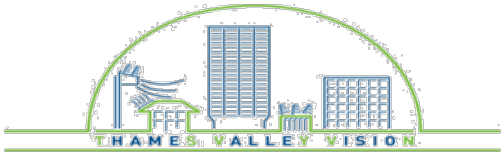
Scottish and Southern Energy Power Distribution



New Thames Valley Vision

PROJECT PROGRESS REPORT

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

Bracknell Forest Council

ea technology

KEMA DNV

Honeywell

University of Reading

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. Moving into an operational phase, the first insights from LV customer energy usage have been analysed and reported, whilst a number of new LV management tools are about to enter practical trials on completion of handover. A short summary of delivery achievements against each of the core learning outcomes is given below:

Learning Outcome: Understanding

With significant information being captured and processed from end-point and substation monitors, the NTVV has completed its first piece of analysis into energy use and the impact on future network management. A report into categorisation of these uses was published in November alongside prototype code to enable replication. The report identifies ten categories and considers the key features of interest to a DNO based on energy use patterns alone. Customer engagement is about to begin for a second round of end-point monitoring which aims to create a number of pockets with high monitoring density. Assuming satisfactory test results, the project will use cut-out based monitors with anticipated improvements to installation time. Likewise, a second batch of substation monitors has been ordered and will be installed in early 2014. Operation of monitoring equipment at scale has identified a number of communication and data management improvements which have been addressed and are being reflected in subsequent rounds of monitor installation. The design process to extend central NTVV systems for future data and management systems is well advanced, to plan.

Learning Outcomes: Anticipating and Optimising

During this reporting period the Network Modelling Environment (NME) has been configured to meet project requirements and is due for hand-over at the end of December. This tool is a combination of a geospatial asset management tool and an LV power flow analysis tool and has been built to include a number of interfaces to support the aggregation and forecasting analysis of LV loads. Combining the

NME with forecasts and scenarios will allow network planners to visualise network limits and identify future management strategies. Aligned to the NME is the Distribution Management System (DMS) which will use NME derived network data to populate a SCADA and network management system. During the past six months, the DMS has been upgraded from its base instance to enable LV operations, end-point monitoring data interfaces and control of Automatic Demand Reponses - this is on track for a January 2014 hand-over.

Learning Outcome: Supporting Change

The NTVV is exploring a number of technologies which support low carbon energy choices – these technologies and solutions have all progressed during this period. An order has been placed for the supply of 25 Energy Storage and Management Units plus a number of extension units, which are currently undergoing FAT with the first two devices due to be installed during February 2014. Aligned to this, work is underway to develop the Smart Control algorithms and the interfaces to the DMS necessary to optimally manage the ESMUs. 15 Automatic Demand Response (ADR) schemes have been installed with the project's first DNO operated load shedding event implemented.

Stakeholders

Aside from the trial specific customer engagement the project's Low Carbon Community Advisory Centre (Your Energy Matters) has supported local engagement in conjunction with Bracknell Forest Council. Exploring the effect of low carbon promotions a number of events, include a efficient lighting session and an SME focused mini-exhibition, have been held alongside wider topics of interest such as a Green Deal Day hosted by a local authority partner, college and school talks, fire safety and also an electric vehicle presentation weekend. The method to track potential changes to industry practice, governance arrangements and to prepare appropriate training material has been agreed and is being embedded with the project trial methodology.

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 shown on the following page:

Risk Descriptiom (Category & specific activity)	Further details and impact	Controls
Recruitment Phase 1 hot thermal storage 'High-density' end-point monitoring Other project trials with customers	Local recruitment to recruit 30 PV owners onto trials of thermal storage Second round of recruitment to achieve around 80% end-point monitor coverage Phase 2 hot thermal storage and cold thermal storage trials rely on interaction with non-domestic customers. NTVV has a number of strong relationships here but continues to explore the right commercial models to enable trials.	Consistent with the Customer Engagement Plan a locally responsive recruitment approach has begun in support of thermal storage trials. This approach appears to be achieving good results. A trial of similarly locally focused end-point monitoring trials is due to begin shortly.
Procurement	None	
Installation System integration	A number of components in the Distributed Solutions Integrator system rely on scheduled product releases separate from the activities of NTVV	Product handovers due shortly and presently on track

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:

- The establishment of the first pass for a unique, reliable method for customer segmentation based on individual behavioural energy consumption. This is documented and published as per SDRC 9.5a

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

- GIS - Data Cleansing
- Smart Grid Communication Selection

- Address Matching
- Temporal patterns in energy use
- Spotting data errors in large sets
- Technical Language
- Non-monetary value of demand response

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)

- Substation Monitoring
- IEEE Power & Energy Systems General Meeting
- Livos Energy Tour
- GE and Belgium utility visit
- Control Methodologies: Peak Reduction Algorithms For DNO Owned Storage Devices On The Low Voltage Network (IEEE Innovative Smart Grid Technologies Europe Conference 2013)
- Photo competition reward ceremony
- ADR welcome meeting
- Green deal day
- SMI Conference Telecoms for Smart Grids - Emerging Communications
- Heating Day
- Bracknell and Wokingham College introductory tour
- IET Power In Unity - Resilience of Smart Grid networks
- Eco-living UK tour
- Your Safety Matters
- BMW ActiveE event day
- LCNF Conference - Integrating energy storage with substation monitoring
- LCNF Conference - Security of NTVV field based smart grid devices
- LCNF Conference - Smart analytics - categorisation of energy use
- LCNF Conference - customer engagement from the local community and network perspective

- Late night shopping opening
- Mini exhibition centre
- Project website and social media

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. For many of these packages the project activities are moving from hardware and systems deployment into commissioning and operations in support of project trials. For other packages, similar progress has been made to design, tender and install supporting technologies and systems.

