WESTERN POWER DISTRIBUTION

OPEN LV

OPENING UP THE SMART GRID

PROJECT PROGRESS REPORT
REPORTING PERIOD:
December 2018 – May 2019

ea technology

RIIO NIC NETWORK INNOVATION COMPETITION

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Contents

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.
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.

Term	Definition
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 (the period from commencement to the end of June 2017);
2) Design & Build (the period from July 2017 to end of March 2018); and
3) Trial, Consolidate & Share (the period from April 2018 to the end of the project).

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 fifth Project Progress Report (PPR) for the Project and details progress on the last six months, December 2018 to May 2019.

The three methods being considered in this project are:

Method 1 - Network Capacity Uplift: Delivers additional capacity from existing assets therefore avoiding or deferring significant LV network reinforcement and also, the installation of new underground cables and transfer of services, which can have a significant 'behind the scenes' impact on customers;

Method 2 - Community Engagement: Provides communities with relevant LV network data will empower customers to understand how their energy use impacts the distribution network and the ability to deploy innovative algorithms and applications designed to benefit the community will provide significant benefits directly to customers. For example, many customer impacts are 'behind the scenes', which can lead to a disconnect between DNOs and customers. Increasing understanding and aligning aims so that customers also become actors in low carbon networks could be the part of a paradigm shift that de-risks the transition to a low carbon economy for both parties; and

Method 3 - OpenLV Extensibility: Provides academics and new and innovative service providers (including non-energy companies) with relevant LV network data and the ability to deploy innovative algorithms and applications designed that will ultimately provide significant benefits to customers.

1.1 Overall Project Progress

The key achievements in the reporting period are as follows:

- Across all three Methods within the OpenLV Project, the planned 80 units have now been installed;
  - Method 1 Phase 1: All of the total 50 units are installed.
  - Method 1 Phase 2: 5 pairs (10 units) are fully installed.
  - Method 2: All 10 units allocated for the Method 2 trials have been installed and commissioned.
  - Method 3: All 10 units allocated for the Method 3 trials have been installed and commissioned.

  - It should be noted that five 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 Method 2 Community Engagement is fully underway with the seven groups selected receiving data from their associated sites.
  - CSE have progressed further with the development of the functionality of the community web app. The community groups have been working with CSE via Skype workshops and individual session to customise the way that the app displays data, and what data is displayed according to each group's needs,
  - Community groups are using the data from their substation(s) to communicate with their communities according to their requirements. CSE are providing them with professional guidance on how to communicate with their community as required.
  - A Workshop was organised at Exeter Castle on 7th March. Among other benefits the session allowed Regen to interview the groups as part of their work package.
  - Unfortunately, due to circumstance outside the control of the parties involved, one participating group has been forced to withdraw from the Project. In response, a community group already linked with the OpenLV Project in conjunction with a part of Method 3 organisation is progressing an additional trial as part of Method 2. As such, the Yealm Community Group is now part of two projects within OpenLV.
- 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, since then, 14 further organisations have shown their interest on the project and 8 of those decided to go ahead with the trials. There is currently a total of 23 third parties involved on the Method 3 trials with a total of 25 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.

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:

- Press releases have been disseminated publicising project progress;

  - 25th February 2019 – OpenLV takes control of low voltage network, moving us closer to low cost Smart Grid;
  - 9th April 2019 – Universities invited to access real-time electricity data for research projects;
- In addition to the press releases, news articles have been published on the project website highlighting project progress;
  - 21st March 2019 - OpenLV Community Workshop Event Review
  - 22nd May 2019 – OpenLV smart equipment installations complete
- An event was held in March 2019 at which Method 2 and 3 participants provided updates on the progress of their projects and shared learning. The feedback was very positive, such that a further learning event is scheduled for June 2019;
- Articles about the project have been included in energise, a magazine published by CSE;
- A Stakeholder newsletter was issued in May 2019;
- Planning is underway for the project to be represented at technical conferences during the autumn; and
- The project website has been updated to include more information about the Method 3 organisations taking part in the project.

1.4 Risks

The OpenLV risk register is a live document and is updated regularly. A total of 54 risks have been raised, 29 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 Figure 1. This Report details the progress of the Project, focussing on the last six months, December 2018 to May 2019. The reporting period is depicted on Figure 1 by the grey shaded box.

