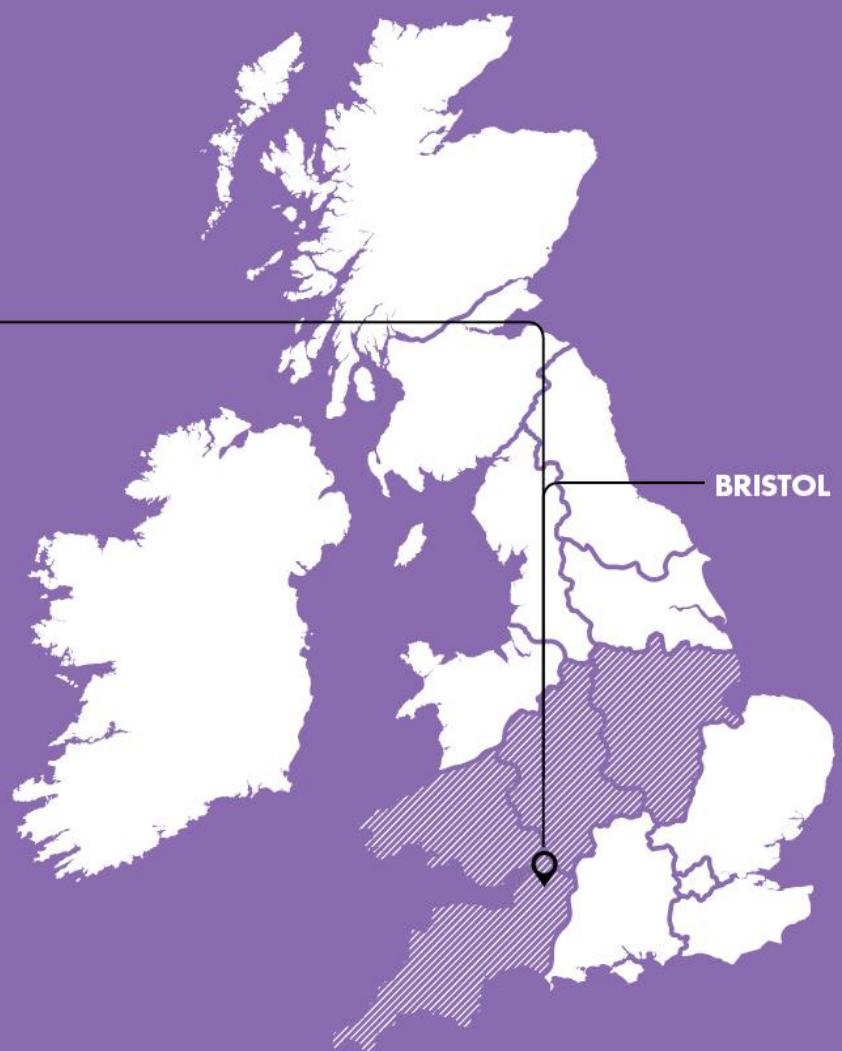


PROJECT SOLA BRISTOL



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Glossary

Term	Definition
BCC	Bristol City Council
KWMC	Knowle West Media Centre
UoB	University of Bath
WPD	Western Power Distribution
SOC	State of Charge
AC	Alternating Current
DC	Direct Current
LED	Light Emitting Diode
HV	High Voltage
LV	Low Voltage
PV	Photo Voltaic
SDRC	Successful Delivery Reward Criteria
LVD	Low Voltage Disconnect

1 Executive Summary

SoLa BRISTOL is funded through Ofgem's Low Carbon networks Second Tier funding mechanism. SoLa BRISTOL commenced in October 2011 and was originally planned to complete in Jan 2015, it will now complete in January 2016. As this report is just prior to the final closedown reports and the last two SDRCs we have kept the report focused on progress updates and less repetition of background information to the project where possible. Background information on the project can be found on the Ofgem and WPD websites.

This report details the progress of SoLa BRISTOL, focusing on the last six months June 2015 through to November 2015 .

During this period no new SDRCs were due to be completed, and the primary focus of the project team has been the final collation of results and the compilation of the relevant reports, including SDRCs and the Final Report. This activity is going according to plan.

Customer feedback has been generally positive throughout the project, more on this will be provided within the Final Report due in January 2016.