Continuing a pattern of reporting key findings, the project has presented a number of documents which draw on the infrastructure and data collected by the project. 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. The NTVV project has already installed a number of devices in Bracknell which are providing data in support of the Network Modelling Environment and the Distribution Management System and also underpin the Smart Analytics methods.

At the time of writing, performance statistics for the first batch of end-point monitors are as follows: 249 installed[1] of which 237 are fully operational, 3 have intermittent communication problems, 9 have enduring communication problems and 10 are held as spare. Communication problems stem from the use of GPRS in challenging situations such as basements or in middle of buildings etc. At the convenience of project participants, an ongoing programme to upgrade aerials and improve performance of the affected devices is underway. Due to the onboard memory of these devices, no data has been lost or is at risk of loss. However it is expected that a handful of devices may never

[1] 253 devices were originally installed, since installation four devices have been removed either at customer request or for other project need.

achieve adequate communications; in which case it may be appropriate to remove and relocate these devices to serve the needs of Smart Analytic activities.

Instalment of a second batch of end-point monitors is planned for spring/summer 2014. These devices will be deployed on targeted feeders to give a 'high density' of coverage. It is planned to use Senecal cut-out based end-point monitors for this round to explore a different installation method and ideally, to further reduce any disruption associated with installation.

These cut-out based devices are presently undergoing a set of tests to ensure their safe operation in domestic installations and include assessments of temperature rise and cyclic loading performance. 100 devices have been manufactured in a first batch of which approximately 80 will be available for installation (the others having been used for testing purposes). A further 100 devices will be ordered if this approach proves successful.

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. A modified approach will be tested during late December/early January and will use some of the spare end-point monitors from the first round of monitoring.

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 project has continued to monitor and adjust the first round of monitoring equipment and also to prepare for a second round to be installed. The project has resources to install up to 325 devices, but will limit the actual number to the amount required to support the Smart Analytics activities.

Performance statistics for the first round of devices are: 109 units installed, 100 devices communicating regularly on a fast-polled basis, 8 with intermittent communications and one unit awaiting repair. As seems to be common with GPRS-based communications, a significant amount of effort has been put into improving and enhancing signal strength. For example 19 units have had their antennas extended leading to significant improvements for all but three devices. Communications performance analysis has drawn on support from the project's telecoms provider, our in-house real-time systems team and the equipment supplier.

To explore the performance of the network in between the regular half-hour samples, the project has implemented widespread five-second device polling. This high-speed scanning speed has tested the limits of communication systems identifying the need to modify device firmware so as to reduce message size and has also led to the creation of a number of virtualised FEPs (front end processors) at the receiving end to ensure data can be successfully handled in time. FEP modifications have been completed and show a dramatic improvement in performance. Firmware upgrades will be rolled out

after the second batch of monitor installations. A handful of substation monitoring devices have been repaired under warranty, with five units requiring repair and two modems replacement.

Training for the second round of monitoring deployment took place in early December 2013 and focused on a new type of internal modem present in the second batch of devices and also on how external antennas could be positioned to optimise communications. Devices will be deployed during early 2014.

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.

The categorisation of energy use is the first step in a process of Smart Analytics which will subsequently "buddy" similar energy users, forecast energy user's needs and deploy control algorithms which optimise operation based on energy use.

The first version of this categorisation was reported in November 2013, fulfilling SDRC 9.5(a). This analysis identified the methods and techniques used to develop the categorisation, with descriptions to enable third parties' use; outlined the possible use cases for how a DNO could utilise these tools; and supplied prototype code and descriptions for unsupported release.

The categorisation analysis work to date has focused on methods of categorisation based on energy usage. The next stage of work, as tracked by SDRC 9.5(c), will associate these energy usage characteristics with other attributes to allow customer 'types' to be associated with energy usage. In the next reporting period, the analysis of energy use will be extended to all monitored customers in the NTVV project.

ICT requirements

(Core learning outcome: Understanding)

As previously reported, the core components of network, firewall, server and storage to support the Distributed Solutions Integrator System (DSI)[2] and analysis of data have been built and commissioned. During this reporting period, activities have focussed on the subsequent systems for Energy Storage and Management Unit (ESMU) communications, Smart Control interface with the DMS, cut-out base monitoring data systems and upgrades to the DMS and data historian.

ESMU devices have been designed to place all 'analytical intelligence' in a central location to make subsequent development work easy to implement and adjust. Whilst increasing the research

[2] The DSI is the combination of Network Modelling Environment and Distribution Management System

potential, this approach has placed a greater reliance on communications than would be expected of a future ESMU deployment. As such, a significant piece of work has been to establish the precise requirements and the most appropriate options for these devices. The options considered included 'exotic' technologies such as WiMAX, TV Whitespace, Sub-GHz radio and LoWPAN. However, given the relative immaturity of these technologies, the project has opted to follow a GRPS/ADSL wireless/wired option which gives a pragmatic and affordable solution to meet project needs. Alongside the communications design, work is underway to finish the high level design for interfacing Smart Control algorithms into the DMS.

