailed design has identified savings in some licensing costs. Budget reallocated to enhance customer experience through full-time staffing at high street outlet. No substantive change in combined cost of activities.

10 Bank account

Ofgem guidance: The DNO should provide a bank statement or statements detailing the transactions of the Project Bank Account for the reporting period.
Where the DNO has received an exemption from Ofgem regarding the requirement to establish a Project Bank Account it must provide an audited schedule of all the memorandum account transactions including interest as stipulated in the Project Direction.

Transaction details for the NTVV Project Bank account during this reporting period are listed in the Appendix. This extract has been redacted to protect the financial details of transacting parties; the full, un-altered copy has been submitted in a confidential appendix to Ofgem.

A summary of the transactions to date are shown in the table below:

Description	**Totals** (project inception to end of May 2014)
Electricity North West Limited	£870,000.00
Northern Electric Distribution Limited	£1,190,000.00
Yorkshire Electricity Distribution Plc	£1,710,000.00
Scottish Hydro Electric Power Distribution Plc	£560,000.03
Southern Electric Power Distribution	£5,700,000.00
Southern Electric Power Distribution (10% contrib)	£2,701,002.00
SP Distribution Limited	£1,150,000.00
SP Manweb Plc	£1,130,000.00
Eastern Power Networks Plc	£1,980,000.00
London Power Networks Plc	£1,710,000.00
South Eastern Power Networks Plc	£1,690,000.00
Western Power Distribution (Midlands East) Plc	£0.00
Western Power Distribution (Midlands West) Plc	£0.00
Western Power Distribution (South Wales) Plc	£0.00
Western Power Distribution (South West) Plc	£4,370,000.00
Interest Received	£67,669.96
Payments out of account	-£12,642,826.11
Balance	**£12,185,845.88**

11 Intellectual Property Rights (IPR)

Ofgem guidance: The DNO should report any IPR that has been generated or registered during the reporting period along with details of who owns the IPR and any royalties which have resulted. The DNO must also report any IPR that is forecast to be registered in the next reporting period.

In commissioning project partners to commence project activities, the NTVV has applied the default IPR treatment to all work orders (as defined in the Low Carbon Networks Fund Governance Document v.5, Section 2). This will ensure IPR which is material to the dissemination of learning in respect of this project is controlled appropriately.

No Relevant Foreground IPR has been generated or registered during the June 2013 – December 2013 reporting period. No Relevant Foreground IPR is forecast to be registered in the next reporting period.

The NTVV intends to gather details of IPR through the structure of individual project trials. Specifically, in concluding a project trial the following details will be gathered: 1) components required for trial replication and, 2) knowledge products required for trial replication. Likewise in configuring the overall system architecture and underlying business processes to enable the NTVV, a methodology to use conventional Business Process Mapping approaches to reveal IPR artefacts is being explored.

12 Other

Ofgem guidance: Any other information the DNO wishes to include in the report which it considers will be of use to Ofgem and others in understanding the progress of the project and performance against the SDRC.

No further details.

13 Accuracy assurance statement

Ofgem guidance: DNO should outline the steps it has taken to ensure that information contained in the report is accurate. In addition to these steps, we would like a Director who sits on the board of the DNO to sign off the PPR. This sign off must state that he/she confirms that processes in place and steps taken to prepare the PPR are sufficiently robust and that the information provided is accurate and complete.

This Project Progress Report has been prepared by the Project Delivery Manager and reviewed by the Project Director before sign-off by the Director of Distribution, who sits on the Board of SEPD.

This report has been corroborated with the monthly minutes of the Project Steering Group[6] and the Project Partners Review Board to ensure the accuracy of details concerning project progress and learning achieved to date and into the future. Financial details are drawn from the SSE group-wide financial management systems and the project bank account.

Prepared by:	Nigel Bessant	Project Delivery Manager	2nd June 2014
Recommended by:	Nigel Bessant	Project Delivery Manager	2nd June 2014
Reviewed by:	Stewart Reid	Project Director	13th June 2014
Final sign-off:	Stuart Hogart	Director of Distribution	17 JUNE 2014

A Stuart WITH DELEGATED AUTHORITY OF A. BROADBENT DIRECTOR OF DISTRIBUTION.

[6] The Project Steering Board meets as part of an overall SSEPD Innovation Steering Board

Appendix - Redacted copy of bank account transactions

Bankline

RBS
The Royal Bank of Scotland

Statement for account **-**-** ******** from 01/12/2013 to 31/05/2014

Short name:	SEPD PLC-TVV PROJECT	Currency:	GBP
Alias:	SEPD PLC-TVV PROJECT	Account type:	SPECIAL INT BEARING
BIC:	********	Bank name:	NATIONAL WESTMINSTER BANK
IBAN:	**********************	Bank branch:	READING MKT PLACE

Date	Narrative	Type	Debit	Credit	Ledger balance
	CLOSING BALANCE				**12,185,845.88Cr**
27/05/2014	SOUTHERN ELECTRI NTVV COSTS	EBP	460,009.89		12,185,845.88Cr
27/05/2014	SOUTHERN ELECTRI NTVV COSTS	EBP	496,280.95		12,645,855.77Cr
30/04/2014	SOUTHERN ELECTRI NTVV COSTS	EBP	570,968.03		13,142,136.72Cr
31/03/2014	31MAR GRS 90252721	INT		9,254.65	13,713,104.75Cr
26/03/2014	SOUTHERN ELECTRI NTVV COSTS	EBP	219,261.61		13,703,850.10Cr
26/02/2014	SOUTHERN ELECTRI NTVV COSTS	EBP	1,721,482.19		13,923,111.71Cr
03/01/2014	SOUTHERN ELECTRI NTVV COSTS	EBP	357,069.62		15,644,593.90Cr
31/12/2013	31DEC GRS 90252721	INT		10,273.21	16,001,663.52Cr
	OPENING BALANCE				**15,991,390.31Cr**
Totals			**3,825,072.29**	**19,527.86**	