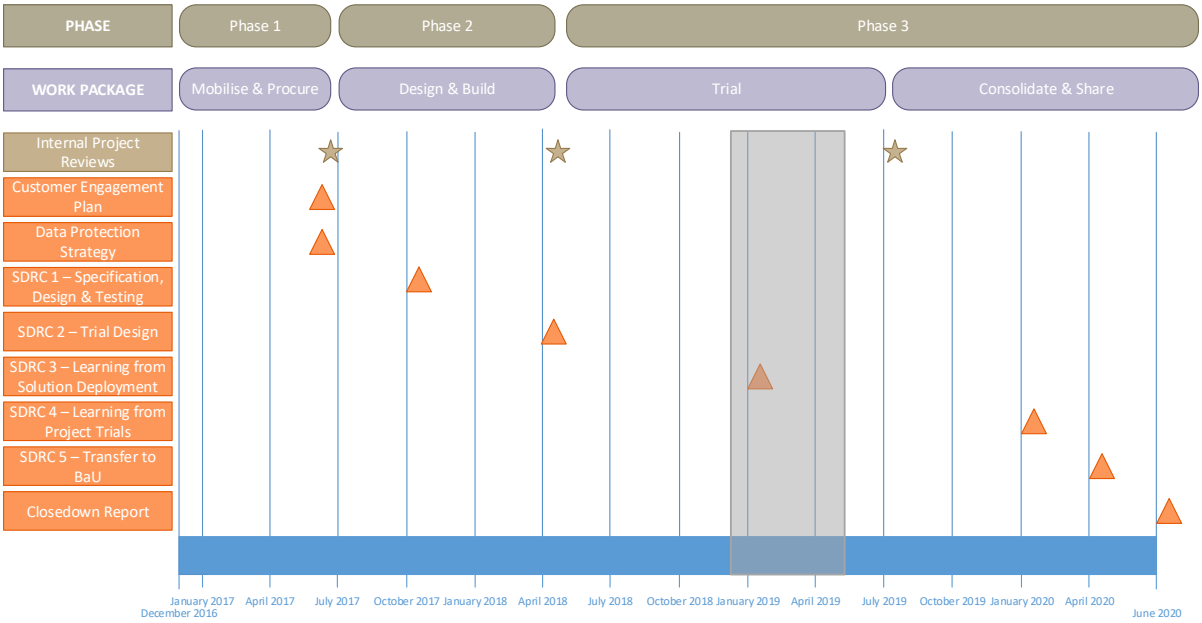

Figure 1: OpenLV Timeline

2.2 Project Progress

2.2.1 Overall Progress

During this reporting period the key achievements are as follows:

- 80 OpenLV platforms have been installed across WPD's licence area in total, across all three Project Methods;
  - Method 1 Phase 1: All 50 units allocated to this part of the project are installed.
  - Method 1 Phase 2: All 10 units are installed, including deployment of the Alvin Reclose™ units.
  - Method 2: All 10 units allocated for the Method 2 trials have been installed and commissioned.

- Method 2: The community web app has been modified by CSE to provide greater functionality to the community organisation who have been able to configure it to suit their requirements,
- The Method 2 organisations are using OpenLV data according to their individual requirements to move their projects forward,
- Method 3: All 10 units allocated to Method 3 have been installed and commissioned. The 3rd party equipment for one participating company, Haysys, is yet to be installed at their allocated site, although the LV-CAP™ platform has been deployed for data gathering purposes. They expect to supply their equipment within the next two months.
- It should be noted that five 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 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, since then, 14 further organisations shown their interest on the project and 8 of those decided to go ahead with the trials. There is currently a total of 23 third parties involved on the Method 3 trials with a total of 25 different ideas;
- It should be noted that the final number of the Method 3 participants has varied during the trial period; further companies may show their interest as the project exposure increases and the main reason given by those participants dropping out of the project has been 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 bid submission document 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:

- The actions recommended by the cyber-security assessment of the overall OpenLV Solution have been completed and verification of the updates will be completed by experts from cyber-security specialists NCC Group, as part of their remaining work on the OpenLV Project;
- At the time of writing all 80 OpenLV platforms planned for deployment in the project have been built, tested and deployed on the LV Network.

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

- Method 1 Phase 1: All 50 allocated units are installed;
- Method 1 Phase 2:
    - All 10 allocated units are installed;
    - The control trial has been implemented on three of the five pairs and been demonstrated successfully in all instances;
- Models used for the analysis of the data gathered during the Method 1 trials are being developed and initial analysis has begun.

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

- CSE have progressed further with the development of the functionality of the community web app. The community groups have been working with CSE via Skype workshops and individual sessions to customize the way that the app displays data, and what data is displayed according to each group's needs,