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 on energy usage profiles to be calculated and presented.

SDRC 9.6 tracks the progress of the development of the NME and is due at the end of December 2013. Consistent with the project plan the NME is undergoing final testing with a related report being written for submission at the end of this month. During this reporting period, the project specific user requirements have been configured, existing GIS data for Bracknell has been migrated and a standard approach to address matching agreed which ensures addresses and data points are geo-coded accurately.

At the time of writing this Progress Report, the NME had been through two stages of User Acceptance Testing. Testing identified three areas to be addressed as part of handover 1) electrical connectivity of geographic mapping data associated with wooden overhead line poles needs correction - a fix is underway and will be retested; 2) Power flow analysis with multiple, normally separate feeders connected in parallel did not solve as expected - problem understood and being retested; 3) functionality to present building drawings from property developers as a background layer to the existing network using the method preferred by SSEPD not working as a result of a known product release issue – to be resolved after handover through a standard product update with an alternative method used in the interim. It should be noted that none of these aspects present a concern and should be satisfactorily resolved before NME handover to the project in December.

Pre-handover training has been provided on an ad-hoc basis to suit user requirements with further formal training to be provided in early 2014. The NME will then be subject to a number of project trials to assess its application to LV network management.

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 last reporting period, the base version of Power-On Fusion has been upgraded to give the following required functions: LV operations, end-point

monitoring interface, Automatic Demand Response (ADR) and the GIS Common Information Model (CIM) interface to allow geographic LV network data to update the DMS. User acceptance testing has been completed on LV operations and the end-point monitoring interfaces and is underway for the GIS CIM interface. The ADR UAT is not due to be started until the next reporting period as part of a future stage of development for the DMS. Work is in hand to document the establishment of the DMS as part of SDRC9.2(c) for January 2014 in line with the project plan.

Aggregation and Forecasting of energy profiles

(Core learning outcome: Anticipating)

Aggregation analysis will allow 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. Forecasting analysis runs a number of scenarios (varying in both timescale and application) to support future power flow analysis.

Aggregation or 'buddying' uses a number of external inputs to identify helpful metrics that link energy use characteristics to properties. Previous analysis on this topic called into question the validity of socio-demographic or simple 'house-type' analysis. The NTVV is drawing on the use of an enhanced power flow model from the NME and the best available network data to identify usage patterns that are relevant to a network operator.

Forecasting extends the monitoring and buddying of data into short, medium and long term predictions of use. A method for short and medium term predictions has been developed and will be applied to NTVV derived data during the next reporting period. Long term predictions will adopt a scenario methodology with adjustments to interface with short and medium forecasts whilst allowing for 10-year type developments to be identified though a handful of plausible narratives. Since the NTVV will be able to study effects on a real and complete LV network, it is anticipated that the outputs will give a much better understanding of real network constraints rather than the smoothed and homogenised predications associated with economic modelling alone. SDRCs 9.5(b), (c) and (d) track these areas of work with reports due by April 2014.

Automatic Demand Response (ADR)

(Core learning outcome: Supporting)

The project is engaging 30 buildings for trials of the ADR system by summer 2015 and had set an internal target to achieve this milestone in summer 2013/14. During this reporting period installation works have significantly progressed with ADR now installed in 15 buildings, five of which are completing final commissioning works. However, the project has not been able to achieve the full thirty buildings by the internal target. There is no concern that the formal target cannot be met, but it is noted that this is taking longer than had been hoped. This is primarily due to a lack of existing inertia for ADR involvement and protracted negotiations concerning legal review within a number of prospective participants – for example, delays in contract sign-off due to building owners having split responsibilities across the US and UK.

DNO driven testing of the ADR solution has begun, with the first aggregated test achieving a 100kW sustained reduction, which on cessation of shed produced a momentary 250kW 'bounce-back.' An extensive testing plan is being developed for subsequent months to explore this and other phenomena more fully. Part of the design of this testing plan concerns the application of operational control and the rigour necessary in scheduling these events through normal business processes. Likewise, design and implementation of the ADR to Distribution Management System interface is progressing well, with the appropriate communications implemented and messaging under test.

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 intends to deploy a number of these devices on the LV network.

Following an exhaustive procurement process, an order has been placed for twenty-five 36kVA 12.5kWh base units plus two 36kVA extension power electronics units and sixteen 12.5kWh extension energy storage units; 512.5kWh of energy storage in total. Consistent with the aim of installing these units alongside the LV main, the units will have the following physical dimensions: 1200mm high by 400mm deep with varying lengths of base unit. During the subsequent detailed design and verification process, internal components have been agreed and drawings produced for production of trial units comprising two base units with two extension energy storage units to be operated with one base unit to provide a 36kVA with 37.5kWh ESMU. At the time of writing, factory acceptance tests are underway in Canada and will be followed by type testing to G59/3 in the UK in February 2014. Site installation of the first units will begin in February 2014 with subsequent tests to prove controls and to stress test the energy storage element with several charge/discharge cycles per day.

As previously noted in June's Project Progress Report, these units are not presently found in the UK. As a result of changes in external factors and learning since the original Full Submission, SEPD has submitted a Change Request to Ofgem. The request proposes modifications to the configuration original equipment configurations and the timescale for deployment of equipment. The changes will update the plans set out at the time of Full Submission to reflect the current market capability. The modifications do not affect the planned learning or project costs.

