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OPEN LV

OPENING UP THE SMART GRID

ea technology

RIIO NIC NETWORK INNOVATION COMPETITION

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Glossary

Term	Definition
Background IPR	Intellectual Property Rights owned by or licensed to a Project Participant at the start of a Project.
Customer Engagement Plan	The plan that the Network Licensee must submit to Ofgem setting out how it or any of its Project Partners, will engage with, or impact upon, Relevant Customers as part of the Project.
Distribution Network Operator (DNO)	Any Electricity Distributor in whose Electricity Distribution Licence the requirements of Section B of the standard conditions of that licence have effect (whether in whole or in part).
Expert Panel	A panel of independent experts who together provide knowledge and expertise under the following headings: energy network industries, environmental policy, technical and engineering, economics and financial and consumer interests. The panel is appointed by Ofgem to advise the Authority's decision-making process on the selection of Projects for funding.
Foreground IPR	All Intellectual Property Rights created by or on behalf of any of the Project Participants, their sub-Licensees, agents and sub-contractors as part of, or pursuant to, the Project, including all that subsisting in the outputs of the Project.
Full Submission Pro-forma	Pro-forma which Network Licensees must complete and submit to Ofgem in order to apply for funding under the NIC.
Funding Licensee	The Network Licensee named in the Full Submission as the Funding Licensee, which receives the Approved Amount and is responsible for ensuring the Project complies with this Governance Document and the terms of the Project Direction.
Intellectual Property Rights (IPR)	All industrial and intellectual property rights including patents, utility models, rights in inventions, registered designs, rights in design, trademarks, copyrights and neighbouring rights, database rights, moral rights, trade secrets and rights in confidential information and know-how (all whether registered or unregistered and including any renewals and extensions thereof) and all rights or forms of protection having equivalent or similar effect to any of these which may subsist anywhere in the world and the right to apply for registrations of any of the foregoing.
ITT	Invitation to Tender
LV	Low Voltage
LV-CAP™	Low Voltage Common Application Platform.
NIC	Network Innovation Competition.

Term	Definition
Project	The Development or Demonstration being proposed or undertaken.
Project Bank Account	A separate bank account opened and used solely for the purpose of all financial transactions associated with a NIC Project.
Project Direction	A direction issued by the Authority pursuant to the NIC Governance Document setting out the terms to be followed in relation to the Eligible NIC Project as a condition of its being funded pursuant to NIC Funding Mechanism.
Project Participant	A party who is involved in a Project. A participant will be one of the following: Network Licensee, Project Partner, External Funder, Project Supplier or Project Supporter.
Project Partners	Any Network Licensee or any other Non-Network Licensee that makes a contractual commitment to contribute equity to the Project (e.g. in the form of funding, personnel, equipment etc.) the return on which is related to the success of the Network Licensee's Project.
Project Supplier	A party that makes a contractual commitment to supply a product or service to the Project according to standard commercial terms that are not related to the success of the Project.
Relevant Background IPR	Any Background IPR that is required in order to undertake the Project.
Relevant Foreground IPR	Any Foreground IPR that is required in order to undertake the Project.
Successful Delivery Reward Criteria (SDRC)	The Project specific criteria set out in the Project Direction against which the Project will be judged for the Successful Delivery Reward.
WPD	Western Power Distribution

1 Executive Summary

The OpenLV Project "the Project" is funded through Ofgem's Network Innovation Competition (NIC) funding mechanism. The Project commenced in December 2016 and is scheduled to complete in April 2020.

The Project has three phases: 1) Mobilise & Procure, 2) Design & Build and 3) Trial, Consolidate & Share. This Report details the progress of the Project, finalising the first phase "Mobilise & Procure" and progress made in the "Design & Build" phase. This is the fourth Project Progress Report (PPR) for the Project and details progress on the last six months, June 2018 to November 2018.

1.1 Overall Project Progress

The key achievements in the reporting period are as follows:

- 71 OpenLV platforms have been installed across WPD's licence area in total, across all three Project Methods;
  - Method 1 Phase 1: 48 of the total 50 units are installed, with the final pair held in reserve until all Phase 2 sites are successfully commissioned.
  - Method 1 Phase 2: 8 of the total 10 units are fully installed. The remaining 2 are scheduled for installation in the first week of December 2018.
  - Method 2: All 10 units allocated for the Method 2 trials have been installed and commissioned.
  - Method 3: 5 of the 10 units allocated to Method 3 have been installed and commissioned. The selection of the remaining sites for equipment installation is dependent on the Method 3 participating companies.
  - It should be noted that four installed locations are 'shared' between Methods 2 and 3, due to proximity of suitable installation locations and benefits for communities and third parties derived from pooling the available data.
- The seven groups selected to take part in Method 2 Community Engagement trial have now completed all necessary paperwork. Relevant substations have been selected, installations have been completed and data is being received from sites. Two additional substations that are of interest to Method 2 groups but can also be used by Method 3 organisations have also been chosen and are now providing data;
- CSE have produced an app that has been installed in the 12 substations of relevance to Method 2 organisations. It is producing data for a web app that the 7 community organisations can configure to their own specifications according to the priorities of their communities. This configuration process is underway;
- The project team initially received 23 applications to take part in the Method 3: OpenLV Extensibility trials. All these applicants were interviewed and 17 organisations were, at first, selected to take part in this trial. Of those 17, 2 companies expressed their inability to proceed with the projects at a later stage but, at the same time, 12 further organisations shown their interest on the project and 10 of those decided to go ahead with the trials. There is currently a total of 25 third parties involved on the Method 3 trials with a total of 27 different ideas;

- It should be noted that the final number of the Method 3 participants may vary during the trial period; further companies may show their interest as the project exposure increases and others may not be able to complete the trials due to mainly resource availability.
- The fault resolution guidance and notices for the operation of the OpenLV platforms with automated Alvin Reclose™ capabilities have been finalised;
- Stage 2 Factory Acceptance Tests (FAT2) were successfully completed, demonstrating the ability of the LoadSense™ control algorithm, when combined with Alvin Reclose™ units, to autonomously operate in response to varying load on the monitored transformer system. This enabled installation of the Method 1, Phase 2 sites to commence.

1.2 Business Case

At the time of writing, there have been no changes to the anticipated benefits to be gained by the Project.

1.3 Project Learning and Dissemination

Project lessons learned and what worked well are captured throughout the project lifecycle. These are captured through a series of on-going reviews with stakeholders and project team members. These are reported in Section 8 of this report.

Key dissemination activity within the reporting period are as follows:

- Richard Potter represented OpenLV at the CIRED Workshop in Ljubljana, Slovenia, attended by over 400 delegates from 33 countries presenting a paper titled “The Development and Implementation of a Common Application Platform to Support Local Energy Communities”;

Figure 1: Richard Potter representing the OpenLV project at CIRED

- Richard Potter delivered a presentation about the OpenLV project at the ‘Smart Energy Marketplace 2018’ event held in Exeter on 19th June 2018;

- The OpenLV project was represented at the Low Carbon Network and Innovation (LCNI) conference on the EA Technology and the WPD stand in October 2018. This conference welcomed over 1,000 visitors and featured over 40 exhibitors. An LV-CAP device, used in the project, was displayed on the WPD stand and there was much interest in the diversity of Apps being developed by Method 2 and 3 organisations;