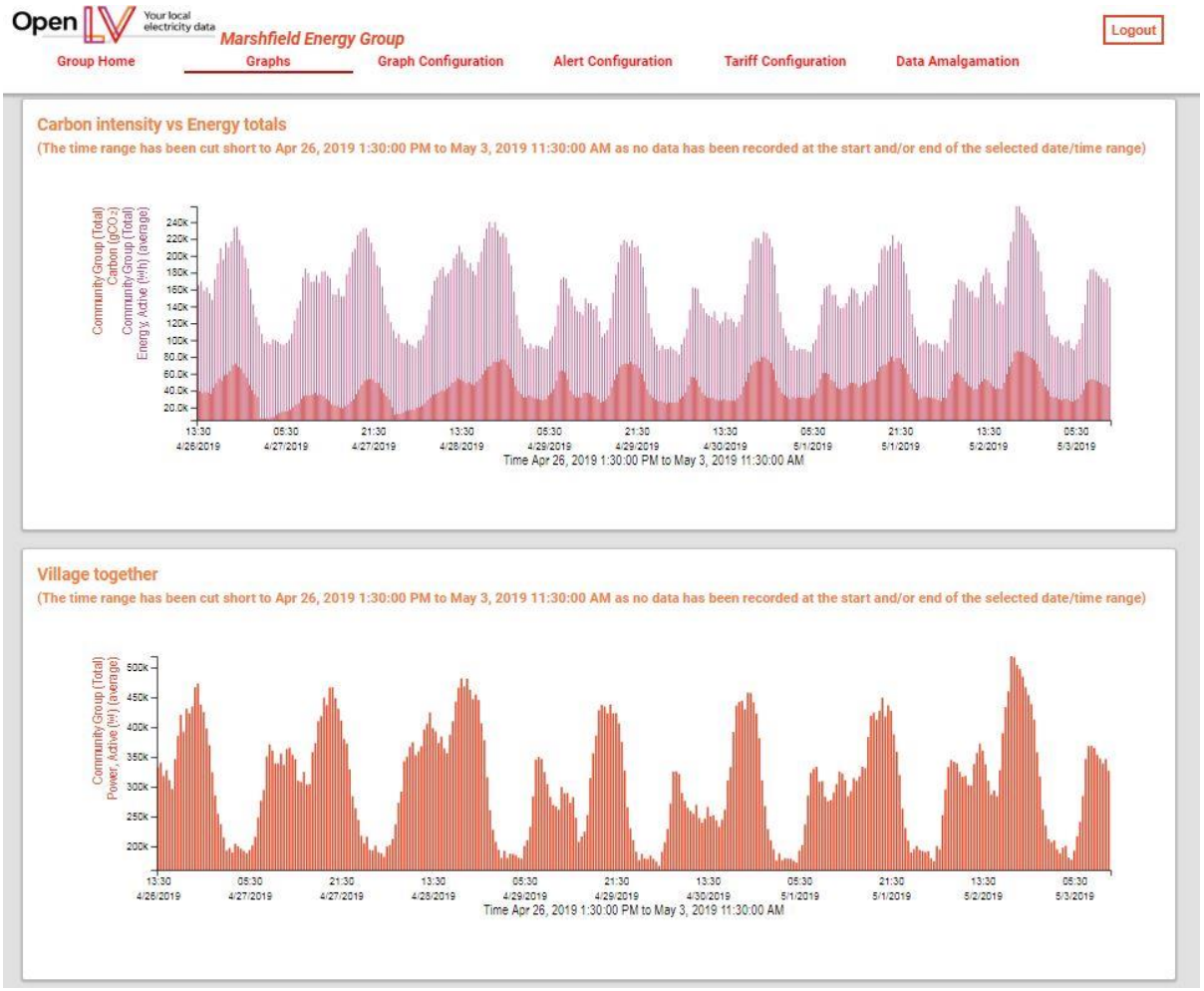

Figure 2: Illustration of the CSE web app

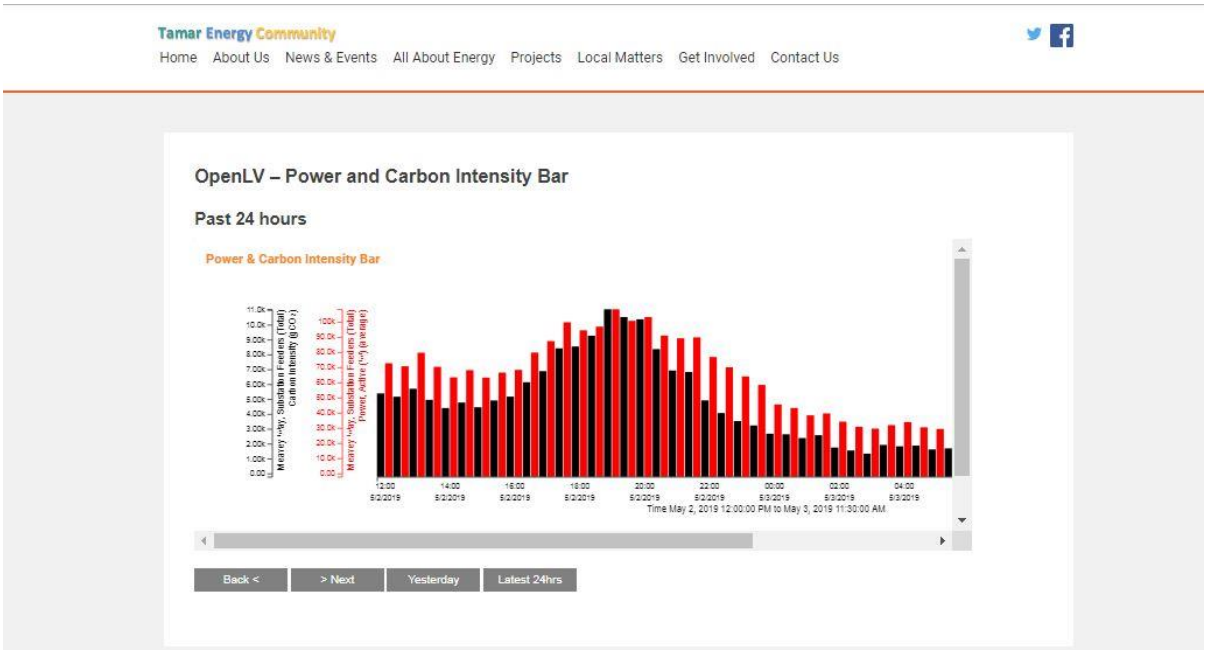

Figure 3: One of the community organisations, Tamar Energy Community, has embedded the CSE web app in their own website