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. The focus of the past six months and into the next six months has been and continues to be the application of theory and principles in the practical context of optimal control of ESMUs.

From a control perspective, the NTVV has defined the actions which could be used to provide value on the LV network, these include phase load balancing; energy storage to manage thermal and voltage issues during times of high loads and/or high generation; reactive power control to assist in LV network voltage management; operation of aggregated numbers of ESMUs to manage loads on 11kV feeders and at primary sub stations; and frequency response to assist in management of the GB grid. Following this, progress has been made in the definition of software agents to carry out the management of the network as identified above. In support of this, analysis of the outputs from substation monitoring is adding to the knowledge about how the study networks behave in higher resolution - close to five seconds readings in some cases and well under a minute in nearly all cases.

Into the next reporting period, the project will construct its first software agents to reduce peak loads on LV networks and use the outputs of these agents to manage physical devices on the network. The project will also develop a 'safety agent' to prevent issuing inappropriate commands which would otherwise drive the onboard safety features of physical devices into operation.

Hot Thermal Storage

(Core learning outcome: Supporting)

The thermal storage capacity of existing hot water tanks in domestic customer properties is being explored as an efficient way to enable the connection of large volumes of photovoltaic (PV) panels onto the existing network.

As previously reported, the first prototype unit has been installed and since then has been operating successfully over the summer period. This has demonstrated that modifications to the algorithm can successfully maximise the benefit to both the DNO and customer - in terms of reducing peak network export during times of high PV output and enabling a predictable and viable amount of energy to be diverted to hot water for the customer.

The newest model of the EMMA device has been delivered and all documentation has been produced for site surveys and installation. During this time, the customer engagement approach has been refined to allow deployment of further EMMA units. Learning from previous customer participation activities, it was decided to delay active engagement until all units were ready and the installation contractor prepared so that customer interest could be taken through to final trial with minimal delay or fuss for the customer. The project is on track to install the first 30 thermal storage devices by April 2014 as tracked by SDRC 9.4b.

Whilst it is presently envisioned that the subsequent 70 units would be installed alongside the PV installation programme of a Registered Social Landlord (RSL), it may be practical and more reflective of true network situations to scale up the engagement approach being adopted for the initial 30 units, should this lead to sites of a suitably concentrated nature. Once the first 30 units have been installed, the customer engagement approach will be reviewed to assess whether this method could be applied to the subsequent roll-out of 70 units.

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 harmonic distortion. The NTVV project understands that this project has suffered a delay due to resourcing with the project's academic partner and is monitoring this situation.

Cold Thermal Storage

(Core learning outcome: Supporting)

In combination with other project trials which aim to explore the amount of controllable thermal demand on the LV network, the NTVV is looking to encourage up to 50 commercial customers to install ice cooling storage units. Drawing on US and Australian experience, where this technology is widely deployed, the 2011 full submission pro-forma envisaged that these units would be funded by the customer as a naturally growing market for these devices formed in the UK. This uptake has not been observed in the UK and the NTVV has adopted a multi-staged plan to assess the viability of this trial as originally proposed, and if appropriate encourage the intended uptake in the Bracknell area

To better understand this situation, the project has begun a market analysis of cold thermal storage in commercial buildings in the UK with the aim of appreciating how and if the installation of these units will provide relevant learning. The next stage of this analysis will be to hold discussions and interviews with commercial customers who a) have loads which are most likely to match cold thermal storage and b) have loads typical of customers in the Thames Valley. The output of these conversations would be to understand 1) the tariff structure they use to purchase energy and how this maps to their use of thermally related load, 2) potential application of cold thermal storage within their premises and 3) their willingness (or otherwise) to trial this technology. In the next reporting period, the project will develop a series of ongoing conversations with commercial customers and also directly with the equipment manufacturer to better understand UK relevant options.

Low Carbon Promotions

(Core learning outcome: Supporting)

The NTVV is looking to assess 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, which is appropriate to the role and obligations of a DNO. Over the past reporting period this area of work has progressed significantly with the low carbon technologies selected, promotion plan agreed and events held. Two of these events (efficient lighting and the SME focused mini exhibition) have been held; subsequent events (including efficient appliances, engagement though a Bracknell Social Club Event and local generation) are planned over the next reporting period.

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. An initial meeting has been held with a representative of the Council to identify

the areas where further detailed analysis of the DNO interface with a Local Authority should take place. This is informing a subsequent work order due to be placed towards the end of the next reporting period.

Industry Governance

(Knowledge dissemination)

The project review of industry governance has been further extended to include aspects of safety and security management including the Construction (Design and Management) Regulations and the Data Protection Act. These governance aspects have been appended to other project Packages of Work, as appropriate. Beyond the next reporting period, the project will make reference to this earlier analysis to identify any consequential changes to industry governance that may be necessary if project principles were adopted at a wider scale.

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

(Knowledge dissemination)

The NTVV employs a variety of channels to engage with stakeholders and disseminate knowledge. These channels include the www.thamesvalleyvision.co.uk website and the Low Carbon Community Advisory Centre, known as 'Your Energy Matters.'