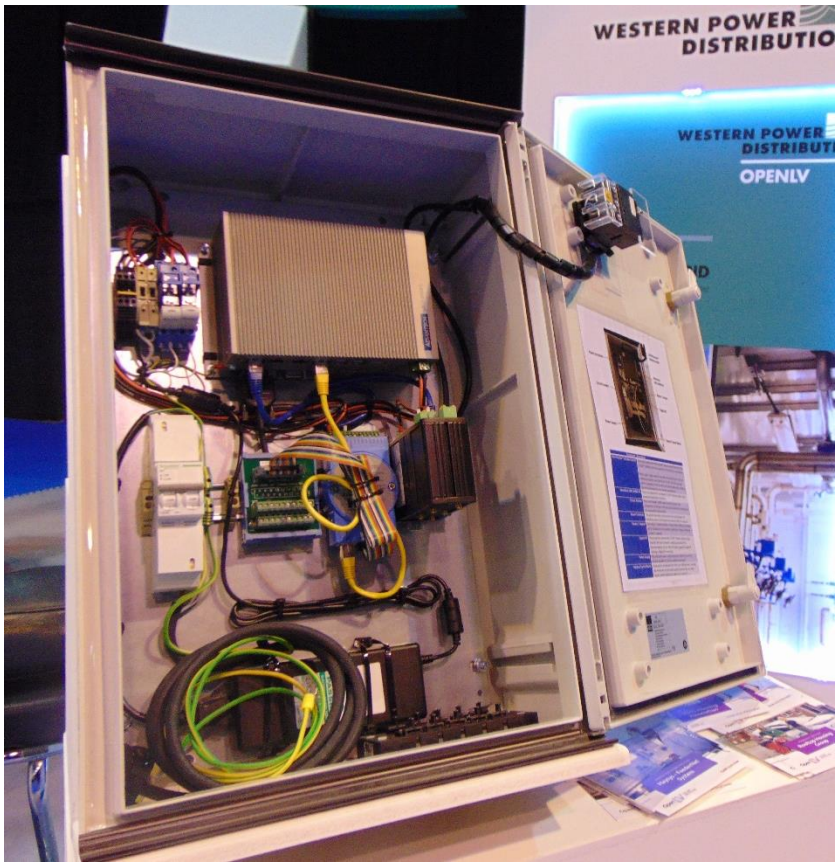

Figure 2: An LVCap™ on the WPD stand at LCNI

- Stakeholder newsletters containing the latest project news were circulated in July and November 2018 to 897 recipients;
- Case studies have been produced to highlight the motivations and objectives of the all the Community groups participating in Method 2 of the project, and four of the organisations taking part in Method 3 of the project. These can be found at: https://openlv.net/case-studies/;
- Postcards summarising each case study together with an overarching leaflet have also been produced to highlight the communities and organisations involved in the project;
- SDRC 2.2 "Target Networks, Market Potential and Trial Design" has been published on the OpenLV Website.

Figure 3: EA Technology's David Russell and Ana Duran from the OpenLV team beside the postcards highlighting case studies at LCNI2018

- The project Twitter account has been active, disseminating news about the project. It now has over 200 followers. The account is averaging 41 "likes" per month and monthly impressions (how many times a tweet is seen) have increased from 8,111 to an average of 13,332 over the period;

1.4 Risks

The OpenLV risk register is a live document and is updated regularly. A total of 47 risks have been raised, 22 of which have been closed, leaving a total of 25 live risks. Mitigation action plans are identified when raising a risk and the appropriate steps then taken to ensure risks do not become issues wherever possible. Of the 25 live risks none are ranked as severe or major, 4 are ranked as moderate and 21 are ranked as minor.

2 Project Manager's Report

2.1 Project Background

The OpenLV Project "the Project" is funded through Ofgem's Network Innovation Competition (NIC) funding mechanism. The Project commenced in December 2016 and is scheduled to complete in April 2020.

The Project Partners are as follows: 1) Western Power Distribution (WPD): The Lead/Funding DNO (licensee); and 2) EA Technology: The 3rd Party Lead Supplier who is responsible for the overall delivery of the Project.

The Project has three phases and four work packages as shown in 4. This Report details the progress of the Project, focussing on the last six months, June 2018 to November 2018. The reporting period is depicted on Figure 4 by the grey shaded box.

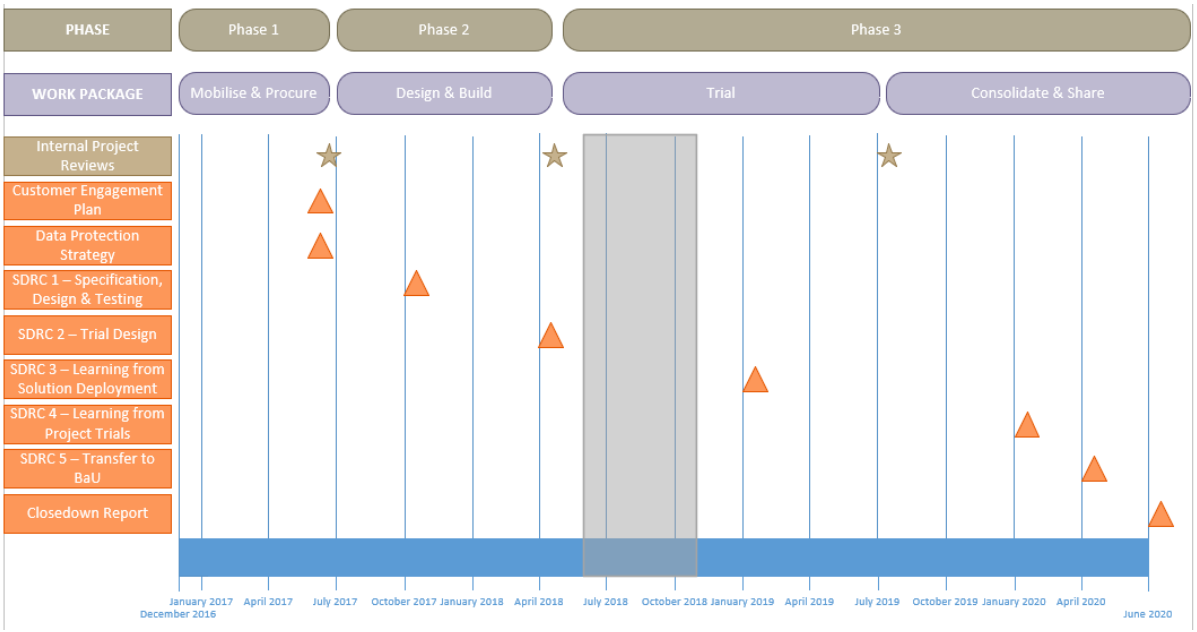

Figure 4: OpenLV Timeline

2.2 Project Progress

2.2.1 Overall Progress

During this reporting period the key achievements are as follows:

- 71 OpenLV platforms have been installed across WPD's licence area in total, across all three Project Methods;
  - Method 1 Phase 1: 48 of the total 50 units are installed, with the final pair held in reserve until all Phase 2 sites are successfully commissioned.
  - Method 1 Phase 2: 8 of the total 10 units are installed, 2 only which only required an upgrade with Alvin Reclose™ units.
  - Method 2: All 10 units allocated for the Method 2 trials have been installed and commissioned.

  - Method 3: 5 of the 10 units allocated to Method 3 have been installed and commissioned. The selection of the remaining sites for equipment installation is dependent on the Method 3 participating companies.
  - It should be noted that four installed locations are 'shared' between Methods 2 and 3, due to proximity of suitable installation locations and benefits for communities and third parties derived from pooling the available data.
- Stage 2 Factory Acceptance Tests (FAT2) were successfully completed in July 2018, demonstrating the ability of the LoadSense™ control algorithm, when combined with Alvin Reclose™ units, to autonomously operate in response to varying load on the monitored transformer system. This enabled installation of the Method 1, Phase 2 sites to commence.
- The fault resolution guidance and notices for the operation of the OpenLV platforms with automated Alvin Reclose™ capabilities have been finalised;
- The project team initially received 23 applications to take part in the Method 3: OpenLV Extensibility trials. All these applicants were interviewed, and 17 organisations were, at first, selected to take part in this trial. Of those 17, 2 companies expressed their inability to proceed with the projects at a later stage but, at the same time, 12 further organisations shown their interest on the project and 10 of those decided to go ahead with the trials. There is currently a total of 25 third parties involved on the Method 3 trials with a total of 27 different ideas;
- It should be noted that the final number of the Method 3 participants may vary during the trial period; further companies may show their interest as the project exposure increases and others may not be able to complete the trials due to mainly resource availability.

2.2.2 Procurement

No change. All the required commercial agreements for the Project are in place.

2.2.3 Trials

This phase of the Project includes setting up the overall OpenLV Solution as defined in the FSP [Ref. 1] and underpins the ability of the Project to test each of the proposed Methods. This phase has provided the overall OpenLV Solution to be trialled for each of the three Project Methods:

Method 1 - Network Capacity Uplift: Will demonstrate how the OpenLV platform can be utilised to increase the capacity of the LV network. Importantly, this Method will seek to prove how network control can be carried out, effectively and securely, via a highly decentralised architecture. This will enable costly and disruptive network reinforcement costs to be deferred or avoided.

Method 2 - Community Engagement: Will demonstrate the value of providing LV network data and an 'open platform' to communities, who want to be part of a smarter grid, to better understand their electricity use (and generation). This will enable communities to take action, for example, to reduce their impact on the environment, energy use and energy costs or to deploy innovative apps on the intelligent substation devices.

Method 3 - OpenLV Extensibility: Will demonstrate the benefits of providing an 'open platform' that will enable academics, companies (including non-energy companies) and communities to develop innovative algorithms and apps that could be deployed on intelligent substation monitoring devices to improve network performance, facilitate non-traditional business models and support the uptake of Low Carbon Technologies (LCTs) like electric vehicles, localised generation / energy storage, etc.