- Community groups are using the data from their substation(s) to communicate with their communities according to their requirements. CSE are providing them with professional guidance on how to communicate with their community as required,
- The projects that the community organisations are undertaking as part of the project are underway,
- A Workshop was delivered for Method 2 and 3 organisations participating in the project in March 2019 at Exeter Castle. This event allowed groups and organisations participating in the project to meet each other, learn about the projects that other groups were involved with, find out more about the wider project and meet representatives from WPD and EA Technology. It also provided an opportunity for Regen to discuss project progress with each of the community organisations involved in Method 2 that attended the event;

Figure 4: The Workshop at Exeter Castle

- Regen delivered a mid-trial report in March 2019;
- 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 gauge the level of understanding of energy principles within their communities 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 14 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 organisation has been taken on board on this reporting period;
- Unfortunately, 3 organisations have communicated their inability to proceed with their projects during this reporting period, but this is still leaving 23 parties currently involved on the Method 3 trials and contributing to 25 different project ideas;
- EA Technology held regular meetings with all the participants to follow the project progress in respect of: the project documentation, the selection of the relevant substations, the development and deployment of software applications, the set-up of the data sharing mechanisms and the development of marketing material. A summary of the current status of all these categories is presented below;
    - There are 23 participants of which 14 are businesses and 9 are Academia;
    - There are 25 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 13 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	All signed	8 completed 1 under review
Server Link	4	All signed	All signed	4 completed 2 under review
Data Only	13	N/A	12 signed	10 completed 2 under review

    - All of the 10 dedicated OpenLV substations have been installed;
    - 4 out of the 8 software applications are close to their technical completion, 4 already complete, one of which is currently deployed in the field;
    - Two trials have been completed in this reporting period and their learning evaluation processes took place in May.
    - 10 out of 12 organisations have been provided access to Lucy's cloud hosted server, and 20 of 23 to their SharePoint accounts. Furthermore, 2 organisations have also been provided access to Nortech's server within this reporting period. It is expected that the outstanding accounts will be

provided within the following month – access pending on confirmation of information from the trialists;
- 22 case studies have been requested. Of these, 6 have been completed, printed off and uploaded to the project website. 3 more case studies are expected in the next reporting period.
- A twitter campaign was undertaken and 14 3rd party tweets uploaded to the social platform within this reporting period.
- Logos from each of the 3rd party organisations were requested and 13 of these have been received. It is expected that these logos will be used for OpenLV project marketing purposes. The ones received have already been uploaded to the OpenLV website.
- A conference paper written by an academia organisation has been published in the ISGT-Europe 2018 conference. Two further papers will be submitted for review during the following months.

2.2.4 Key Issues

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

- **Implementation of Alvin Reclose™ device automation for full meshing trials:** Following installation of the five pairs of equipment for Method 1 Phase 2 trials, the local teams identified potential risks associated with the automation of the LV network at the locations selected.
  Specifically, this risk involved undesirable effects on the HV network, due to tele-switching and network automation already in place at locations in the vicinity on the network.
  This necessitated the disabling of automated control of one pair, previously fully commissioned by the project team, until a solution was implemented.
  A possible solution is under investigation but is only expected to be applicable in two of the three cases.
  It is likely that the site required to be partially decommissioned through the removal of control capability, will not be reactivated under the OpenLV Project.
- **Loss of a Method 2 Community Group:** The Community Group based in Walsall, led by WHG have regrettably been withdrawn from the project. The LV-CAP™ equipment will be maintained in the substation to provide data until decommissioning at the end of the project.
  - The OpenLV Project last received any communication from WHG in December 2018 and a number of attempts since then to re-establish contact were unsuccessful.
  - Following this lack of communication, it was deemed appropriate to allocate the resource available in the Method 2 part of the trials to another community group, which is also progressing a trial with a Method 3 organisation.
- **Communication with community groups:** This continues to remain on an ad-hoc basis according to the commitments of group members. This has presented a challenge for CSE, but more especially Regen who it was expected would dial into calls pre-arranged between the groups and CSE. This arrangement failed to work. To circumvent this logistical challenge a workshop event was arranged at Exeter Castle

that allowed Regen the opportunity to interview many of the groups, and another has been arranged for June in Bristol.