'Your Energy Matters' is open daily from Tuesday to Saturday and has hosted a wide variety of activities and events for the local residents of Bracknell. These events support strong links with the community but also serve to test the concept of a DNO and Local Authority working in partnership to support low carbon energy use. The events included: efficient lighting, Green Deal Day hosted by Insta, X3 Bracknell and Wokingham College School talks, fire safety with Berkshire Fire & Rescue, BMW ActiveE electric vehicles, Christmas evening late night shopping opening to match the local department store, knowledge sharing with a Belgium utility, SME focussed mini-exhibition showcasing low carbon technologies, Bracknell plumbing and heating exhibition and the ADR welcome event. During the next reporting period, a new domestic engagement consortium will be established to invite project participants with end-point monitoring to understand their energy use in more detail and to allow the project to feed back information on their actual usage. These events will coordinate with the commercial consumer consortium events, the next of which is planned for February 2014 in Bracknell's Capitol building.

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

(Knowledge dissemination)

With the first phase of analysis complete, the project has agreed the principles and techniques for ongoing knowledge capture and the mechanism for reviewing progress. A work order to start this activity has been agreed in principle. Over the next reporting period the project will review all trials to ensure findings are being recorded in an effective way and appropriate evidence is gathered to inform subsequent polices and industry relevant training.

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[3] met on:

- 25th July 2013 Project Partner Review Board
- 26th July 2013 Project Steering Group
- 29th August 2013 Project Partner Review Board
- 30th August 2013 Project Steering Group
- 26th September 2013 Project Partner Review Board
- 29th October 2013 Project Steering Group
- 31st October 2013 Project Partner Review Board (full day review workshop)
- 28th November 2013 Project Partner Review Board

[3] 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: Energy Storage & Management Units	After an extensive procurement exercise, a tender has been placed for the supply of twenty-five Energy Storage & Management Units. As previously noted in June's Project Progress Report, these units are not presently found in the UK. As a result of changes in external factors and learning since the original Full Submission, SEPD has submitted a Change Request to Ofgem. The request proposes modifications to the configuration original equipment configurations and the timescale for deployment of equipment. The changes will update the plans set out at the time of Full Submission to reflect the current market capability. The modifications do not affect the planned learning or project costs.	S3-a
2	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 these devices alongside the ADR trials at no additional cost. However work to date has not identified any such units deployed in Bracknell. During this last reporting period a management plan has been designed to fully explore the options and opportunities that exist with commercial customer in the Bracknell area and to also explore various deployment options with the product manufacturer. This analysis will continue into the next reporting period with the aim of identifying appropriate instances where this technology can be demonstrated in advance of a mainstream UK market. However, the risk remains that the project will ultimately conclude it necessary to modify future plans to exclude cold thermal storage.	S5-a
3	Supporting: Hot Thermal Storage	The project is on target to install the first 30 storage units as planned. However, the subsequent deployment of 70 units in conjunction with a Registered Social Landlord's	T4-d and T4-e

		(RSL's) solar panel deployment programme remains at risk since the RSL has modified their priorities to focus on re-roofing and not solar. The project is continuing to work with the RSL and is supporting their analysis of solar-tiles. The project is also looking at other recruitment options and locations which would provide suitable network challenges to test the deployment of thermal storage. However, there is the potential that this activity may require a longer deployment timescale and/or be deployed in an alternative comparable location. Related to this is activity is a dependency on a separate project which has been designed to confirm that the concentrated deployment of thermal storage control units will not create adverse network effects – such as unacceptable harmonic voltage disturbance. It is understood that this project's academic partner has had some resourcing issues and is running behind plan. The NTVV is monitoring the situation but may need to delay at scale implementation until there is adequate confidence that there will not be any adverse network effects.	

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, University of Reading, Honeywell, DNV KEMA, EA Technology and Bracknell Forest Council. The register is reviewed at the monthly Project Partner Review Boards and is reported to the SEPD Project Steering Group.

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 five 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.	3	5		3			3	15	1. Order placed, detailed design agreed and presently undergoing Factory Acceptance testing 2. CR currently under consideration to enable a delivery schedule in response to market readiness.	3	3		3			3	9
A1-d and A2-g	The data transfer mechanism around the export of the LV network model from NME to DMS is dependent on a product enhancement. There is a risk that this enhancement will not be delivered in line with the project schedule. The development is done by terms internal to the supplier	2	3					5	15	1. Regular communication with the product team developing the CIM interface to cover LV network. 2. Example data flows have been demonstrated 3. The supplier is preparing a manual process as an alternative to the fully automatic system, should the automatic system be delayed.	2	3					3	9
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 (as well as a change to the commercial proposal due to change in FiT). This was intended to create a high density PV network challenge and also be a basis for recruitment/ deployment of storage solutions.	3	3					4	12	1. Support and explore new PV ventures with local housing organisations 2. Establish new participants as part of wider low carbon promotions work 3. The RSL has indicated that, whilst they do not want traditional PV panels on their roofs they would be open to solar tiles as part of their re-roofing programme.	2	3		3			3	9

		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
T4-e	Thermal Storage Units cannot be deployed at scale until it has been confirmed that the at scale deployment of control units will not cause adverse network effects (harmonics)	2	3		4			3	12	1. Take outputs from separate project to assess suitability or mitigations 2. Support analysis and extrapolate results as appropriate	2	3		2			3	9
U1-e	Smart meter installation programme (by others) delayed.	2	2		2			5	10	1. Increase count of deployed end-point monitors targeted to support analysis 2. Maintain engagement with supply companies 3. Support through access to existing data flows	2	1		1			4	8
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
U1-h	Customer recruitment for second phase of monitoring not available in high-enough densities		2		3			3	9	1. Customer engagement plan approved/incentive structure designed. 2. Small scale trials planned for late December		2		3			2	6
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			3	9	1. Understand proposition and discuss with commercial customers (where relationship already exists) 2. Complete a specific analysis to identify if there is an appropriate market for these units 3. Consider funding models whereby units are supplied at minimal cost, discuss common deployment models with manufacturer 4. If no practical proposition for customers is found (a viable project learning outcome) then modify future plans to exclude cold thermal storage	1	2		3			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[4]	First ADR Agreement negotiated and signed with Commercial Customer	Complete – as noted in previous Project Progress Report
SDRC 9.1b	31/7/2012[5]	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

[4] 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.