For reporting purposes, the progress under the Design & Build phase was been split into the following categories:

1) **Enabling Works:** Provides an overview of the work completed on the overall OpenLV Solution that will support the three Project Methods.
2) **Network Capacity Uplift:** Provides an overview of the work completed to support the Project trials under Method 1.
3) **Community Engagement:** Provides an overview of the work completed to support the Project trials under Method 2.
4) **OpenLV Extensibility:** Provides an overview of the work completed to support the Project trials under Method 3.

It is confirmed that the following progress, under the **enabling works** category has been made within the reporting period:

- Work has commenced to address the actions recommended by the cyber-security assessment of the overall OpenLV Solution;
- At the time of writing 75 of the 80 OpenLV platforms have been built and tested with the remainder awaiting allocation of substations under Method 1 (reserve pair) and Method 3.; and

It is confirmed that the following progress, under the **network capacity uplift** category has been made within the reporting period:

- Method 1 Phase 1: 48 of the total 50 units are now installed, with the final pair held in reserve until all Phase 2 sites are successfully commissioned;
- Method 1 Phase 2: 8 of the total 10 units are installed, 2 which only required an upgrade with Alvin Reclose™ units;
- Stage 2 Factory Acceptance Tests (FAT2) were successfully completed in July 2018, demonstrating the ability of the LoadSense™ control algorithm, when combined with Alvin Reclose™ units, to autonomously operate in response to varying load on the monitored transformer system. This enabled installation of the Method 1, Phase 2 sites to commence;
- The fault resolution guidance and notices for the operation of the OpenLV platforms with automated Alvin Reclose™ capabilities have been finalised;

It is confirmed that the following progress, under the **community engagement** category has been made within the reporting period:

- All 7 selected community groups have signed a Memorandum of Understanding document, outlining the responsibilities of CSE and the community engagement trial

participants, and Data Sharing Agreement and are progressing with their involvement in the trial;

- Installations are now complete, and data is being received from all monitored substations;
- Case studies detailing have been produced about all 7 community groups and are hosted on the project website;
- CSE have produced an App that has been in deployed in 12 relevant substations. The app is producing data that is displayed in a web portal that can be configured according to the priorities and aims of the groups participating in the trial. This configuration process is underway however the graphs below provide examples of the portal's capabilities and the work that has already been done;

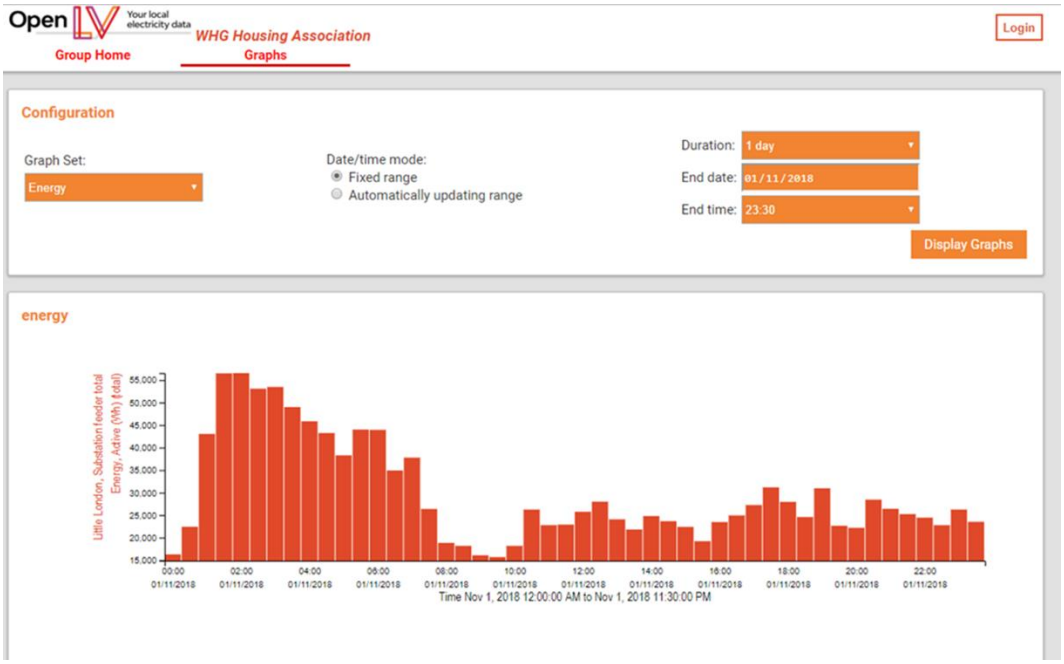

Figure 5: Graph showing the monitored load at the Little London substation, Walsall. This substation feeds a single tower block where heating is predominantly by storage heaters.

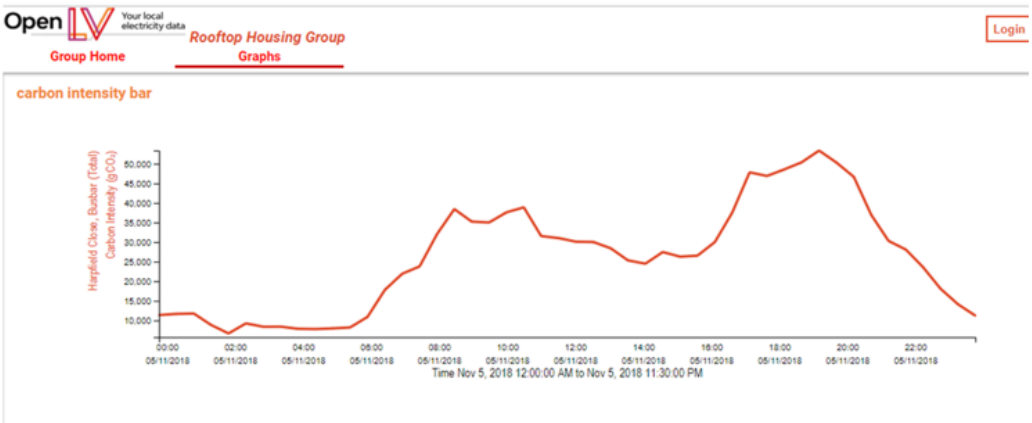

Figure 6: Carbon Intensity over a day at a substation being monitored near Cheltenham on behalf of Rooftops Housing Association

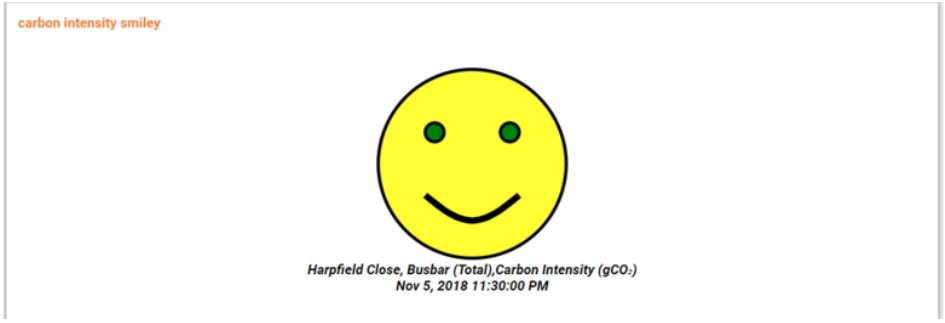

Figure 7: Some groups will use Smiley faces rather than graphs to communicate usage

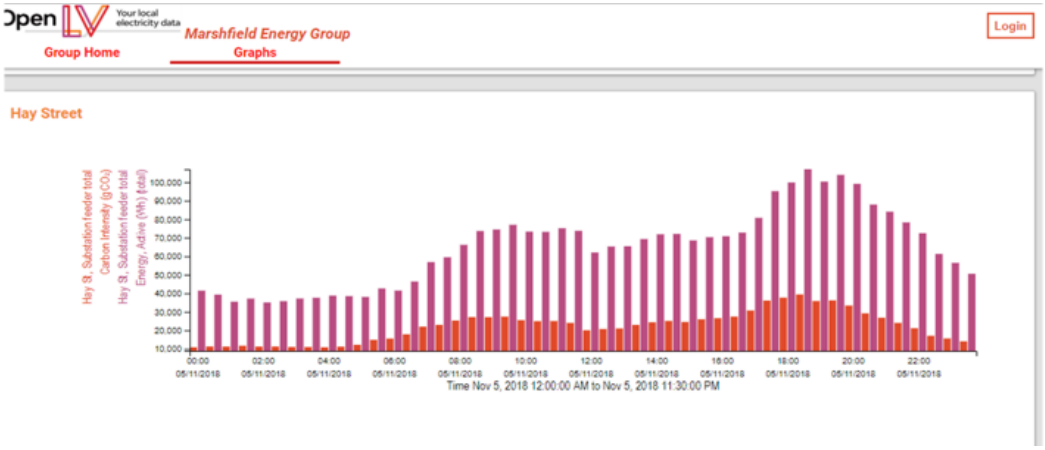

Figure 8: Load and Carbon Intensity at one of the four substations being monitored in the village of Marshfield

- CSE have delivered the following internal documentation:
  - Risk and Method Statements in August 2018;
  - 'Sharing LV network data with communities - Proposed Uses of the Data by Method 2 participants' in October 2018;
  - 'Feedback on Standard Guidelines for Application Development' in October 2018;
- Regen delivered an internal report summarising the recruitment process evaluation and outlining the trial evaluation plans for each of the 7 selected groups in August 2018;
- Regen made reporting tools available to the groups to help them track their involvement and time spent on the trials;
- Regen provided a set of questions to the groups to help them gauging the level of understanding of energy principles on their community and assist with consistent comparisons and analysis across the groups at the end of the project.