1.1 Business Case

The Low Voltage distribution network is designed to operate passively. We use an After Diversity Maximum Demand (ADMD) of connected customers to design the network to operate within statutory limits and technical capabilities regardless of time of day or season.

The traditional network designs and operating practices have to date been an efficient method to supply customers. However in the future with much higher distribution peaks and customers exporting generation into the network, it may no longer be the most efficient way to design and operate more complex networks. Innovation may provide improved methods.

The joint Energy Networks Association and Imperial College summary report "Benefits of Advanced Smart Metering for Demand Response based Control of Distribution Networks -version 2.0", April 2010 predicted the reinforcement of GB distribution networks with a like for like replacement strategy using conventional reinforcement would be significantly higher than using smarter network reinforcement techniques. The report highlighted the greatest potential impact of smart appliances is at HV/LV substations and on the LV feeder. With a 50% penetration of electric vehicles and heat pumps by 2030 the predicted the scale of the LV reinforcement will be £21.8bn, compared to £9.3bn using smart grid techniques.

It is therefore appropriate to look at improving voltage profiles, reducing peaks and improving the power quality of the LV network using innovative techniques that allow the connection of significantly more micro generation and other LCTs to the distribution network without the need for conventional reinforcement

1.2 Project Progress

During this reporting period, the project has been concentrating on data capture and analysis, and as mentioned above, the planning and compilation of the final reports and SDRCs. This is a time consuming process, especially with data collection activities and decommissioning running in parallel.

Data collection has continued throughout this period along with extensive analysis of the information.

Decommissioning of homes and commercial installations has commenced but this is in the early stages.

We held another stakeholder meeting (including other DNOs) on 4th September 2015 to share the findings within the Network Benefits Report.

All of the above will be discussed in more detail in the Project Managers report below.

1.3 Project Delivery Structure

1.3.1 Project Review Group

The SoLa BRISTOL Project Review Group met once during this reporting period.

1.3.2 Resourcing

A new Project Manager for BCC has been appointed and will be meeting with the WPD Sola Bristol Project Manager on 14th December 2015

1.3.3 Collaboration Partners

A new company has been appointed to decommission the commercial installations following the previous company being unable to fulfil this obligation.

1.4 Procurement

A contract has been signed for the schools support and decommissioning following the change of installer mentioned in 1.3.3.

1.5 Installation

The 26 domestic installations, 5 schools and the office were completed and therefore no further installation has been undertaken.

1.6 Project Risks

The Project Manager takes a proactive role in ensuring effective risk management for SoLa BRISTOL. They ensure that processes have been put in place to review whether risks still exist, whether new risks have arisen, whether the likelihood and impact of risks has changed, and report significant changes which adjust risk priorities and deliver assurance of the effectiveness of control.

Contained within Section 8 of this report are the current top risks associated with successfully delivering SoLa BRISTOL as captured in our Risk Register along with an update on the risks captured in our last six monthly project report. Section 8 provides an update on the most prominent risks identified at the project bid phase.

1.7 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, and will be shared in lessons learned workshops at the end of the project. These are reported in Section 6 of this report.

During this reporting period we have shared our learning from SoLa BRISTOL through events we have spoken at. We have also held a project event during this period on 4th September. The event was primarily to share the outputs within the Network Benefits Report that was published last year. It was a very successful event and afforded the team to opportunity to more widely share learning and reflections.

In addition to this we have shared our learning (where applicable), through discussions and networking at a number of knowledge sharing events hosted by other organisations.

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

Event Title	Date	Host	Contribution
BREPS Conference	15/06/2015	Sheffield Uni	Presenter
Sola Dissemination Event	04/09/2015	WPD	Host/Presenter
Solar Energy UK	13/10/2015	Solar Media	Attendance
DECC storage Event	21/10/2015	DECC	Attendance
LCNI Conference	24/11/2015	ENA	Presenter
Energy Symposium	16/11/2015	UoB	Presenter

2 Project Managers Report

2.1 Project Background

SoLa BRISTOL is an alternative method to enable high density photo voltaic solar generation to connect to the low voltage network more efficiently through using an in home battery and variable tariffs. The project aim is to address the technical constraints that DNOs expect to arise on Low Voltage networks as a result of the adoption of solar PV panels. The trial uses in-home battery storage to provide benefits to customers and aid the DNO with network management. Twenty six houses, five schools and an office had solar PV and a battery installed. In the domestic properties, the solar PV was connected directly to the battery using a DC connection. The AC lighting circuits in the premises were also converted to DC to enable customers to run small appliances on DC directly from the PV/battery. The battery was “shared” between the customer and the DNO. The customer was provided with a pseudo variable tariff to encourage electricity use at times of high PV generation and to use electricity stored by the battery when the network is heavily loaded. The DNO was able to communicate with the battery to charge and discharge it to help with network management.