- **Method 3 trials challenges**:
    - One Method 3 trialist is having difficulties in achieving its project objective. Its idea is to try to find a link between the Internet of Things (IoT) and LV networks, but his local group of influence is being very busy with other projects. The trialist is still interested in his group (Cardiff IoT MeetUp), doing a presentation at a project event although it is proving challenging so far.
    - Haysys had to re-design their FeederNet Controller Unit following a non-compliance with the flash testing at 3kV for one minute on the initial electrical safety test. The unit is now under production and it will be ready by the end of May. Haysys expect to pass the Safety and EMC tests this time, and the project will be ready for Haysys' system deployment at the assigned substation once all satisfactory documentation is provided to and approved by WPD.
    - Upside Energy trial requires hot water tanks to be installed at domestic properties attached to the LV network fed by the monitored substation. The installation of the OpenLV unit at St Ambrusca Road substation, the location finally agreed with the trialist, had to be delayed until mid-April due to lack of clarity on where those hot water tanks were going to be installed. 10 tanks were finally installed by mid-April and 20 more are expected to be completed in due course.
    - One of IBM's applications was initially designed to control the charging of Tesla electric vehicles. The project has been unable to source a Tesla for the field tests and the trial is now being adapted to use a Jaguar iPace vehicle.

- **New Virtual Machine released**: The Virtual Machine provided to 3rd parties for testing their developed applications was updated in April 2019. This was provided to all concerned parties. Only one organisation was impacted by the release and had to delay its testing by a week.

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 to end of September 2019 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:

- All Method 1 Phase 1 installations were completed;
- All Method 1 Phase 2 installations are complete:
  - Pair 22: Fully commissioned and operational.
  - Pair 26: Fully commissioned and operational.
  - Pair 27: Was fully commissioned and operational – At present the control scheme is temporarily deactivated.
  - Pair 28: Fully commissioned and has been operational. Currently the control scheme is deactivated and is unlikely to be reactivated within the OpenLV Project.
  - Pair 29: Fully commissioned but has not yet been made fully operational.
- All Method 3 installations are complete and commissioned;
- 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;
- Two Method 3 project trials belonging to the University of Bath and University of Strathclyde, were concluded in April and their learning evaluations undertaken in May 2019.
- A set of three mid-trials reports are to be delivered by Regen between January and October 2019. The first of these reports was delivered and approved in March 2019 and focused on the initial project progress as well as community attributes and technology relevant to replication of trials with other communities. Regen is currently finalising the second of the reports which will focus on a mid-point evaluation of learning and project outputs. This report is expected in June 2019.
- A workshop event for Method 2 and 3 trialists was held in Exeter on the 7th March. The event was attended by participants of Methods 2 and 3. Its aim was to allow project trialists to discuss topics of interest and get a better insight of the OpenLV project and to meet representatives of the project partners and relevant suppliers. Presentations were given by several project partners; two different community groups and one academia participant and networking tables were also prepared for active discussions.

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);
- Full integration of Yealm Community Energy into the Method 2 part of the project;
- Hold an event to allow Method 2 and 3 organisations to meet, discuss project ideas and outcomes and learn more about overall project outputs (this is scheduled for early June):
- Formally sign up and complete the remaining Data Sharing Agreement and 5 individual trial design documentation for the OpenLV Extensibility trials (Method 3);
- Test four and deploy the remaining seven third party software applications;

- Make LV network data available to all those participants that may not have had their accounts enabled (subject to confirmation of information from the trialists);
- Regen to deliver remaining two internal mid trial reports evaluating the learning and project outputs, analysing the engagement in the communities, extracting the lessons from how best to communicate substation information and outlining the routes communities can take to raise funding of similar projects;
- Continue the Network Capacity Uplift trials (Method 1);
- Continue the Community Group trials (Method 2);
- Continue the OpenLV extensibility trials (Method 3);
- Continue to share learning from the Project through newsletters industry publications and conferences and news articles;
- Create more case studies to disseminate Lessons Learned from the project;
- Attend and present at relevant industry and community events;
- 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	All Equipment for Method 1 Installed	Complete	15/02/18	31/01/19	N/A
2	All Equipment for Method 3 Installed	Complete	30/09/18	22/05/19	N/A
3	Implement changes following cyber-security assessment of complete functioning system	Complete	31/10/18	22/05/19	N/A
4	SDRC 3 Learning from Deployment and Guidelines for App Development	Complete	01/02/19	08/02/19	N/A
5	Method 3 Engage and Sign-Up Companies	Complete	07/09/18	21/12/18	N/A
6	Create network models for undertaking LV-CAP simulation	In Progress	31/03/19	N/A	Jun-19
7	Method 3 Develop Apps, Algorithms and Share Data	In Progress	06/09/18	N/A	Jun-19
8	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.	In Progress	31/05/19	N/A	Sep-19

The identification and confirmation of Method 1 Phase 2 sites took 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, pushed the installation dates into the current reporting period; all are now installed and commissioned.