It is confirmed that the following progress, under the **OpenLV extensibility** category has been made within the reporting period:

- A further 12 organisations showed interest in taking part on the OpenLV project after the application process was finalised in February 2018. It was decided that the project management time required to accommodate these new organisations could still be provided, should the parties only require OpenLV data to undertake their investigations. As such, parties that are interested on accessing OpenLV data are still

being welcome to join the trials and a further 10 organisations have been taken on board on this reporting period;

- There are currently 25 parties involved on the Method 3 trials, contributing to 27 different project ideas;
- EA Technology held regular meetings with all the participants to follow the project progress in respect to: the project documentation, the selection of the relevant substations, the development of software applications, the set-up of the data sharing mechanisms and the creation of case studies. A summary of the current status of all these categories is presented below;
    - There are 25 participants of which 17 are businesses and 8 are Academia;
    - There are 27 project ideas of which 8 require development of software applications to be deployed at OpenLV platforms (App), 4 require a server to server link to Lucy's cloud hosted server via an API (Server Link) and 15 require access to off-line historic monthly data stored in secured SharePoint accounts (Data Only);
        - It is to be noted that 3 participants that are not currently developing an app may end developing one towards the end of their trial.
    - Project documentation:

Table 1: Method 3 - Project Documentation Status

Idea Type	Number of Ideas	MoU	Data Sharing Agreement	Trial Design Document
App	8	All signed	7 signed	2 completed 6 under review
Server Link	4	All signed	All signed	1 completed 3 under review
Data Only	15	N/A	10 signed	N/A

    - 5 of the 10 dedicated OpenLV substations have been installed and a further 2 substations are likely to be agreed in this reporting period;
    - 6 out of the 8 software applications are close to their technical completion;
    - 6 out of 12 organisations have been provided access to Lucy's cloud hosted server. Similarly, 15 of 21 organisations will have access to their SharePoint accounts before the end of November 2018. Furthermore, 2 or 3 organisations will also have access to Nortech's server within this reporting period;
    - 19 case studies have been requested. Of these, 6 have been completed, printed off and uploaded to the project website.

2.2.4 Key Issues

The following key issues were encountered and managed within the reporting period:

- **Funding for the community engagement trials:** No funding is available to support the organisations participating in the community engagement and OpenLV extensibility trials. In order to ensure community groups have access to OpenLV data

a specific LV-CAP application was developed by CSE and deployed to Method 2 sites. This together with a web application allows community groups to configure and view OpenLV data from onward dissemination within their communities.

- **Gaining commitment from OpenLV extensibility trial participants:** As no funding is provided for developing applications, ensuring full engagement of Method 3 participants is an ongoing challenge. The supply of OpenLV generated data is straightforward, however application development requires more effort and commitment. The use of MoUs, data sharing agreements and particularly trial design documents has focused participants resulting in good engagement, although a small number have withdrawn due to other business pressures.
- **Geographic Areas:** At FSP stage it was proposed that the project would target 3 geographic areas with up to 20 installations in each geographic area to support the Network Capacity Uplift trials (Method 1). In order to meet the site selection requirements in the FSP the 30 pairs (60 substations) are currently being installed in 9 geographic areas. This means that it took longer than expected to arrange and complete the site surveys;
- **Fault and protection studies for full meshing trials:** Of the 5 pairs of sites initially identified for the full meshing trials only 1 pair passed the fault and protection studies. This meant that the project team had to go back through the list of the full 182 pairs and identify further pairs that could be utilised for full meshing trials. This has now been completed; and
- **Installation of Alvin Reclose devices for full meshing trials:** To enable installation of the Alvin Reclose™ devices deeper doors for LV cabinets had to be ordered. The lead time for these doors was quoted as 6 to 8 weeks but turned out to be nearer 20 weeks. This has in turn delayed the full installation programme and some door sizes were wrongly supplied.

The OpenLV FSP outlines an 18-month duration for the Method 1 Network Capacity Uplift trials. The trials of the first 4 OpenLV platforms started on 13th December 2017. As a result, the trials will run for a minimum 18-month time period from January 2018 to June 2019 and likely for longer as the equipment will be maintained on-site for as long as possible to maximise the data gathered and subsequent learning potential.

This will enable the project team to collate the learning from the trials and report it in "SDRC-4 Learning Generated from the OpenLV Project Trials for All Methods", which is scheduled for delivery in January 2020. It is confirmed that the delays in the installation schedule will not have any impact on the planned delivery dates for key Project milestones or on the overall learning that will be generated by the Project.

2.2.5 Deliverables

The following key deliverables were completed in this reporting period:

- Finalised the Method Statements for installation of the Alvin Reclose devices;
- Created a Method Statement for the replacement of deeper enclosure doors on Schneider / Merlin Gerin LV Enclosures;
- All Method 1 Phase 1 installations (except for the reserve pair – to be installed once all Phase 2 sites are fully commissioned) have now been installed;

- Complete Factory Acceptance Testing (FAT-3) for the OpenLV LoadSense™ and WeatherSense™ Software Applications;
- Complete Site Acceptance Testing (SAT-2) for the OpenLV Full Solution. This includes the tests to sign off the LoadSense™ and WeatherSense™ Software Applications;
- All Method 1 Phase 2 installations are complete[1], and the commissioning process is underway;
- All Method 2 installations are complete and commissioned;
- Five Method 3 installations are complete and commissioned;
- CSE delivered internal project Risk and Method Statements in August 2018;
- CSE delivered 'Sharing LV network data with communities - Proposed Uses of the Data by Method 2 participants' in October 2018;
- CSE delivered 'Feedback on Standard Guidelines for Application Development' in October 2018;
- Regen delivered an internal report summarising the recruitment process evaluation and outlining the trial evaluation plans for each of the 7 Method 2 selected groups in August 2018;
- Regen made reporting tools available to the Method 2 groups to help them track their involvement and time spent on the trials;
- Regen provided a set of questions to the Method 2 groups to help them gauging the level of understanding of energy principles on their community and assist with consistent comparisons and analysis across the groups at the end of the project.

2.3 Outlook to the Next Reporting Period

During the next reporting period the Project will continue to complete key tasks to finalise the Design & Build work package and continue the Trial work package. The project team will:

- Continued configuration of the Community web portal by the community groups and movement into the trial stage, gathering learning from this process (Method 2);
- Formally sign up and complete the remaining 6 Data Sharing Agreements and 9 individual trial design documentation for the OpenLV Extensibility trials (Method 3);
- Complete the installation of the remaining 5 OpenLV platforms allocated to the Method 3 trials;
- Test and deploy the eight third party software applications;
- Make LV network data available to all those participants that may not have had their accounts enabled (subject to acceptance of the Data Sharing Agreement);
- Regen to deliver an internal mid trial report analysing the characteristics of the Method 2 participants, including the technologies used by each of their trials, and the potential benefits their engagement can provide to the network.
- Continue the Network Capacity Uplift trials (Method 1);
- Complete the commissioning process of Method 1 Phase 2 sites;
- Continue to share learning from the Project through newsletters and industry publications;

[1] Final pair are being installed on 3-4 December 2018

- Create more case studies to disseminate Lessons Learned from the project;
- Attend and present at relevant industry and community events;
- Complete the implementation of changes to the full OpenLV Solution based on the outputs from the full Cyber Security assessment that has been completed by NCC Group;
- Ensure the trials for all Methods are assessed regularly to maximise the learning on the Project.

3 Business Case Update

At the time of writing, there have been no changes to the anticipated benefits to be gained by the Project.

4 Progress Against Plan

4.1 This Reporting Period

Table 2 summarises the progress in this reporting period against the project plan. Key issues encountered during the reporting period are provided in Section 2.2.4.