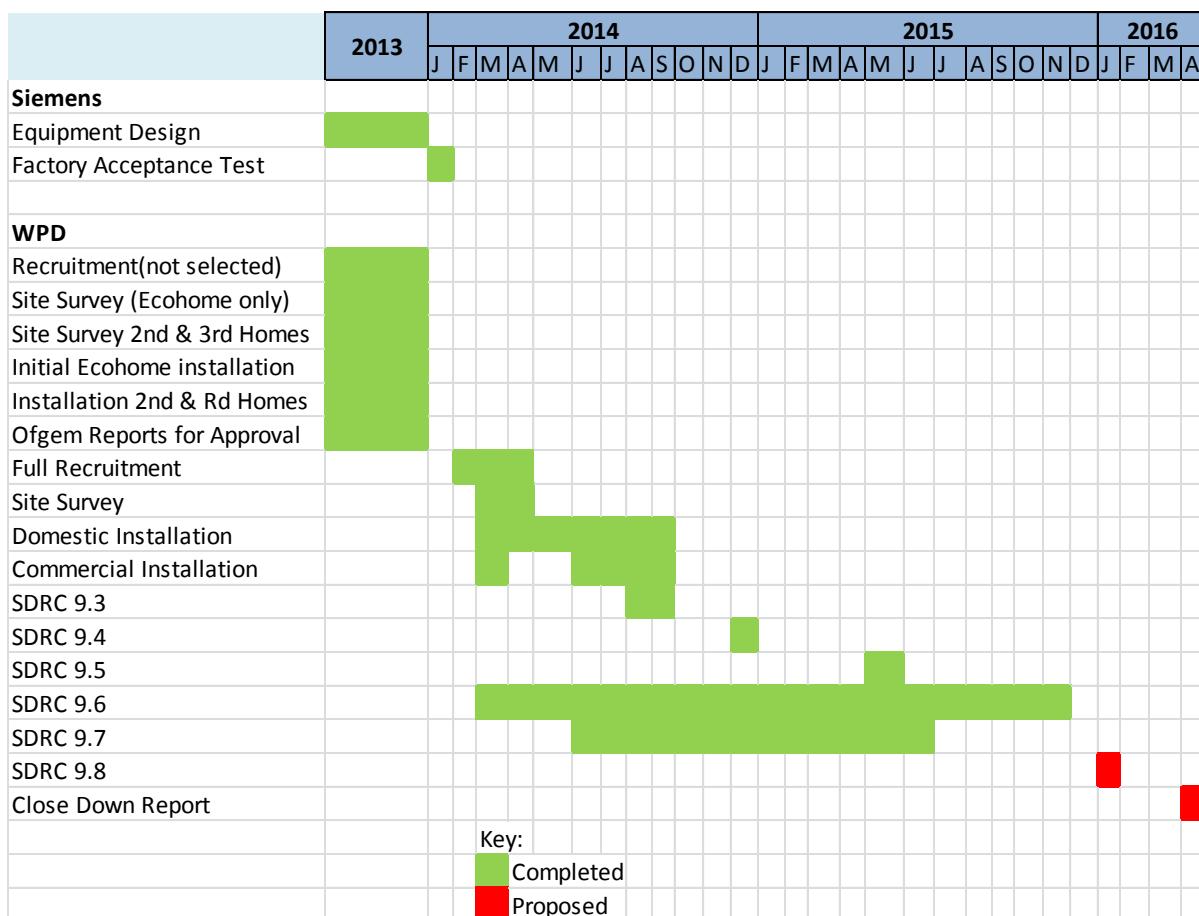
The project aimed to:

- solve the network problems which arise when a number of customers in a local area connect PV solar panels to their house
- investigate how a battery installed in the home can help customers to manage their energy usage and save money on their bills
- test how customers respond when offered different electricity tariffs throughout the day
- explore the benefits of utilising direct current (DC) in the home, rather than the traditional alternating current (AC).