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, installation of the final pair did not occur until 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 a minimum 18-month time period from January 2018 to at least 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 the required cyber security changes following the cyber security review by NCC took longer than initially anticipated but was completed in May 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 7 and 8 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	Compare LV-CAP against BAU and compare alternatives	In Progress	Jun-19	Sep-19
2	Evaluation of the effectiveness of LV-Cap™ for Communities	In Progress	Aug-19	Oct-19
3	Evaluation of the effectiveness of LV-Cap™ for 3rd party organisations	In Progress	Sep-19	Nov-19
4	Decommission equipment Method 1	Not started	Nov-19	Mar-20
5	Decommission equipment Method 2	Not started	Nov-19	Mar-20
6	Decommission equipment Method 3	Not started	Nov-19	Mar-20
7	Create network models for undertaking LV-CAP simulation	In Progress	Mar-19	Jun-19
8	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.	In Progress	May-19	Sep-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 May-19	Actual Spend to date May-19	Variance £k	Variance %
Labour	**267.3**	204.7	203.1	1.6	1%
Equipment	**853.6**	851.2	812.0	39.2	5%
Contractors	**3,775.1**	3,217.1	2,875.4	341.6	11%
IT	**2.5**	2.1	1.5	0.7	31%
IPR Costs	**0**	0.0	0.0	0.0	0%
Travel & Expenses	**29.7**	22.7	18.3	4.5	20%
Payments to Users	**0**	0.0	0.0	0.0	0%
Contingency	**451.5**	322.5	20.0	302.5	94%
Decommissioning	**66.0**	11.0	0.0	11.0	0%
Other	**0**	0.0	0.0	0.0	0%
TOTAL	**5,445.7**	**4,631.3**	**3,930.3**	**701.0**	

In terms of the variances shown no line items are in excess of the -5% threshold requiring explanation. For reporting against baseline, contingency spend is assumed to be linearly distributed across the project timescale. However, only a relatively small amount of contingency budget has been accessed to date. £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. A further £5,000 of contingency has been used to bring Yealm Community Energy into the project as a replacement for Method 2 participant WHG.

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	08/02/19	Delivered
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; 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 The Project Methods

Community Engagement (Method 2) – Trial Design

- **Specific domain knowledge –** whilst the community groups are highly enthusiastic, and comprise intelligent, experienced individuals, industry specific knowledge, and ways of working are a barrier to fully effective participation. An issue that is not limited to the electricity industry. Extra support and guidance has been requested by some community groups to aid them in gaining the necessary understanding of their local network to fully utilise the information available to them;
- **Events beyond the control of the project -** All research projects are inherently unpredictable, with at least some elements that remain outside the control of the project team; as such, there is a need to be flexible and react to changing circumstances. The loss of WHG from the OpenLV project was in response to events occurring outside the control or influence of the OpenLV Project;
- **Flexibility –**The withdrawal of WHG from the project left an opening that between the project team and Yealm Community Energy, was filled relatively quickly through flexibility and willingness to change the planned approach where necessary at relatively short notice;
- **Community connections –** The inclusion of Yealm into Method 2 elements of the project was significantly aided through the close, pre-existing relationship between Yealm, CSE and Regen. Such professional relations can provide significant benefits, that cannot be anticipated during the initial stages of a project.
- **Feature creep –** development of software commonly experiences feature creep, where additional features are continually proposed and requested by users of the

system as soon as it becomes available for testing. The development of a community group application by CSE is experiencing just such an effect from the multiple community groups participating in the project;

- **Huge amount of data –** The significant volume of data generated by the deployed equipment has surprised some participants in the community groups and provided them with technical hurdles to overcome. In some cases, the volume of data significantly exceeds the capabilities of MS Excel, the most commonly understood spreadsheet software, requiring guidance for them on the use of alternative software.
- **Regen finding it hard to interview groups** –The initial involvement of the community groups clearly defined a requirement for Regen to interview the community groups later in their involvement with the OpenLV Project, however coordinating suitable dates for this has proved challenging at times. To attempt resolution of this issue, a specific event for Method 2 and 3 participants was held in Exeter, a more central location for most of the participants.

<u>OpenLV Extensibility (Method 3) – Project Trials</u>

- **Data sharing –** Several organisations initially requested access to a minor set of substation's data but realised that having access to a wider set of information would allow them to analyse more scenarios. Consequently, interested participants were provided with access to more substation's data than the originally planned;
- **Testing capabilities –** It is important to have an open mind and various plans of action when referring to testing in a trial environment. This was the case on IBM's trial where the availability of a Tesla car was not feasible for field tests and IBM are now trying to adapt their application to interact with other EVs or event test their application with a simulated vehicle instead;
- **Project publications -** Parties need to be reminded of their contractual agreements from time to time, specially related to the publication of papers/articles, so that any information released by them (e.g. magazines, conferences, social media, etc.) with regards to their trials follow the guidance and requirements of the project partners and OpenLV project;
- **Participant's forum –** A few participants proposed the idea of the project offering a shared platform to allow organisations to share information between themselves so that learning and project ideas/developments from one party can also be used by others while the project is in progress. This could help participants to avoid repeating work that may have already been done;
- **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 and encouraged them to keep on track with their project plans

8.2 Learning Dissemination

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

- Method 2 and 3 joint workshop event held in March, Exeter
- Learning evaluations from 2 Method 3 participants, University of Bath and University of Strathclyde
- Project newsletter distributed in May 2019
- Fourteen Method 3 tweets have been published in twitter and a number re-tweeted
- Cardiff University has a paper related to their project trial under review, which will be published, if accepted, at the 2019 IEEE PES Innovative Smart Grid Technologies Europe (ISGT-Europe)

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[1]
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

[1] 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 54 risks have been raised, 29 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. The action plan includes measures to address concerns raised by WPD control room staff regarding three of the five Method 1 Phase 2 pairs. They believe there is a possibility that under certain circumstances remote or automatic HV switching operations could reconfigure the local HV network such that LV meshing would not be appropriate. This risk has been mitigated by rolling back the three affected pairs to stage 2 commissioning, whereby the control logic is not actually initiating meshing. A "meshing inhibited" sequence switching scheme is being developed to prevent LV meshing under certain circumstances and this will be implemented where practically feasible.