Table 2: Progress Against Plan

Item	Milestone Description	Status	Due Date	Actual Completion Date	Revised Due Date
1	Develop Customer Engagement Application	Complete	Aug-18	30/08/18	N/A
2	FAT-3: OpenLV LoadSense™ and WeatherSense™ Software Applications	Complete	Jan-18	Jul-18	Jul-18
3	All Equipment for Method 2 installed	Complete	06/09/18	18/08/18	N/A
4	Customer Engagement Trials (start)	Complete	07/09/18	7/09/18	N/A
5	Customer Engagement Assess and Collate Trial Data (start)	Complete	07/09/18	05/10/18	N/A
6	All Equipment for Method 1 Installed	In Progress	15/02/18	N/A	Jan-19
7	Extensibility Trials (start)	Complete	07/09/18	31/08/18	N/A
8	Extensibility Assess and Collate Trial Data (start)	Complete	07/09/18	28/09/18	N/A
9	Implement changes following cyber-security assessment of complete functioning system	In Progress	31/10/18	N/A	25/01/18

There are two items that were scheduled to be completed within this reporting period that have not been completed. The identification and confirmation of Method 1 Phase 2 sites has taken longer than expected due to the extensive validation of the electrical characteristics of candidate low voltage feeders. This coupled with delay in completing the LoadSense™ application has pushed back the installation dates.

The baseline date identified in the project plan, at FSP stage, for the installation of all the OpenLV platforms for the Method 1 capacity uplift trials was 15th February 2018. The FSP specified that the project team would target at least 3 examples of 8 LV network template types as identified in the WPD LV Network Templates project. This was harder than initially anticipated and the project team had to complete more site surveys than expected to meet

this requirement. A total of 182 pairs (364 substations) were surveyed to select 30 pairs (60 substations). In addition, the project team found that deeper doors were required to install the Alvin Reclose devices to support meshing of LV networks, and whilst the lead time for the deeper doors was quoted as 6 to 8 weeks, in reality it was over 20 weeks. As a result, the full installation of the 30 pairs (60 substations) has been delayed and is currently scheduled for completion at the end of January 2019.

The OpenLV FSP outlines an 18-month duration for the Method 1 network capacity uplift trials. The trials of the first 4 OpenLV platforms started on 13th December 2017. As a result, the trials will run for an 18-month time period from January 2018 to June 2019. This will enable the project team to collate the learning from the trials and report it in "SDRC-4 Learning Generated from the OpenLV Project Trials for All Methods", which is scheduled for delivery in January 2020.

The implementation of cyber security changes following the cyber security assessment is taking longer than initially anticipated, but the task list is being prioritised and the work is expected to be complete prior to deployment of 3rd party applications at the end of January 2019.

4.2 Next Reporting Period

Table 3 summarises the key planned activities for the next reporting period. Description(s) of key planned activities for the next reporting period are provided in Section 2.3. Items 1 and 2 were scheduled to be completed within this reporting time period but have been re-scheduled. It is confirmed that re-scheduling these items has had no impact on key deliverables.

Table 3: Progress Against Plan

Item	Milestone Description	Status	Due Date	Revised Due Date
1	All Equipment for Method 3 Installed	In Progress	Sep-18	Feb-19
2	All Equipment for Method 1 Installed	In Progress	15/02/18	Jan-19
3	Create network models for undertaking LV-CAP simulation	In Progress	Mar-19	Mar-19
4	SDRC 3 Learning from Deployment and Guidelines for App Development	In Progress	01/02/19	01/02/19
5	Method 3 Develop Apps, Algorithms and Share Data	In Progress	06/09/18	Feb 2019
6	Method 3 Engage and Sign-Up Companies	In Progress	07/09/18	Dec-18
7	Method 1 Simulate networks with and without LV-CAP™ deployed as per the OpenLV Project. Utilise Transform to evaluate benefits of deploying such a system in the future.	Not Started	May-19	May-19

5 Progress Against Budget

Table 4 shows the baseline budget as outlined in the FSP.

Table 4: Progress Against Budget

Cost Category	Total Budget £k	Expected Spend to Date Nov-18	Actual Spend to date Nov-18	Variance £k	Variance %
Labour	267.3	175.8	117.8	58.0	33%
Equipment	853.6	821.4	812.0	9.4	1%
Contractors	3,775.1	2,483.5	2,510.9	-27.5	-1%
IT	2.5	0.6	1.5	-0.9	-151%
IPR Costs	0	0.0	0.0	0.0	0%
Travel & Expenses	29.7	16.6	13.1	3.5	21%
Payments to Users	0	0.0	0.0	0.0	0%
Contingency	451.5	451.5	15.0	436.5	97%
Decommissioning	66.0	0.0	0.0	0.0	0%
Other	0	0.0	0.0	0.0	0%
TOTAL	5,445.7	3,949.3	3,470.2	479.0	

In terms of the variances shown one-line item is in excess of the -5% threshold and requires explanation. The FSP spread the IT costs across 3 financial years: 1) 2017/218 included a £290 budget, 2) 2018/2019 included a £1,760 budget and 3) 2019/2020 included a £440 budget. Following Project award, the IT costs have hit earlier in the Project than originally planned at bid stage. £15,000 of contingency has been used to develop a community group LV-CAP application and an associated webapp to enable visualisation and dissemination of OpenLV data. This was done to address the issue of community groups not having the skills to develop their own applications.

6 Bank Account

The bank account statement for the project, for the reporting period is provided in a separate confidential Appendix.

7 Successful Delivery Reward Criteria (SDRC)

Table 5 details the status of each SDRC outlined in the Project Direction [Ref. 2]. No SDRC reports were due within this reporting period. The following SDRC report will be delivered within the next reporting period:

- SDRC 3: Learning from Deployment of the Overall OpenLV Solution & Standard Guidelines for Application Development (All Methods).

Please note that all SDRCs that are currently flagged as 'Not Started' were not planned on being underway at this point in the Project and so should be considered as on-schedule.

Table 5: SDRCs to be completed

SDRC	Description	Due Date	Status
SDRC 1	Specification, Design and Factory Testing of the overall OpenLV Solution	27/10/17	Delivered
SDRC 2.1	Community Engagement Plan & Interim Results of Assessing Market Potential (Methods 2 & 3)	31/12/17	Delivered
SDRC 2.2	Identification of Target Networks (Method 1), Update of Assessing the Market Potential (Methods 2 & 3) and Detailed Trial Design for all Methods	30/05/18	Delivered
SDRC 3	Learning from Deployment of the Overall OpenLV Solution & Standard Guidelines for Application Development	01/02/19	In Progress
SDRC 4	Learning Generated from the OpenLV Project Trials for All Methods	31/01/20	Not Started
SDRC 5	Knowledge Capture, Dissemination & Transferring the OpenLV Solution to Business as Usual	30/04/20	Not Started

8 Learning Outcomes

8.1 Learning Outcomes

The high-level learning outcomes recorded within the reporting period have been categorised under the following headings:

- Commercial, Project Management & Dissemination;
- Method 1: Identifying target networks & detailed trial design; and
- Overall learning points for each of the OpenLV Methods.

8.1.1 Commercial, Project Management & Dissemination

The commercial and project management learning points recorded within the reporting period are as follows:

- **Media Engagement:** The energy media "get" the OpenLV concept, but it's been harder to engage with the broader technology media as the project is very focussed on installing the OpenLV Solution in LV substations; and
- **Value of Dissemination:** The value and overall impact of dissemination should not be under estimated. The media coverage on OpenLV has generated interest from a network operator in New Zealand.

8.1.2 Method 1: Identifying target networks & detailed trial design

The learning points recorded for identifying the target networks and detailed trial design for Method 1, within the reporting period, are outlined below:

Principal Learning Points

The **unintended consequences of seemingly separate decisions** combined to limit the number of substation pairs suitable for use in the project.

- Decisions made during the initial project development stage combined with on-site restrictions to decrease the number of sites suitable for use in the trials.
- Each decision or requirement added an additional, albeit small, restriction but these combined to rule-out a significant proportion of the network.
- Each decision was made for the right reasons, in conjunction with necessary assumptions, but resulted in unintended consequences.
- Enough flexibility still remained to identify suitable locations, but the site selection process was more time consuming than expected for the eventual outcome.

The reliance on relatively new products created additional issues. Now that the LV-CAP™ and Alvin Reclose™ products are being produced in much greater volumes, such issues will diminish over time.

Contributing factors (and the underlying rationale)

The above learning points arose from a number of indirectly connected criteria defined in the project bid documentation, resulting from hardware limitations, or subsequent design decisions taken during the initial project initiation phase.

