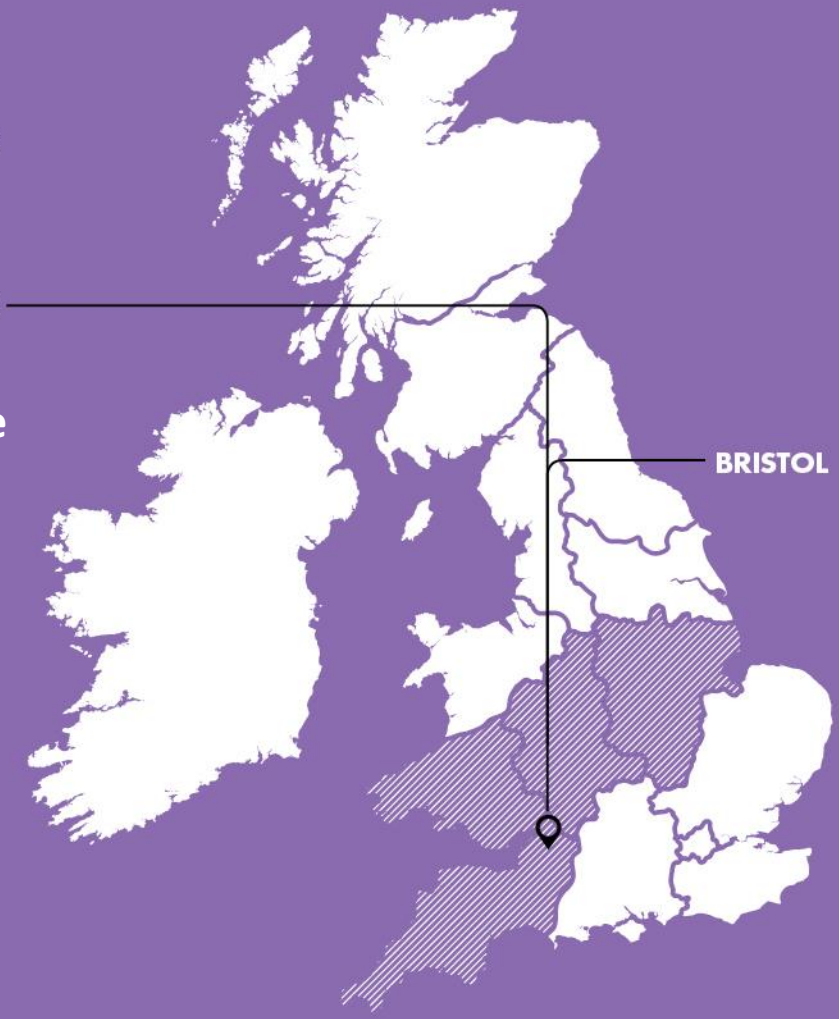
WESTERN POWER DISTRIBUTION

SOLA BRISTOL

# PROJECT SOLA BRISTOL

## Sola Bristol Domestic Change Request
## CCR005




LCN Fund Low Carbon Networks

BRISTOL CITY COUNCIL

UNIVERSITY OF BATH

KNOWLE WEST MEDIA CENTRE

SIEMENS

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|---|---|---|
| Report Title | : | Title: Domestic Change Request CCR005 |
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| Date | : | 12th March 2015 |

**Document Control**

| | Name | Date |
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| Prepared by: | Mark Dale | 09/03/15 |
| Reviewed by: | Roger Hey | 09/03/15 |
| Approved (WPD): | Paul Jewell | 09/03/15 |

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| Date | Issue | Status |
|---|---|---|
| 06/02/15 | 1 | Draft |
| 06/03/15 | 2 | Draft |
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## Glossary

| Abbreviation | Term |
|---|---|
| AC | Alternating Current |
| DC | Direct Current |
| BCC | Bristol City Council |
| UoB | University of Bath |
| DNO | Distribution Network Operator |
| PV | Phot Voltaic |
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## 1. The need for the Change Request

Originally there were to be 30 domestic properties to have the Sola Bristol equipment installed. Due to various un-foreseen issues it has only been practicable to install 26 units.