[5] 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 9.2b	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 – Report submitted detailing the methodology and initial analysis of NTVV derived data
SDRC 9.6	31/12/2013	Build, Install and Commission the Low Voltage Modelling Environment component of the Distributed Solutions Integrator System (DSI).vocabulary for DNOs	On track – report to be submitted during December
SDRC 9.2c	31/1/2014	Install and commission the Network Management component of the Distributed Solutions Integrator System (DSI)	On track – final data loading and testing underway - report to be submitted during January
SDRC 9.4b	31/3/2014	Install 30 thermal energy storage devices as defined in (9.4a)	On track – equipment delivered, property surveys underway
SDRC 9.4c	31/3/2014	Install 25 LV connected batteries as defined in (9.4a)	Delivery schedule subject to Change Request
SDRC 9.2d	30/4/2014	Develop and trial method of optimising network monitoring based on installation of first 100 substation monitors	On track – related to deployment of previous monitoring and development of aggregation tools under SDRC 9.5c
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	On track – methodology developed for short and medium term forecasts. Long term scenario tools under development
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	On track – draws on initial data flows from end-point and substation monitoring as well as other geospatial data.

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

SDRC	Due	Description
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
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

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 Learning Moments

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

GIS - Data Cleansing Data cleansing has been carried out on study substation mapping records to ensure a correct and accurate LV network model. Manual intervention by the Mapping Services team took two hours to cleanse an individual substation. Clearly, this would not be a sustainable or scalable solution and the project has set about defining an automated rule based approach to perform the data cleansing on the remaining substations in the project area.
Smart Grid Communication Selection The NTVV project has begun to compare the performance of the communications solutions implemented on both end point monitoring and substation monitoring to inform future smart grid technology deployments. The main learning point is that M2M over GPRS networks is not suitable for near real time communication or control of field based devices at scale. This is reflected and supported by other LCNF projects, for example WPD reported a 10% loss of communications when using GPRS communications that meant that an additional 10% of devices needed to be installed to meet a statistically valid population of substations. This oversampling approach would not be valid in the context of NTVV, but also NTVV has achieved a higher GPRS success rate.
Address Matching Address matching has been used to geo-tag tabular data such as MPANs. Early exercises indicate automatic match of 89.7% from SSEPD records to Address Layer 2 data. This could have wider implications for roll-out across a whole DNO and work is underway to identify the man hours required to improve on the data quality via manual process or by using additional data quality tools.

Temporal patterns in energy use

To enable categorisation of end-point data recent work has focused on identifying characteristics which are most useful to a DNO and use some fairly interpretable aspects. For example, it has been found that the likelihood of maximum demand occurring during the evening, overnight, breakfast or weekend is both helpful and also a useful first stage in relating behaviours to network outcomes and identifying transitions where one behaviour type might change to another. This has led to the development of a 10 cluster segmentation based on intra-day usage.

Spotting data errors in large sets

An implicit design assumption was made that time stamping of data did not require definition beyond normal units (i.e. seconds). However, it has been noted that due to the sheer volume of data being transmitted any discrepancies in format can make it very difficult to analyse the data.As a result a common format for time stamping should be included in any future tenders.

Similarly, learning was shared from a data validation exercise by Durham University on another LCNF project where zero values within the data were validated by plotting a distribution curve of the zero's over a defined period and if the shape was the inverse of the standard load profile then the figures were concluded to be accurate. Had the distribution been random then this would have triggered a fault finding exercise to establish the cause.

Technical Language

The project noted an instance where project specific language could have caused confusion had the recipient not checked the context and asked to clarify. In this case, a server system was termed the 'test environment' but was being reconfigured such that it would ultimately become a 'production environment' – care is needed to ensure specific meanings are understood by all.

Non-monetary value of demand response

Feedback received during the ADR 'kick off' meeting reinforced the concept that a notable incentive for customers to be involved in these trials was a full building energy audit. A customer representative suggested that at this opportunity it would be a good idea for DNOs to address energy efficiency issues at the same time as understanding the potential for load shedding – delivering network and customer benefits.