1. Whilst the BAU implementation of an OpenLV platform will be a smaller, self-contained unit, for the trials a modular system was determined as the most suitable approach. This was due to several reasons:
    - It was unknown at the time of specification and procurement what the requirements would be for Methods 2 & 3, and consequently, the system needed to be capable of communicating with as many different systems and devices as possible.
    - A single-unit platform for the LV-CAP™ software, suitable for long-term deployment on the network, did not exist at the commencement of the OpenLV Project.
    - It was deemed necessary in the event of equipment failure to be able to remove and replace any part of the system to minimise downtime within the trials.
2. This decision influenced the availability of substations suitable for installation.
   The project team elected not to utilise any Overhead Line (OHL) networks, specifically Pole Mounted Transformers (PMTs), within the project due to:
    - The additional complexities associated with installing and maintaining the equipment.
    - The size and weight of the equipment enclosure at such a location.
    - Connection to a Ground Mounted Transformer (GMT) enables easy access to the hardware if required.
3. In order to demonstrate the overall Distributed Intelligence capability of the OpenLV platform, a method of implementing a measurable network change, controllable by the OpenLV platform, was required. Whilst several alternative approaches were considered, the use of Alvin Reclose™ devices was considered to be the approach providing the best ability to deliver the project learning whilst minimising overall risk of delivery. However, this required consideration of:
    - The size of the Alvin Reclose™ units limited the substations that were suitable for implementation of the network meshing functionality; specifically, many of the LV enclosures surveyed did not have sufficient space to fit Alvin reclose units with the enclosure door closed. This problem was exacerbated as both substations at either end of the 'pair' needed to be compatible with the units, so a single substation could block the pair from being suitable.
    - Where a network was found to be suitable for the automated meshing trials, and deeper LV Enclosure doors could be fitted in place of the original ones, this was taken into consideration, enabling the installation of the Alvin Reclose™ units whilst also allowing the enclosure to be closed.
    - The use of Alvin Reclose™ units required that both substations in the pair were connected to the same HV network to prevent the possibility of a fault being back-fed along the inter-connected LV network.

- WPD do not operate a meshed LV network under normal operating circumstances and consequently, significant evaluation of the networks proposed for deployment of the Alvin Reclose™ units was required.

Alternative methods that were considered would not have experienced these restrictions but at a greater financial cost, and increased project risk through additional project suppliers being required.

4. It was stated that eight of the ten LV network types identified during WPD's LV Network Templates project would be utilised within the OpenLV Project, with at least three of each type utilised in Method 1. Some network types defined in the LV Network Templates project are highly specific, (e.g. Network Type 7 being defined as a rural setting). The other requirements above, combined to prevent some network types being significantly represented when the final shortlist was collated. For example, a significant proportion of rural areas are excluded by the combination of 'no OHL networks' and the requirement for a reasonable strength mobile network.

8.1.3 The Project Methods

The learning points recorded within the reporting period as part of the project methods are outlined below. The learning points have been recorded under the following titles: Network Capacity Uplift (Method 1), Community Engagement (Method 2) and OpenLV Extensibility (Method 3).

Network Capacity Uplift (Method 1) - Installation

- **Installation:** Some substations have LV boards fed by multiple connections, requiring either multiple sensors (one per cable) or oversized flexible rogowski coils capable of extending around all present. Either solution is possible to implement but is not recommended within the project due to the added complexity of utilising further bespoke installation approaches on a small subset of sites. For BAU scenarios, this would be less of a concern.

Community Engagement (Method 2) – Assessing the Market Potential

- **Importance of data quality to community groups:** Building and maintaining the confidence of community groups is key to sustaining their commitment to the project throughout its life. Providing consistent and reliable data is essential. Poor or incomplete data, when transformed into visual representations for dissemination by groups to their community, can undermine the messages and make it harder for community group leaders to engage with the communities they represent.
- **Community groups don't have App writing skills:** It has become evident that these volunteer-led organisations do not normally possess either the time or requisite technical skills to develop Apps. Rather than this being an insurmountable barrier, innovative solutions can be found, such as using 3rd parties to develop "configurable" Apps, allowing a level of customisation to fit particular circumstances. The OpenLV project exploited this route, allowing CSE to develop a configurable App for use by the community groups that will be widely available at the end of the trial.
- **These groups are made up of volunteers and as such can't necessarily fit around routines or plans:** A flexible approach to interaction with them is needed:

Attempting to use a very structured approach in the form of regular meetings at set times and working to a rigorous plan can be problematical. Adopting a much more "as and when" flexible approach, which acknowledges that non-business hours may be more appropriate, does result in better engagement. This adds more complexity from a project perspective, as regular reporting is still needed, but overall results in better outcomes.

- **Groups who think they have data analytic skills may not be as skilled as they think they are:** The competences needed to assess, analyse and integrate data to produce a meaningful picture that is digestible by the communities they serve is something some groups struggle with. The App was developed to assist this task and simple configuration allows the creation of graphical outputs, some predefined, to help overcome domain knowledge deficit. Community groups may also need additional assistance for example to understand the significance of data fields, or with tasks like importing historical data files into a format that they can exploit.
- **How do you get the data to them:** Beyond using the App to configure and view data some community groups have also requested raw data files. There are a great many data files generated by the project, they are large and stored in specific formats to aid subsequent processing. Providing them in a way which is easily accessible by a variety of community groups, each wanting something different, requires careful thought. Email attachments, SharePoint links, mailed out USBs etc, are all possible solutions and each needs to be judged on its merits and acceptability to the requesting party, taking into consideration WPD data security protocols.
- **Data Share Agreements are a major risk to groups without comfort that they won't be used to bankrupt them:** As part of the legal process of making data available to community groups and 3rd parties they are required to sign an agreement with WPD. Whilst 3rd party commercial organisations are more familiar with such arrangements volunteer led groups can find this onerous and daunting, with legal obligations being sought and an understandable nervousness on their part to sign-up. These reservations were mitigated by providing clear explanations of terms and assurances as to the purpose of any agreements.
- **Groups want network maps, so they know the area that a substation covers, and help understanding how the network is configured:** Electricity network domain knowledge possessed by WPD and project staff is much greater than that of community groups. Therefore, the terminology used and ways chosen to explore and explain how the network operates should be suitable for a general audience.
- **Groups are a loose conglomerate of people with similar interests but different objectives. It is important to identify a single goal for them:** It can be a challenge to ensure there is a consistent goal, understood, articulated and adopted by all members of a community group. Early and deep engagement with all key players and securing their sign-on, then reinforcing the goal at every opportunity, respectfully challenging if there appears to be divergence.
- **Community groups engagement:** Community groups have required a tailored engagement approach in terms of imagery and style of communications. This has been critical to engagement success in terms of understanding the appetite from community groups to take part in the project;

- **App ideas:** Community groups proposing potential App ideas under the banner of "policy, planning and retrofit programmes" has been a surprise. This is not an area that was covered in the initial list of six potential App ideas when the survey was sent out. A total of five App ideas have been received under this title (11% of the total). An example includes, using the data to input to neighbourhood development planning;
- **Number of units:** One group were interested in the project but did not put an application form in as the project could not supply enough units. Their idea was to develop an App that would help identify the impact that an energy local club would have on peak shifting and peak flattening. However, the group hadn't realised that there would be so many substations within their area of interest. This shows there is clearly more potential if LV-CAP™ was rolled out at scale;
- **Community group interest:** There are enough groups with individuals who have an interest in data and electricity, combined with a drive to benefit the community they represent, to have met demand for this project;
- **Timescales – applications process:** A longer period of time between the launch of the application process and the deadline may have resulted in more applications. This would have given groups more time to work up their ideas;
- **Timescales – sites:** Allowing more time to assess suitability of substations before interviews would have been useful;
- **Application form:** The length of the application form may have deterred some groups from applying, but all those that did were sensible proposals that met the brief, so it may have acted as a filter to unsuitable projects;
- **Type of community group:** There was good engagement from existing community energy groups and housing associations, but it was much harder to engage with Parish Councils;
- **Technical complexity:** This is a technically complex project, that includes talking to community energy groups about software programming and getting them to think about LV network data and its uses. The selection process was further complicated by screening out applications that included Pole Mount Transformers (PMTs) and with a poor mobile signal strength. The technical complexity along with the lack of funding has meant that only the most committed groups have made it through the selection process; and
- **Inability to install LV-CAP™ on pole-mounted transformers (PMTs):** One of the full proposals didn't make it to interview as all the substations in their hamlet were PMTs. Anyone from a small rural settlement who responded to the original survey would have come across the same problem when looking to complete their application, and this would have probably meant a fair number didn't complete a formal application to take part in the project trials.
- **Trusted local partners are important to encourage applications:** The project partners strong relationships and network with community energy groups, particularly in the South West, is likely to have contributed to the relatively high level of applications from this sector and location. This illustrates that trusted local partners are important to support community organisations in making applications to trial projects such as OpenLV.