This Change request is seeking approval to reduce the domestic sample size from 30 to 26, and to use the remaining units to benefit the project in other ways. Two of these units are to be used for R&D and test units at Bath and Newcastle Universities, one to be used as strategic spares and one has already been used to replace a storm damaged unit.
These issues are discussed in greater detail within the following report.

## 2. Reduction in Sample size

The University of Bath (UoB) have analysed the proposed reduction from 30 to 26 domestic properties, both from a statistical and engineering point of view. They believe this reduction will not have any significant impact on the project learning and benefits.
**Appendix 1** contains a letter of support from the University that details their thoughts.
This letter has been reviewed by the other UK DNO's and their comments are included in **Appendix 2.**

### 2.1 Houses no longer included on the project

**H03** When BCC contractors fitted the PV array on this property they could only fit on 975w of panels on the roof due to the available roof space. These panels were fitted and commissioned on 24th September 2012 but the reduction in size was not relayed back to BCC. The issue was only brought to light on the pre installation survey early in 2013. 975w was considered not sufficient capacity to have any benefit to the project. It should be made clear that the PV installation was funded through BCC and not the LCNF.

**H05** The tenant from this property spontaneously left between the sign up and installation phase. The situation was deemed confidential and the tenancy remained open so a new tenant could not be signed up. Below is an extract from a BCC e-mail regarding this property from 5th September 2014.

Dear all,

I've investigated further with our voids team and it appears that the tenant at H05 has had to leave the property spontaneously for reasons that can't be disclosed but may be returning at some point in the future. There is still a tenancy agreement in place and no intention to re-let this property to another party. Whilst frustrating, all we can do is re-engage with the tenant once/if they return. Obviously the tenancy will not be held open indefinitely, but nobody is able to tell whether they will be back within the project timescales. It looks like we may have to remove the property from the list and hope that at some point in the immediate future they return. Regards,

**H17** Customer changed her mind over signing up for the project. This was early in the sign up phase, so an alternative property was used.
* See note 1 below

**H25** This house was the subject of a domestic dispute. One partner was engaged with the project and signed up for the installation, but on installation day the other partner refused to allow the work to go ahead. Further engagement was attempted with the other partner, but access was denied. This came to light during the install week of 1st August 2014. Loft boarding, install and Removal costs were incurred

**H28** A recent family bereavement meant that the householder no longer felt that the project was for them and they didn't want any disruption. Install was cancelled. This came to light on the install day. Loft boarding, install and removal costs were incurred.

***Note 1** There was one extra home included on the sign up list, as a back-up property, and this was utilised as a replacement for **H17**. This was installed and commissioned on 16/09/14

## 3. Re use of surplus domestic units

### 3.1 Water Damaged Unit

As reported in the May 2014 six monthly progress report the unit in **H04** was damaged beyond repair following storm damage to the roof that resulted in water ingress into the inverter and Battery Control box. As a precaution the whole system was replaced. At the time of the incident we were aware of the issues, mentioned previously, with **H03**, so it was decided that, rather than building an additional unit that would require extra funding, this unit would be used to replace the damaged one. The replacement unit was installed in February 2014 decommissioning and removal of the damaged equipment along with the re-installation of the new equipment incurred excess costs.

### 3.2 Strategic Spares

Ever since it was understood that **H05** was not going to be included in the project, this unit has been used for rolling replacement spares. There have been several occasions of individual component failures, DC/DC converter, Moixa unit, Comms equipment etc. Having the spares unit has enabled a quick replacement of the faulty component, whilst the original is repaired or replaced. This results in less impact on the affected customer/property, and a reduction in the data/comms 'down time'.

Although there was a contingency amount in the original budget, this was designed to be for project change of scope issues. It was never the intention to provide any strategic spares. This budget has already been used with the design and build of the external commercial cabinets see CCR004.

### 3.3 Change in Circumstances and the need for Test units

The original concept was to have 30 'typical' gas heated homes. The assumption being that the load profiles would all be reasonably similar and close to the accepted average domestic profile.