2.2 Project Progress

New updated project Plan is shown in Table 2 below.

Table 2 New Project plan



Below are the updated Key outputs and milestones.

Table 3 - Progress to date - Key Outputs and Milestones

Due Date	Type	Description	Status
30/06/2012	Report	6 Monthly PPR	Completed
15/12/2012	Report	Initial Installation Report R2	Completed 23/09/13
31/12/2012	Report	6 Monthly PPR	Completed
30/06/2013	Report	6 Monthly PPR	Completed
02/09/2013	Document	Data Protection Plan	Approved 17/12/13
02/09/2013	Document	Customer Engagement Plan	Approved 17/12/13
30/09/2012	Report	Combined domestic FAT report M3	Completed 14/2/14
30/09/2012	Report	Commercial FAT report M3	Completed 10/4/14
31/12/2013	Report	6 Monthly PPR	Completed

13/06/2014	Report	6 monthly PPR	Completed 13/06/14
01/09/2014	Milestone	Final School commissioned	Completed
17/11/2014	Milestone	Office commissioned	Completed
18/11/2014	Milestone	Final House Commissioned	Completed
11/12/2014	Report	Change request CCR 004	Approved
31/12/2014	SDRC	9.4 Early Learning Report	Received
31/12/2014	Report	6 Monthly PPR	Completed
13/03/2015	Report	Change Request CCR 005	Approved
20/05/2015	SDRC	9.7 Outage trials & Report	Completed
31/05/2015	SDRC	9.5 Network Benefits Report	Completed
30/06/2015	Report	6 Monthly PPR	Completed
30/11/2015	SDRC	9.6 Customer surveys completed	Completed

Householder Update

De-commissioning has begun and each of the households has been invited to take part in a final interview to record their experiences of the project and the final stages. These interviews were completed in November 2015, and we are able to report preliminary findings from six households, in the section below we summarise the key themes.

Costs/savings

One householder reported that his weekly costs had gone back up since the decommissioning (previously paid £10/15, now £20). While another reported that she was still paying the same amount. The remaining households were uncertain, as they were either on direct debit, new tenants to the project or did not keep records of their payments. For the householder who has seen an increase, while he was understandably disappointed with the increase, he still valued the reduction the solar panels had made to his costs. All of the householders were pleased with the savings they had made throughout the duration of the project.

Lighting

The DC LED lights have been reverted back to the energy saving bulbs that householders had prior to the project. Typically the householders are happy with this, with some commenting that the lights seem brighter now. However, there are differences with one household finding the energy lights to be too dull, they have chosen to replace the bulbs with LED lights.

Decommissioning

All of the households were happy with the decommissioning process, commenting on the friendly demeanour of the Bristol City Council Electricians and how it was good that the same installers at the start of the project were used to remove the system. Some houses are awaiting final renovations but all are happy with the process.

Future

When asked about future projects some of the householders commented that they would consider having a battery installed, but it would need to be more aesthetically pleasing, or hidden from view. A couple of the householders felt that more contact with BCC would have been invaluable as well as more update meetings so they could have learnt more about the 'behind the scenes' side of the project.

Responses varied about the potential to take part again, with all feeling positive about the Solar panels, but some unsure whether the battery storage was worthwhile.

Project Dissemination

On Friday September 4th the SoLa Bristol team held a knowledge-sharing event in Bath, designed primarily to share the learning from the Network Benefits report. It was decided that this was a good opportunity to share additional project learning such as engaging with customers and the education package at the same time.



Dissemination Event 4th September

Representatives from DNOs and Ofgem joined with academics and charities to learn about the SoLa BRISTOL project. Designed to be an informal panel discussion the audience were invited to join in with the discussions and contribute to the knowledge sharing. Feedback from the event suggested that this was a good format, and in particular the inclusion of one of the householders on the customer engagement panel provided an authenticity and real life understanding of the project.

Following on from the SoLa event an attendee made contact to invite the SoLa team to contribute to a second knowledge-sharing event around community energy projects. Alongside WPD's Less is More project, the SoLa team provided customer engagement and energy behaviour guidance to the SSE's SAVE Project. Discussing themes such as customer

engagement, inclusion of new technology and methods for motivating behaviour change. The opportunity to share our knowledge not only helped SSE but also consolidated our own understanding and allowed us to hear about similar projects that are just starting.