OpenLV Extensibility (Method 3) – Assessing the Market Potential

- **App ideas**: Commercial offerings from third parties generally revert, at the most basic level, to switching something on or off, whether this is an EV or battery system charging or discharging, inputs to a building energy management system (BEMS) or control of smart appliances. Other ideas provided by third parties also include: forecasting of future network conditions or creation of a central database for connected substations that allows accessing data from any connected node under certain fault conditions. The growing interest from third parties in taking part in the project clearly shows that there is potential for the roll out of LV-CAP™ units.
- **Timescales – application process:** Although development of applications has now been restricted to new welcoming third parties, there is still many organisations interested in accessing LV substation data. The project recognises the benefit in making this data available and such is still accepting new participants.
- **Marketing & PR:** As the OpenLV project grows its presence in the public domain (marketing & PR activities, shows & events, word of mouth from existing participants, etc.) there is a wider interest from 3rd parties, that were not aware of the project at the application stage but want to be involved and use OpenLV data to inform their own energy related activities. The OpenLV project has allowed 10 new organisations to come on-board of the Method 3 trials in this reporting period;
- **Resourcing/Business Case/Funding:** A number of companies that formally applied and were selected to take part in the trials could not justify turning down new fee-paying work and decided to withdraw from the project trials at that point. This risk was discussed with all trial participants at the selection stage but can only be mitigated up to a certain point. It is however believed that the number of participants will remain relatively stable with some parties not being able to complete their trials but others signing up as the project progresses.

Community Engagement (Method 2) – Trial Design

- **Approach and associated documentation:** The approach taken to signing up participants includes using the Memorandum of Understanding, Data Share agreement and trial design form. These documents provide a clear basis for the Method 2 trials
- **Length of trials:** All the seven applicant community groups progressing to trial have expressed a need for at least 12 months' worth of data to make the trial viable. The flexibility of the project to install LV-CAP™ units from June 2018, and for them to remain in situ until December 2018 will be of significant benefit to the participating community groups under Method 2, and will support on-going extrapolation of learning and assessment of replicability and benefits going forward;
- **In-house App development:** The project has evolved from the initial anticipated scope of the communities developing their own software applications to one where the communities use a central application. This has overcome one of the major barriers to community groups developing their own apps – i.e. access to funding.

- **Trial implementation and associated documentation:** A number of documents will enable the project team and applicants to design and implement the trials. This documentation is needed to ensure the trials are successful. Documentation includes: 1) OpenLV Point Measurement document, 2) Developing with the LV-CAP™ Virtual Machine, 3) The OpenLV Common Application Platform API and 4) The trials design form.
- **Support for substation selection:** Selection of substations proved to be an iterative process. Community projects proved to need support in selecting substations and feeders relevant to their projects.

OpenLV Extensibility (Method 3) – Project Trials

- **Project documentation – Memorandum of Understanding:** The Memorandum of Understanding outlines the responsibilities of EA Technology and the OpenLV extensibility trial participants from the point of view of trialist developing software Applications. The document was not written with other type of participants in mind and, as such, it is not a document that is enforced to all Method 3 participants. Only participants developing Applications are requested to return a signed copy of this document;
- **Project documentation – Data Sharing Agreement:** The Data Sharing Agreement is a fairly generic document containing clauses that do not necessarily reflect the nature of the OpenLV project since the agreement is written to apply to various types of Network Innovation Competition projects. A considerable amount of time was spent with WPD and the OpenLV participants to agree on certain modifications and provide, in some cases, extensive clarifications over specific clauses and terminology definitions.
- **Trial implementation and associated documentation:** A number of documents are enabling the project team and applicants to implement the trials. This documentation is needed to ensure the trials are successful. Documentation previously provided includes: 1) OpenLV Point Measurement document, 2) Developing with the LV-CAP™ Virtual Machine, 3) The OpenLV Common Application Platform API and 4) The trials design form. Further documentation provided this reporting period also includes the OpenLV Third Party Software Application Information Form;
- **Site selection:** Many organisations shown interest on specific LV substations, but others were interested on data samples from substations located on stressed/constrained/densely populated areas, subject to high penetrations of LCTs, etc. To maximise the potential benefits third parties can provide it is recommended that downstream loading and network conditions are known; and
- **Regular progress reviews:** Monthly telephone and skype calls were held with the participants to ensure the right technical and project management support was provided to the trialists. More frequent meetings and/or email communications were also exchanged when required. The regular progress updates were appreciated by all parties.

8.2 Learning Dissemination

The following dissemination activities have been completed within the reporting period:

- The OpenLV project was represented at the LCNI conference on the WPD and the EA Technology stand in October 2018;
- The OpenLV project resented a paper titled "The Development and Implementation of a Common Application Platform to Support Local Energy Communities" at the CIRED Workshop held in Ljubljana in June 2018;
- The project was represented at Regen organised community events in June 2018 and November 2018;
- Newsletters were written and circulated to stakeholders in June and November 2018;
- A synopsis of the project was included in the Centre for Sustainable Energy's 'Trustees' Report and Financial Statement, circulated in October 2018;
- Case studies have been produced for all the community organisations and several of the business and academic organisations participating in the project. These explain why they are participating in the project and how they intend to use project data. These can be found at: https://openlv.net/case-studies/;
- Postcards and a leaflet have been produced to highlight the communities and organisations involved in the project;
- The project Twitter account has been active, disseminating news about the project. It now has over 200 followers. The account is averaging 41 "likes" per month and monthly impressions (how many times a tweet is seen) have increased from 8,111 to an average of 13,332 over the period;
- SDRC 2.2 "Target Networks, Market Potential and Trial Design" has been published on the OpenLV Website.

9 Intellectual Property Rights

9.1 Overall IP Statement

Table 6 outlines the details of the Background IP that will be brought to the Project and the Foreground IP that either will or could be generated on the Project. No changes have been made to the IP Register during this reporting period.

Table 6: IP Summary

IP No.	Description	Detail of IP	IP Type	IP Created By	IP Assignment
IP001	Core LV-CAP™ system	Comprising the operating system image including Internal API, 3rd Party Developer API (v1.0) and the following containers: MQTT, Data Storage, Sensor Reads, Container Manager	Background	EA Technology & Nortech	EA Technology[2]
IP002	LV-CAP™ Comms. Container (Method 1)	Comprising of the Nortech iHost comms. container	Background	Nortech	Nortech
IP003	iHost (Application Deployment Server Method 1)	Pre-Existing iHost platform	Background	Nortech	Nortech
IP004	Container Management from iHost (Method 1)	Development of iHost capability to manage & deploy container	Background	Nortech	Nortech
IP005	Cloud Based Hosted Platform (Method 2 & 3)	Existing Lucy Electric GridKey platform	Background	Lucy Electric GridKey	Lucy Electric GridKey
IP006	LV-CAP™ Comms. Container (Methods 2 & 3)	Comprising of the Lucy Electric GridKey communication container	Background	Lucy Electric GridKey	Lucy Electric GridKey

[2] Pre-existing commercial agreement in place between EA Technology and Nortech for this purpose

IP No.	Description	Detail of IP	IP Type	IP Created By	IP Assignment
IP007	WeatherSense™ Transformer RTTR (DTR App)	EA Technology implementation of University of Manchester algorithm	Background	EA Technology & University of Manchester	TBC
IP008	LoadSense™ the LV Control App for Method 1 (Network Meshing App)	Application developed on the Project to enable automation of LV network meshing	Foreground	Western Power Distribution (via EA Technology)	GB DNOs
IP009	3rd Party App Containers (Methods 2 and 3)	To be defined on the Project	To Be Confirmed	Dependent upon funding mechanism	App developer / funder
IP010	LV-CAP™ API v2.0	A second iteration of the API to allow third party Apps to be created on the LV-CAP™ platform following learning from Methods 2 and 3	Foreground	Western Power Distribution (via EA Technology)	GB DNOs
IP011	Method 1 Communication Container	Development of the iHost communications container and iHost server to enable the wide scale deployment of LV-CAP™ for the OpenLV project.	Relevant Foreground	Nortech	Nortech
IP012	GridKey LV Monitoring Equipment	Use of the Lucy Electric GridKey "substation monitoring equipment" as part of the overall OpenLV solution	Relevant Foreground	Lucy Electric GridKey	Lucy Electric GridKey

IP013	Method 2 & 3 Communication Container	Development of the Application container to enable communication between the LV-CAP™ platform and the Lucy Electric GridKey platform (allowing extraction of data through network monitoring and system updates)	Relevant Foreground	Lucy Electric GridKey	Lucy Electric GridKey
IP014	Alvin Hardware	Use of the EA Technology Alvin platform as part of the overall OpenLV solution	Relevant Background	EA Technology	EA Technology
IP015	Alvin Communication Protocols	Development of the Alvin communication protocols into the LV-CAP™ solution to enable communication links between Alvin devices.	Relevant Foreground	EA Technology	EA Technology
IP016	LV Monitoring Hardware	Use of the GridKey MCU520, as part of the overall OpenLV Solution, to provide monitoring of LV substations.	Relevant Background	Lucy Electric GridKey	Lucy Electric GridKey

9.2 Current Reporting Period

There is no IPR generated or registered during this reporting period.