In reality the project trial homes are in an area of high poverty and un-employment, resulting in many of the families involved being unemployed and home all day. This in itself means that their load profile is not a typical domestic one. In addition the diversity of the families involved compounds this problem, and has resulted in the need to adopt several different charging/discharging algorithm settings in order to balance the system between customer and DNO benefits.

There are also 3 homes on the project that are on Economy 7 electric heating tariff, which also requires a different approach.

Research and analysis to find the optimum settings is still on-going, and is essential in order to ensure the maximum efficiency of the system.

## 4. The solution

Two units have been setup, utilising units not installed in homes, one in the University of Bath, and one in the Siemens Smart Lab at the University of Newcastle. This gives Siemens the ability to test new settings and their effect on the charging/discharging of the battery and its ability to support the DC and AC loads without the need to trial it in a customer's home. It also negates the need to travel to Bristol for several days in order to run the tests on site.

The second installation at the UoB enables the same testing as above but also combines this with the variable tariff design, so that the predicted financial implications on the customer can be estimated.

Without these two systems in place, the required process for assessing the settings changes would involve trials with real customers in their homes, with potential impact on their DC lighting and financial savings. It would also take considerably longer to implement such changes and require greater access to homes to reconfigure equipment. It would also impact on the feedback of data in order to make further changes if required.

## 5. Conclusion

If this change request is accepted then the despite the reduction in sample size, the project efficiency may well be enhanced, as it will allow a more rapid implementation of improved settings changes, meaning different strategies can be tried. It will enable a quicker response in the event of component failures, meaning less disruption to customers and less data/comms downtime, and will have no impact on the project budget.

In addition it should be noted that the original plan intended for 30 homes to be supplying data for a full 12 month period. Due to CCR 004 extending the project time line until Jan 2016, the data for the 26 connected homes will be available for a minimum of 12 months, with some homes providing data for considerable longer periods.

The marked up original pro-forma, Appendix 3, has been amended to show the proposed changes.

# Appendix 1 Letter of Support from Bath University

**Department of**
**Electrical Engineering**
University of Bath
Claverton Down
BATH BA2 7AY

25th February 2015

**With reference to: Sola Bristol**

We are writing to report our findings on the likely impact on the learning outcome of the project from the reduction in domestic homes from 30 to 26.
The original trial plan for LV Network **SDRC (9.5)** was to have 30 domestic properties providing trial data over a full 12month period. The revised plan, as shown in table below, though has a reduction of 4 homes, it has longer trial periods for 77% of the 26 trial homes.

| | |
|---|---|
| 2 homes 23 months data | since Sep 13 |
| 3 homes 17 months data | since Apr 14 |
| 3 homes 16 months data | since May 14 |
| 3 homes 15 months data | since Jun 14 |
| 4 homes 14 months data | since Jul 14 |
| 5 homes 13 months data | since Aug 14 |
| 6 homes 12 months data | since Sep 14 |

In order to understand whether there are material impacts to learning outcomes from the reduction in the trial size, we conducted statistical analyses to examine the variability of 30 homes over 12 months (original plan) versus the revised plan. Essentially, we investigate whether the trial extension from the 26 homes can compensate the overall reduction in sample size and to what degree.

As data from the trial homes are not yet fully available, our analyses is based on smart metering data from the Irish smart metering project, where 24 month data reading from 30 domestic dwellings (sharing similar social profiles such as the type of property and occupancy income) are used in this assessment, emulating the trial situation in our project.

Under the original plan, the variance across 30 homes over 12 months is around 7.83 kW. Table I shows the variance between 30 homes for each of the 12 months, as indicated by the table, the variances across the 12 months are relatively stable and in average is around

0.7 kW (0.5 kW in summer and 0.8 kW in winter). This suggests that the dissimilarities between the 30 homes are fairly consistent throughout the year.

Table II shows the variances between customers in the revised plan, where the trial duration for the 26 homes ranges from 12 months to 23 months. Our analyses indicates that the total variance of the revised plan is 9.62 kW, which is higher than the original plan, suggesting the extension in the trial duration more than compensates the reduction in the trial size.