7.3 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	11/07/2013	**Substation Monitoring** Presentation at event to share learning on substation monitoring technology, and installation experience. An external event aimed at DNOs and Transmission Operators (TOs)
University of Reading	23/07/2013	**IEEE Power & Energy Systems General Meeting** To describe and encourage the use of some of the energy load forecasting

		techniques as developed in NTVV. Conference presentation on load forecasting techniques - in particular detailing the improved accuracy afforded by some of the methods employed. Also opportunity taken to discuss the NTVV project with people working in the wider power and energy industry. An external event aimed at DNOs and TOs, electricity suppliers, electricity generators and ESCOs, and academia
SSEPD	02/08/2013	**Livos Energy Tour** Tour of the Your Energy Matters Low Carbon Community Advisory Centre to disseminate learning from the NTVV project to Livos Energy. Livos Energy are a renewable energy developer.
SSEPD	28/08/2013	**GE and Belgium utility visit** An opportunity to explain our project to European partners, and to explain to them how development and use of the DMS and NME will allow us to build a more visible network
University of Reading	06/09/2013	**Control Methodologies: Peak Reduction Algorithms For DNO Owned Storage Devices On The Low Voltage Network (IEEE Innovative Smart Grid Technologies Europe Conference 2013)**. Presentation on categorising and comparing different control algorithms for DNO-owned energy storage devices on the low voltage network for peak demand reduction and looking at how we can select algorithms to use based on how forecastable a demand aggregation is (single phase size) and discuss certain control elements and their benefits/detriments. An external event for academia, DNOs and TNOs and system providers and integrators
SSEPD	17/09/2013	**Photo competition reward ceremony** An external general public event to raise energy awareness throughout the community
Honeywell	18/09/2013	**ADR welcome meeting** Breakfast meeting including presentation by SSEPD and Honeywell on how the ADR programme will operate followed by a group discussion. Event specifically targeted at existing and future project participants.
Bracknell Forest Council	21/09/2013	**Green deal day** An external general public day to raise awareness of the subsidies made for home improvements through the Green Deal - presented by a partner to the local authority
SSEPD	23/09/2013	**SMI Conference Telecoms for Smart Grids - Emerging Communications** Technology selected for use on the NTVV. Presentation covered project overview; communications security requirements; product maturity in smart grid solutions; communications selection criteria; comparison with contemporary solutions and conclusions. An external event to share findings on communication technology with DNOs and TOs, system providers and integrators.
SSEPD	04/10/2013 01/11/2013	**Heating Day** An external/general public event to raise awareness of efficient heaters to the residents in Bracknell and to generate interest at Your Energy Matters. Event focused on community groups and local stakeholders, supported through the use of handouts, local media and display materials.
SSEPD	10/10/2013 20/11/2013 29/11/2013	**Bracknell and Wokingham College introductory tour** A series of external events aimed at a local education establishment
SSEPD	16/10/2013	**IET Power In Unity - Resilience of Smart Grid networks** IET hosted conference, presentation on ensuring new technologies and control equipment are reliable; how the security of this critical national infrastructure

		including cyber risks is controlled; and managing the whole system with its increasing complexities. Drawing on the design and implementation of NTVV and its application to LV networks. Conference for policy makers, DNOs and TOs, system providers and integrators, equipment manufacturers and academia.
SSEPD	17/10/2013	**Eco-living UK tour** An overview of how the Low Carbon Community Advisory centre can support local understanding. Tour of centre and participant at mini exhibition. An external event for community groups
SSEPD	31/10/2013	**Your Safety Matters** In partnership with Royal Berkshire Fire and Rescue to disseminate firework advice and liaise with the local community. Used advisory centre alongside an outreach vehicle within the promotional site of Charles Square.
SSEPD	09/11/2013	**BMW ActiveE event day** To raise awareness of the effects that electric vehicles will have on the grid and how NTVV aims to manage potential network limitations cost-effectively. Also to increase awareness of the costs/benefits of EVs within the local community
SSEPD	13/11/2013	**LCNF Conference - Integrating energy storage with substation monitoring**
SSEPD	13/11/2013	**LCNF Conference - Security of NTVV field based smart grid devices**
SSEPD	13/11/2013	**LCNF Conference - Smart analytics - categorisation of energy use**
SSEPD	14/11/2013	**LCNF Conference - customer engagement from the local community and local network perspective**
SSEPD	21/11/2013	**Late night shopping opening** Late night opening of advisory centre alongside Christmas shopping times to disseminate project information. Timing chosen to reach the widest group of local stakeholders possible.
DNV KEMA	28/11/2013	**Mini exhibition centre** A local community event aimed at the SME sector to raise awareness for PVs, heat pumps, heating and ventilation control (HVAC) controls and efficient lighting for social housing associations, property developers and SMEs

7.4 NTVV Website

The second release of the NTVV Website went live on the 10th September 2013. Web traffic for the website post release (09/09/2013 - 05/12/2013) was:

Total visits:	684
Unique visitors:	447
Pageviews:	2658
Pages per visit:	3.89
Avg visit duration:	3 minutes 56 seconds
% New Visits:	56.6%

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.

As indicated in the Bid Submission business case, SEPD has joined with other European DSOs and academic institutions to draw on the outputs of the NTVV and similar projects through the DISCERN FP7 project. The main objective of DISCERN is the enhancement of European distribution grids with technical and organisational solutions for the optimal level of smart grid intelligence. More details of this project can be found at the project's website http://www.discern.eu/. SEPD's role will be to 'lead' on the core aspects of network monitoring as demonstrated though NTVV and to also 'listen' and test business and technology cases as demonstrated by projects operated through the DISCERN project. Work to date has focused on the testing and applying of the Smart Grid Architecture Model and development of a related semantic model. In parallel to this, DISCERN is developing a number of pan-European KPIs to measure and compare the effectives of various new technologies.

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[6]. Projected variances are are also listed for changes >5%.