9.3 Overall IP Statement

It is not expected that we will register any IPR in the next reporting period.

10 Risk Management

Our risk management objectives are to:

- Ensure that risk management is clearly and consistently integrated into the project management activities and evidenced through the project documentation;
- Comply with WPDs and EA Technology's risk management processes and any governance requirements as specified by Ofgem; and
- Anticipate and respond to changing project requirements.

These objectives will be achieved by:

- ✓ Defining the roles, responsibilities and reporting lines within the team for risk management;
- ✓ Including risk management issues when writing reports and considering decisions;
- ✓ Maintaining a risk register;
- ✓ Communicating risks and ensuring suitable training and supervision is provided;
- ✓ Preparing mitigation action plans;
- ✓ Preparing contingency action plans; and
- ✓ Regular monitoring and updating of risks and the risk controls.

10.1 Current Risks

The OpenLV risk register is a live document and is updated regularly. A total of 46 risks have been raised, 21 of which have been closed, leaving a total of 25 live risks. Mitigation action plans are identified when raising a risk and the appropriate steps then taken to ensure risks do not become issues wherever possible.

Of the 25 live risks none are ranked as severe or major, 4 are ranked as moderate and 21 are ranked as minor. Table 7 details the four moderate risks. For each of these, a mitigation action plan has been identified and the progress of these are tracked and reported.

Table 7: Top current risks (by rating)

Details of the Risk	Risk Rating	Mitigation Action Plan	Progress
Resource - there is a risk that key project staff are either not available or move on to new roles (within or outside their existing companies)	Moderate	Good management of staff	Change in both EA Technology and WPD project managers has been managed
There is a loss of data on the OpenLV platform(s) or the data collected is not fit for purpose.	Moderate	Regular checks on the data collected and post installation checks to ensure the correct data is being collected	Communications checks being made and database routines to ensure valid data and/or feedback on shared datasets
There is a risk that funding cannot be secured for the development of 'Apps' for Method 3.	Moderate	Active involvement with 3rd party organisations early in the Project and testing the market.	Organisations have been selected and risk is reducing now trial MoU and data share agreements are in place
There is a risk that the automated switching and meshing of the network leads to safety issues for operational staff.	Moderate	The design of the OpenLV Solution will be independently reviewed by WPD operational staff to ensure it is fit for purpose.	Operational documentation supported by training has been provided to WPD

Table 8: Graphical View of Risk Register

Certain/ Imminent (21-25)	0	0	0	0	0
More likely to occur than not/Likely to be near future (16-20)	0	0	0	0	0
50/50 chance of occuring/Mid to short term (11-15)	0	1	0	0	0
Less likely to occur/Mid to long term (6-10)	0	4	1	0	0
Very unlikely to occur/Far in the future (1-5)	8	6	3	2	0
	1. Insignificant changes, re-	2. Small Delay, small	3. Delay, increased	4. Substantial Delay, key	5. Inability to
	Impact				

Minor	Moderate	Major	Severe	
21	4	0	0	No of instances
25				No of live risks

10.2 Update for risks previously identified

One of the top three risks from the last reporting period has been mitigated through the development by CSE of a community App. An update on progress on the top 3 risks has been provided in Table 7.

Descriptions of the most prominent risks, identified at the project bid phase, are provided in Table 9 with updates on their current risk status.

Table 9: Key Risks Identified at Bid Stage

Details of the Risk	Bid Stage Risk Rating	Current Risk Rating	Comments
There is a risk that funding cannot be secured for the development of 'Community Apps'.	Major	Closed	N/A
There is a risk that the integration of LV-CAP™ with generic hardware and the use of Alvin switching devices is more complex than expected and delays the OpenLV programme.	Major	Minor	See Table 7
There is a risk that the last mile communications between the distributed LV-CAP™ devices and the switches on the LV network is not robust and the devices cannot be switched as expected.	Major	Closed	N/A

11 Accuracy Assurance Statement

This report has been prepared by: 1) the WPD Project Manager (Sam Rossi Ashton) and 2) the EA Technology Project Manager (David Russell), recommended by: 1) the WPD Future Networks Manager (Roger Hey) and 2) the EA Technology Delivery Manager (Paul Barnfather) and approved by: 1) the Resources & External Affairs Director (Alison Sleightholm) and 2) the EA Technology Strategy & Interventions Director (Dave A Roberts). Both WPD and EA Technology confirm that this report has been produced, reviewed and approved following our quality assurance process for external documents and reports.

12 References

1. OpenLV Full Submission Pro-forma: https://www.westernpower.co.uk/downloads/2299
2. OpenLV Project Direction: https://www.westernpower.co.uk/downloads/2311
3. SDRC 1: Specification, Design & Testing of the Overall OpenLV Solution, Version 1.1, 17th October 2017: https://openlv.net/wp-content/uploads/2017/08/OpenLV-SDRC1-Specification-Design-Testing-Version-1.1_With-Appendices.pdf
4. SDRC 2.1: Community Engagement Plan & Testing the Market, Version 1.0, 8th December 2017: https://openlv.net/wp-content/uploads/2018/06/SDRC-2.1-Community-Engagement-Plan-Testing-the-Market-V1.0-without-Appendix.pdf
5. SDRC 2.2: Targets networks, market potential and detailed trial design, Version 1.0, 25th May 2018: https://openlv.net/wp-content/uploads/2018/10/SDRC-2-2-Target-Networks-Market-Potential-Detailed-Trial-Design-Working-Draft-v1-0_No-Annex.pdf

Annex 1 – Media Coverage

Number	Organisation	Date	Link
1	Community Links	07-Dec-17	http://communitylincs.com/open-lv-project-invitation-parish-councils/
2	Community Open Energy Monitor	13-Nov-17	https://community.openenergymonitor.org/t/openlv/5643
3	Electrans	02-Nov-17	https://www.electrans.co.uk/openlv-looks-network-capacity-evs/
4	Energy Capital	08-Nov-17	https://www.energycapital.org.uk/uncategorized/open-lv/
5	Energy Networks Association	05-Dec-17	http://www.energynetworks.org/blog/2017/12/05/get-'appy'-western-power-distribution's-openlv-project/
6	Energy World	01-Apr-18	https://knowledge.energyinst.org/search/record?id=109571
7	ITS For Home	17-Jan-18	http://www.itsforhome.com/pub/index.php/2018/01/17/Companies-invited-to-take-advantage-of-OpenLV-electricity-data/
8	IMechE	21-Nov-17	https://www.imeche.org/news/news-article/the-smart-grid-gamechanger-openlv
9	LinkedIn	15-Dec-17	https://www.linkedin.com/pulse/openlv-what-great-initiative-robert-plant
10	LowCVP	18-Dec-17	https://twitter.com/theLowCVP/status/942741442904100864
11	Metering	21-Nov-17	https://www.metering.com/news/western-power-distribution-ea-technology/
12	Networks	17-Jan-18	https://networks.online/gphsn/news/1000838/companies-invited-advantage-openlv-electricity
13	Power Technology	23-Jan-18	https://www.power-technology.com/features/opening-electricity-data/
14	Power Technology	10-Jan-18	https://www.power-technology.com/features/future-power-technology-magazine-issue-94/
15	Western Power Distribution	23-Oct-17	https://www.westernpower.co.uk/Innovation/News-Events/News/A-Unique-App-ortunity.aspx
16	Wind Power Monthly	17-Nov-17	https://www.windpowermonthly.com/article/1450499/wpd-ea-technology-launch-project-open-substation-data
17	Your Electrical Equipment News	06-Dec-17	http://www.yourelectricalequipmentnews.com/openlv+project+to+help+minimise+costs+for+new+connections+on+local+electricity+networks+such+as+ev+charge+points_41672.html