Table I Variance between 30 homes in each month over a year

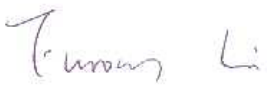
| Month | Variance between 30 customers (Power, kW) |
|---|---|
| January | 0.88 |
| February | 0.81 |
| March | 0.67 |
| April | 0.55 |
| May | 0.54 |
| June | 0.53 |
| July | 0.59 |
| August | 0.62 |
| September | 0.53 |
| October | 0.55 |
| November | 0.67 |
| December | 0.89 |
| Total | 7.83 |

Table II Variance for each group under the revised plan

| Month | Variance between customers under the revised plan (Power, kW) |
|---|---|
| 23 months 2 customers | 0.98 |
| 17 months 3 customers | 1.02 |
| 16 months 3 customers | 0.95 |
| 15 months 3 customers | 0.88 |
| 14 months 4 customers | 1.36 |
| 13 months 5 customers | 1.88 |
| 12 months 6 customers | 2.55 |
| Total | 9.62 |

To conclude, we are confident that the reduction of 4 homes in the revised plan will not impact on the learning outcome of the project.

Yours sincerely,



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## Appendix 2 DNO responses

electricity north west
Bringing energy to your door

Electricity North West
Linley House, Dickinson Street,
Manchester, M1 4LF

Email: enquiries@enwl.co.uk
Web: www.enwl.co.uk

Direct line:
Email:

Paul Jewell
Western Power Distribution
6th Floor
Toll End Road
Tipton
West Midlands
DY4 0HH

06 March 2015

Dear Paul

**Re: Sola Bristol**

I am writing in response to your recent change request on the sola Bristol LCNF Tier 2 project. I can confirm that Electricity North West is supportive of the need for this change. Based upon the information that you have provided us we are happy that the changes proposed will not impact on the outcomes of the sola Bristol project.

Yours sincerely

**On behalf of Steve Cox**
**Head of Engineering**

Scottish and Southern Energy
Power Distribution

Scottish and Southern Energy Power Distribution
Inveralmond House
200 Dunkeld Road
Perth, PH1 3AQ

Paul Jewell
Western Power Distribution
Avonbank
Feeder Rd
Bristol
BS2 0TB

6th March 2015

Dear Paul,

Regarding the application to Ofgem for a change to the number of domestic homes participating in the Sola Bristol Project, and the creation of two test installations, I have reviewed the evidence you set out in your letter dated March 4th, and the analysis from University of Bath.

I accept that the increase in trial period more than compensates for the reduction in the trial size, and as such the learning outcomes will not be adversely affected by this change. The creation of test installations to enable system updates to be tested before installation can also be expected to bring benefits to the project by de-risking the installation of updates.

Scottish and Southern Energy Power Distribution support this change request.

Kind Regards,

Stewart Reid
Future Networks and Innovation Manager

Dear Paul:

SPEN agree with the proposed modifications will not have adverse material impact on the project based on evidence and the recommendation provided.
Please kindly let me know if you require any further information.

James Yu PhD CEng MIET MITL
Future Networks Manager

SCOTTISHPOWER

Scottish Power Energy Networks
Ochil House, 10 Technology Avenue,
Hamilton International Technology Park,
Blantyre, G72 0HT
Scotland

Email: James.Yu@scottishpower.com

Roger, Mark

Northern Powergrid are comfortable with this change request.

We agree that the reduction in numbers will not have an adverse impact the learning and the use of units at the two universities and to replace damaged units will add additional value to the project and give potential cost savings.

regards

Andrew Spencer
**Regulation & Strategy**

NORTHERN POWERGRID

98 Aketon Road, Castleford, WF10 5DS

Good afternoon Roger / Mark,
Following the previous review of CR4 and the change proposed in CR5, UKPN support and agree with the proposed changes and recognise the potential benefits of the alternative locations proposed for the university sites. Similar to the previous change, we do no believe these changes will have adverse material impact on the Sola Bristol project based on the evidence provided.
Please do not hesitate to contact me should you require any further information or clarity.

Best regards,

Michael Clark
Programme Director
Low Carbon London
UK Power Networks
Newington House
237 Southwark Bridge Road
London, SE1 6NP.

## Appendix 3 marked up original Pro-Forma

(see separate attachment)