	Budget	Expenditure ITD (£K)	Comparison with expected expenditure	Projected Variance (at project conclusion)		
				(£K)	%	#
LABOUR	**5,932.76**	**2,080.93**	**-7.9%**	**160.00**	**2.7%**	
Project and ICT management	1,236.45	606.14	-11.8%	0.00	0.0%	
Project engineering (monitoring, energy management & network design)	1,387.60	657.93	3.3%	0.00	0.0%	
Network Field Resources	610.00	35.32	-1.9%	0.00	0.0%	
Customer, commercial and knowledge management	826.10	268.10	-10.7%	160.00	19.4%	3
ICT architecture	358.13	212.58	-9.0%	0.00	0.0%	
ICT field resource	1,514.48	300.87	-17.8%	0.00	0.0%	
CONTRACTORS	**8,710.71**	**4,415.21**	**-7.7%**	**153.15**	**1.8%**	
LV network monitoring installation	718.00	199.76	-25.8%	0.00	0.0%	
HV network monitoring equipment	65.00	0.00	-	0.00	0.0%	
Battery storage installation	458.00	9.41	-47.1%	0.00	0.0%	
Communications	100.00	0.00	-	0.00	0.0%	
Smart analytics	1,926.80	486.65	-11.2%	0.00	0.0%	
Integration of monitoring, modelling and management	3,844.07	3,015.42	0.0%	171.35	4.5%	2
Automatic demand response	333.88	252.55	-9.1%	-18.20	-5.5%	1
Learning dissemination, website and low carbon community centre	203.00	138.30	-20.8%	0.00	0.0%	
Integration activities to support DNO business as usual	785.70	86.17	-62.4%	0.00	0.0%	
Real-time systems and information technology equipment	122.76	93.52	3.6%	0.00	0.0%	
Customer, commercial and knowledge management	80.00	59.33	-0.2%	0.00	0.0%	
ICT field resource	73.50	74.11	0.7%	0.00	0.0%	

[6] 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**	**1,903.00**	**-5.1%**	**-219.92**	**-4.9%**	
LV network monitoring equipment	1,318.92	649.87	-4.6%	34.05	2.6%	2
HV network monitoring equipment	111.20	0.00	-	0.00	0.0%	
Communications	417.00	87.96	-2.1%	0.00	0.0%	
Battery storage equipment	1,100.00	58.49	0.0%	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	-9.1%	-53.21	-7.0%	1
Thermal storage	80.00	24.68	-0.3%	0.00	0.0%	
Real-time systems and information technology equipment	307.70	284.89	-4.2%	0.00	0.0%	
IT	**4,043.53**	**567.09**	**-14.2%**	**288.99**	**7.1%**	
Integration of monitoring, modelling and management	2,650.37	226.31	0.0%	217.59	8.2%	2
Automatic demand response	909.44	229.27	0.0%	71.41	7.9%	1
Learning dissemination, website and low carbon community centre	1,352.97	40.00	-66.1%	0.00	0.0%	
ICT Field Resource	328.92	71.52	-18.1%	0.00	0.0%	
TRAVEL & EXPENSES	**335.22**	**10.27**	**174.0%**	**-222.22**	**-66.3%**	
Integration of monitoring, modelling and management	222.22	0.00	-	-222.22	-100.0%	2
General	113.00	10.27	174.0%	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**	**239.84**	**-49.7%**	**-160.00**	**-16.2%**	
Land	160.00	0.00	-	0.00	0.0%	
Learning dissemination, website and low carbon community centre	272.60	84.57	-68.6%	0.00	0.0%	
Real-time systems and information technology equipment	423.03	124.39	-10.3%	-160.00	-37.8%	3
ICT field resource	132.75	30.88	-21.6%	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 Nov 2013)
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	£48,142.10
Payments out of account	-£8,817,753.82
Balance	**£15,991,390.31**

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[7] 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	11th December 2013
Recommended by:	Nigel Bessant	Project Delivery Manager	11th December 2013
Reviewed by:	Stewart Reid	Project Director	17th December 2013
Final sign-off:	Stuart Hogarth 	Director of Distribution	16/12/13

[7] 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 01/06/2013 to 09/12/2013

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:	GB**********	Bank branch:	READING MKT PLACE

Date	Narrative	Type	Debit	Credit	Ledger balance
	CLOSING BALANCE				**15,991,390.31Cr**
27/11/2013	SOUTHERN ELECTRI NTVV COSTS	EBP	130,961.77		15,991,390.31Cr
01/11/2013	SOUTHERN ELECTRI NTVV COSTS	EBP	584,176.88		16,122,352.08Cr
07/10/2013	SOUTHERN ELECTRI SOUTHERN ELECTRI	EBP	341,546.83		16,706,528.96Cr
30/09/2013	30SEP-GRS *******	INT		11,376.40	17,048,075.79Cr
28/08/2013	SOUTHERN ELECTRI NTVV COSTS	EBP	975,480.59		17,036,699.39Cr
28/06/2013	SOUTHERN ELECTRI NTVV COSTS	EBP	419,197.33		18,012,179.98Cr
28/06/2013	28JUN-GRS *******	INT		11,895.72	18,431,377.31Cr
	OPENING BALANCE				**18,419,481.59Cr**
Totals			**2,451,363.40**	**23,272.12**	

NB: Transactions with today's date may still be subject to confirmation and may subsequently be reversed from your account.

Confidential appendix - Full copy of bank account transactions