2.3 Decommissioning Progress

Decommissioning started in earnest in this reporting period. 15 of the 26 domestic installations have been removed with each one being completed within one day. As per the Customer communications plan all appointments were arranged through KWMC and carried out by BCC electricians. Any remedial works i.e. decorating will be arranged through BCC and completed to the householder's satisfaction.

Smokeless Energy have been contracted to complete the commercial decommissioning and 3 schools have been decommissioned with the KWMC and the final school planned for late December.

3 Business Case Update

No update to the business case for this period.

4 Progress against Budget

The budget presentation has been updated to reflect the new layout agreed with Ofgem as part of the recent change request.

Cost Category	New Budget	Actual LCNF Spend Nov 2015	LCNF Variance to Budget Nov 2015	Additional WPD Contribution	Total Project Spend Nov 2015	Notes
Labour	165.7	159.21	-4%	24.06	183.27	
Overall Project Manager	151.2	151.2	0%	24.06	175.26	
Substation installation (including any civil modifications)	14.5	8.01	-45%		8.01	See note 1
Equipment	486.73	479.24	-2%	124.95	604.19	
Distribution Sensing Equipment	11	11	0%	0.44	11.44	
Customer Sensing Equipment	2	2	0%	0.86	2.86	See note 2
Substation installation (including any civil modifications)	14.5	8.01	-45%		8.01	See note 1
DC Meters	5	4	-20%		4	See note 3
Domestic premises equipment (supply)	237	237	0%	74.96	311.96	
School equipment (supply)	114.4	114.4	0%	28.34	142.74	
Office equipment (supply)	22.43	22.43	0%	5.54	27.97	
Substation equipment (supply)	50.4	50.4	0%	12.81	63.21	
Smart Appliances & ICT Equipment	30	30	0%	2.00	32	
Contractors	1329.46	1147.66	-14%	205.55	1353.21	
BCC Project Management	60	50.48	-16%		50.48	See note 4
Detailed Installation Survey and Planning	50	50	0%	0.38	50.38	
Training and Installations	166	166	0%	35.03	201.03	
Trial Property Recruitment, Equipment Maintenance & Ongoing Support	159.5	115.73	-27%		115.73	See note 4
Equipment Decommissioning (including battery disposal)	161	14.45	-91%		14.45	See note 5
System Design and Engineering	101.76	101.76	0%	24.84	126.6	
Domestic premises equipment (supply)	67.49	67.49	0%	21.34	88.83	
School and Office equipment (supply)	12.5	12.5	0%	3.10	15.6	
Substation equipment (supply)	70.98	89.02	25%	18.04	107.06	See note 1

Data archiving and access equipment (supply)	62.92	62.92	0%	38.14	101.06	
Installation, commissioning and operation support	101.76	101.76	0%	34.46	136.22	
Input to smart tariffing	104.41	104.41	0%	10.00	114.41	
Input to network design	151.89	151.89	0%	14.55	166.44	
Dissemination planning	59.25	59.25	0%	5.67	64.92	
IT	43.7	43.53	0%	6.85	50.38	
Data Communications (LV Connection Manager & LV Network Manager)	20	19.83	-1%		19.83	
Domestic premises equipment (supply)	8.4	8.4	0%	2.66	11.06	
School & Office equipment (supply)	3.08	3.08	0%	0.76	3.84	
Substation equipment (supply)	8.4	8.4	0%	2.13	10.53	
Data archiving and access equipment (supply)	1.82	1.82	0%	1.10	2.92	
Input to smart tariffing	1	1	0%	0.10	1.1	
Input to network design	1	1	0%	0.10	1.1	
Travel & Expenses	0	-	0%		-	
IPR Costs	47.33	47.33	0%	3.82	51.15	
System Design and Engineering	12.83	12.83	0%	3.14	15.97	
Domestic premises equipment (supply)	2.15	2.15	0%	0.68	2.83	
School equipment (supply)	0.72	0.72	0%	0.17	0.89	
Substation equipment (supply)	1.69	1.69	0%	0.42	2.11	
Data archiving and access equipment (supply)	1.21	1.21	0%	0.74	1.95	
Installation, commissioning and operation support	28.73	28.73	0%	9.73	38.46	
Payments to users	18	2.43	-87%	0	2.43	
Battery Charging Costs	9	0	-100%		0	See note 6
Variable Tariffs - Payments to users for changes in behaviour	9	2.43	-73%		2.43	See note 7
Contingency	149.87	148.12	-1%	30.88	179.00	
Scope change Contingency (Survey results)	49	47.25	-4%		47.25	
System Design and Engineering	13.8	13.8	0%	3.37	17.17	
Domestic premises equipment (supply)	30.46	30.46	0%	9.63	40.09	
School equipment (supply)	22.33	22.33	0%	5.53	27.86	
Office equipment (supply)	2.59	2.59	0%	0.64	3.23	
Substation equipment (supply)	12.82	12.82	0%	3.26	16.08	
Data archiving and access equipment (supply)	7.72	7.72	0%	4.68	12.4	