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	Additional resource has been assigned to the project
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 LV network leads to operational issues on the HV network	Moderate	WPD operational staff to independently review the existing HV network configuration where meshing is to occur to ensure it is fit for purpose.	Sequence switching to be implemented at active sites where HV network configuration may change remotely or automatically

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
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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
6. SDRC 3: Learning from Deployment of the Overall OpenLV Solution and Standard Guidelines for Application Development, 1st February 2019: https://openlv.net/wp-content/uploads/2019/02/SDRC-3-Specific-Learning-from-Deployment-and-App-Development-V1.0.pdf

Annex 1 – Media Coverage

Organisation	Date	Link
APB	09-Oct-17	http://www.abpclub.co.uk/bodyshop-news.php?story=OpenLV-project---sharing-electricity-usage-data-about-levels-of-capacity-for-charging-EVs-on-local-electricity-networks-139460
Automotive Industry Digest	11-Oct-17	http://www.automotiveindustrydigest.com/latest-fleet-news/network-capacity-for-charging-electric-vehicles-to-be-further-aided/auto-news
Blue and Green Tomorrow	05-Dec-16	https://blueandgreentomorrow.com/news/ofgem-funding-game-changing-project/
Bristol Energy Network	21-Jul-17	http://bristolenergynetwork.org/centre-for-sustainable-energy-openlv-project/
Clean Energy News	20-Sep-17	https://www.cleanenergynews.co.uk/news/efficiency/open-access-substation-data-being-primed-by-western-power-distribution
Community Energy Hub		http://hub.communityenergyengland.org/resources/resource/228/openlv-your-local-electricity-data/
Community Land Trusts		http://www.communitylandtrusts.org.uk/_filecache/252/f9f/390-open-lv-more-information-23617.pdf
Community Land Trusts	28-Jun-17	http://www.communitylandtrusts.org.uk/article/2017/6/28/take-part-in-the-centre-for-sustainable-energys-survey
Community Links	07-Dec-17	http://communitylincs.com/open-lv-project-invitation-parish-councils/
Community Open Energy Monitor	13-Nov-17	https://community.openenergymonitor.org/t/openlv/5643
CSE		https://www.cse.org.uk/projects/view/1335
CSE	15-Mar-19	https://www.cse.org.uk/local-energy/news/view/2322
CSE	17-Oct-18	https://www.cse.org.uk/local-energy/news/view/2270
CSE	04-May-18	https://www.cse.org.uk/news/view/2238
CSE	04-Dec-17	https://www.cse.org.uk/news/view/2214
CSE	30-Aug-17	https://www.cse.org.uk/news/view/2199
Current News	20-Sep-17	https://www.current-news.co.uk/news/open-access-substation-data-being-primed-by-western-power-distribution
e-Hike		http://e-hike.net/content/network-capacity-charging-evs-be-further-aided-opening-data-substations
DriveEV	09-Oct-17	http://driveev.net/2017/10/09/electric-car-charging-project-help-manage-capacity/#.WejQasaZOL8
EA Technology		https://www.eatechnology.com/projects/openlv/
EA Technology	09-Oct-17	https://www.eatechnology.com/blog/2017/10/11/network-capacity-for-charging-electric-vehicles-to-be-further-aided-by-opening-up-data-from-substations/openlv-balancing-act/
EcoPlugg		https://www.ecoplugg.co.uk/openlv-project-aims-to-aid-network-capacity-for-charging-electric-vehicles/
EcoTopical	10-Oct-17	http://ecotopical.com/green-car-congress/196331/openlv-project-proposes-opening-up-local-electricity-usage-data-to-improve-ev-charging/
Efficient Energy		http://www.efficientenergy.net/nl/2016/dec16.htm
Electrans	02-Nov-17	https://www.electrans.co.uk/openlv-looks-network-capacity-evs/
Electric Cars Report	15-Oct-17	http://electriccarsreport.com/2017/10/network-capacity-charging-evs-aided-opening-data-substations/
Electrive	11-Oct-17	http://www.electrive.com/2017/10/11/stockholm-openlv-wales-bengaluru-dubai/
Energy Capital	11-Jul-17	http://www.energycapital.org.uk/2017/07/11/open-lv/
Energy Capital	08-Nov-17	https://www.energycapital.org.uk/uncategorized/open-lv/
Energy Innovation District	19-Sep-17	https://energyinnovationdistrict.com/blog/2017/9/19/record-year-for-energy-tech-company-ea-technology
Energy Networks Association	05-Dec-17	http://www.energynetworks.org/blog/2017/12/05/get-'appy'-western-power-distribution's-openlv-project/
Energy World	01-Apr-18	https://knowledge.energyinst.org/search/record?id=109571