Installation, commissioning and operation support	11.15	11.15	0%	3.77	14.92	
Decommissioning	0	-	0%		-	
Other	40	40	0%	3.83	43.83	
Input to smart tariffing	2	2	0%	0.19	2.19	
Input to network design	2	2	0%	0.19	2.19	
Workshops	12	12	0%	0.19	12.19	
School engagement	24	24	0%	0.19	24.19	
TOTAL	2281.77	2067.52	-9%	399.94	2467.46	

Notes for those line items that exceed +/- 10%:

Note 1	Civils in substation installations were less than expected
Note 2	Customer sensing equipment cost more than expected due to additional complexity of the requirement and initial estimation therefore being on the low side.
Note3	DC Meters for commercial installations not required
Note 4	Awaiting invoice(Excess costs associated with the project extension will be covered by WPD)
Note 5	Decommissioning still under way.
Note 6	Battery Charging costs will be calculated at project end and reported in the closedown report.
Note 7	Variable Tariff savings varied due to phased installations and customer load profiles

5 Successful Delivery Reward Criteria (SDRC)

No new SDRCs were due in this reporting period; the next one is linked to the Final Report which will be published during January 2016.

5.1 Future SDRCs

Table 6 captures the remaining SDRCs for completion in line with the new project plan (table 2)

Table 6 – SDRCs to be completed

SDRC	Status	Due Date	Comments
9.8 Final Report	Green	15/01/2016	Change request proposed new due date 15/01/2016

Status Key:	
Red	Major issues – unlikely to be completed by due date
Amber	Minor issues – expected to be completed by due date
Green	On track – expected to be completed by due date

6 Learning Outcomes

No new documents have been published during this period. The project is closing down now and more documents will be made available during the coming period.

7 Intellectual Property Rights

No relevant foreground IP has been identified and recorded in this reporting period.

8 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 risk management processes and any governance requirements as specified by Ofgem; and
- anticipate and respond to changing project requirements.

These objectives will be achieved by:

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

8.1 Current Risks

The SoLa BRISTOL risk register is a live document and is updated regularly. There are currently eleven live project related risks. Mitigation action plans are identified when raising a risk and the appropriate steps then taken to ensure risks do not become issues wherever possible. In Table 7, we give details of our top five current risks by category. For each of these risks, a mitigation action plan has been identified and the progress of these are tracked and reported. As the project is now drawing to a close a number of risks have naturally closed down so we have not reported those for completeness.

Fig 6 overview of current risks

Below is the summary graphic showing overall risk status:

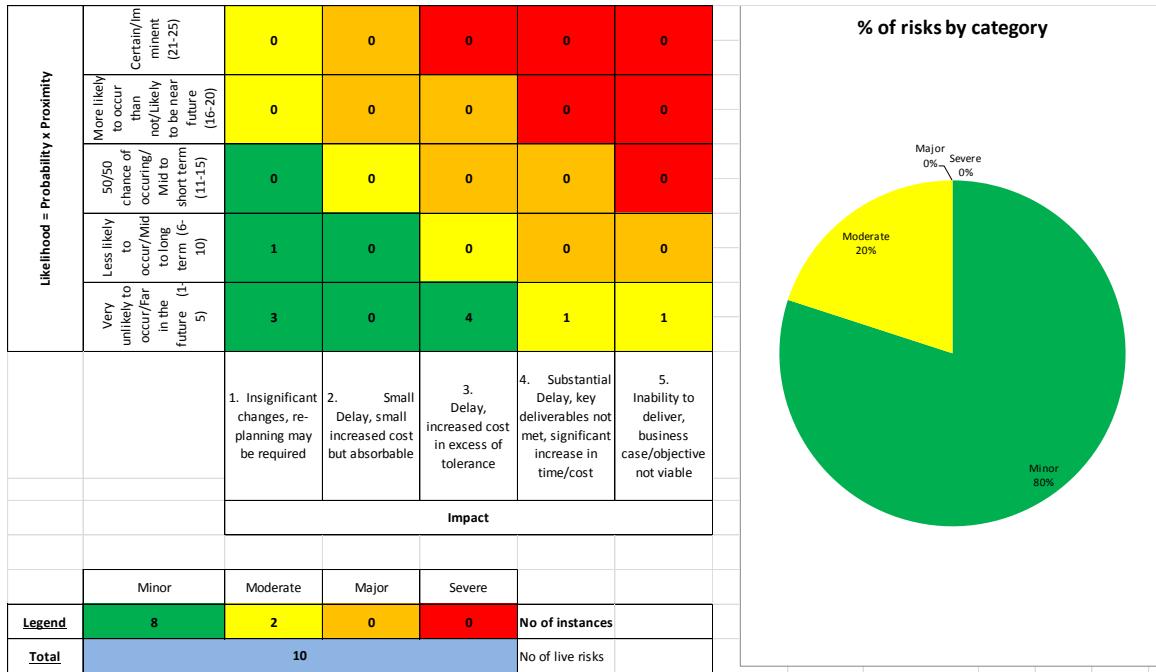


Table 7 – Top five current risks (by rating)

Risk	Risk Rating	Mitigation Action Plan	Progress
R031 communication between the LV network manager and the data repository is unreliable causing holes in data capture	Moderate	Early identification of any issues reported by UoB and acted upon	No major issues at present, this is reported as residual data is being analysed.
R30 Critical component failure on 5 or more properties, causing system shutdown	Moderate	every failure to be diagnosed to pre-empt any patterns	System components reasonably reliable. No patterns emerging of repetitive problems
R022 Communications between the LV connection manager and LV network manager is unreliable	Moderate	A robust communications network will be installed and tested before installation.	Comms working but a few issues with reliable connection
R005 Our partners and supporters perceptions on the project may change	Minor	Work with all project partners and supporters throughout the design and development of the project. Ensure	BCC project Manager being replaced. Assurances given on continued project support. No additional specific risk to report

		communications are clear and the objectives are known.	but viewed as important to monitor.
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8.2 Update for risks previously identified

Descriptions of the most significant risks, identified in the previous six monthly progress report, are provided in Table 8 with updates on their current risk status.

Table 8 – Top five risks identified in previous six monthly report

Risk	Risk Rating	Current Risk Rating	Progress
R018 Over 25% of customer/s wish to terminate the trial before 18 months	Major	Moderate	Ongoing risk as project develops. No indication of this becoming an issue
R029 Access to homes denied, to make system changes following early learning	Major	Minor	Required setting changes were tested at UoB and uploaded remotely
R031 communication between the LV network manager and the data repository is unreliable causing holes in data capture	Major	Moderate	No major issues at present
R022 Communications between the LV connection manager and LV network manager is unreliable	Moderate	Moderate	Comms working but a few issues with reliable connection

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 – Top risks identified at the project bid phase in addition to those mentioned above

Risk	Previous Risk Rating	Status	Comments
R014 There is no suitable location to store the equipment in homes, schools and an office.	Major	Closed	Risk closed. All properties surveyed and suitable locations found. External cabinet designed for commercial properties.
R015 The AC wiring in homes, schools and the office cannot be converted to DC operation	Major	Closed	Risk closed. ERA report commissioned and AC wiring deemed suitable for DC.

9 Consistency with Full Submission

No new items to report during this period.

10 Accuracy Assurance Statement

This report has been prepared by the SoLa BRISTOL Project Manager (Mark Dale), reviewed by the Future Networks Team Manager (Roger Hey), recommended by the Policy Manager (Paul Jewell) and approved by the Operations Director (Philip Swift).

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