EV FleetWorld	09-Oct-17	http://evfleetworld.co.uk/ev-initiative-to-help-overcome-challenges-with-network-capacity/
ENA Smarter Networks		http://www.smarternetworks.org/Project.aspx?ProjectID=2030
Enzari	09-Oct-17	https://enzari.com/network-capacity-for-charging-electric-vehicles-to-be-further-aided/
Express & Star	09-Oct-17	https://www.expressandstar.com/news/motors/2017/10/09/substation-data-to-help-improve-ev-charging-infrastructure/
Fleet Magazine	09-Oct-17	http://fleetmagazine.co.uk/network-capacity-charging-electric-vehicles-aided-opening-data-substations/
Fleet News	10-Oct-17	https://www.fleetnews.co.uk/news/fleet-industry-news/2017/10/10/openlv-project-aims-to-aid-network-capacity-for-charging-electric-vehicles
Fleet Point	09-Oct-17	http://www.fleetpoint.org/fleet-industry-news/news-by-date/openlv-opening-local-electricity-usage-data/
Fleetworld		https://fleetworld.co.uk/ev-initiative-to-help-overcome-challenges-with-network-capacity/
Green Car Congress	10-Oct-17	http://www.greencarcongress.com/2017/10/20171010-openlv.html
Greenfleet	10-Oct-17	http://www.greenfleet.net/news/10102017/openlv-project-open-local-electricity-usage-data
Herefordshire Green Network	29-Jun-17	http://www.hgnetwork.org/centre-for-sustainable-energy-project/
Impulse	26-Feb-18	http://www.impulse-corp.co.uk/news/impulse-support-openlv-with-embedded-computing-for-substations.htm
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/
Just Auto	09-Oct-17	https://www.just-auto.com/electric-drive-technology/Substation-data-to-aid-EV-network-capacity_n179050.aspx
IMechE	21-Nov-17	https://www.imeche.org/news/news-article/the-smart-grid-gamechanger-openlv
LinkedIn	15-Dec-17	https://www.linkedin.com/pulse/openlv-what-great-initiative-robert-plant
LowCVP	18-Dec-17	https://twitter.com/theLowCVP/status/942741442904100864
Lucy Electric		http://www.lucyelectric.com/en/press-news/company/openlv-gets-funding-green-light-ofgem/
Marshfield Community Land Trust		http://marshfieldclt.org/openlv-project
MCLT2 (Marshfield Community Land Trust (MCLT)		http://s627349017.websitehome.co.uk/openlv
Metering	21-Nov-17	https://www.metering.com/news/western-power-distribution-ea-technology/
Networks	10-Oct-17	https://networks.online/gphsn/news/1000734/software-platform-access-local-grid
Networks	17-Jan-18	https://networks.online/gphsn/news/1000838/companies-invited-advantage-openlv-electricity
Networks		energy.soutron.net/Library/Download.aspx?id=7000
New Power	19-Sep-17	https://www.newpower.info/2017/09/ideas-wanted-wpd-opens-network-data-to-app-developers/
OpenLV		https://openlv.net
OVO Energy	01-Jun-18	https://forum.ovoenergy.com/the-watering-hole-42/openlv-1786
Owen Square	03-May-18	https://www.owensquare.coop/single-post/2018/05/03/OpenLV-heat-pump-trial-begins
Power Technology	23-Jan-18	https://www.power-technology.com/features/opening-electricity-data/
Power Technology	10-Jan-18	https://www.power-technology.com/features/future-power-technology-magazine-issue-94/
Power Technology	02-May-17	https://www.power-technology.com/news/newsea-technology-registers-record-year-of-growth-with-new-energy-projects-5802247/
PPL		http://pplweb.mediaroom.com/index.php?s=12270&item=137306
Regen	18-Sep-17	https://www.regensw.co.uk/openlv
Renewable Energy Magazine	02-Nov-17	https://www.renewableenergymagazine.com/panorama/energy-generation-market-to-be-supported-by-20171102
Renewable Energy Magazine	05-Dec-16	https://www.renewableenergymagazine.com/energy_saving/openlv-awarded-4-9-million-funding-20161205
Shropshire Star	09-Oct-17	https://www.shropshirestar.com/news/motors/2017/10/09/substation-data-to-help-improve-ev-charging-infrastructure/
Smart Energy	21-Nov-17	https://www.smart-energy.com/regional-news/europe-uk/western-power-distribution-ea-technology/
Tamar Energy Community		http://tamarenergycommunity.com/power/
Tamar Energy Community	18-Mar-19	http://tamarenergycommunity.com/the-power-in-your-hands-our-openlv-project/
Tamar Energy Community		http://tamarenergycommunity.com/openlv-power-and-carbon-intensity-bar/
Tamar Energy Community		http://tamarenergycommunity.com/author/katetec1/page/2/
Tavistock Today	20-Oct-18	http://www.tavistock-today.co.uk/article.cfm?id=433207&headline=Ground-breaking%20trial%20by%20energy%20group%20should%20benefit%20local%20residents&sectionIs=news&searchyear=2018
The Register	11-Oct-17	https://www.theregister.co.uk/2017/10/11/openlv_substation_electricity_data/
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