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Transmission and Distribution Ltd
Infrastructures and Cities Sector

STDL – Smart Grid – Energy Automation
So-La Bristol (Western Power Distribution)

SoLa BRISTOL – Domestic Property Visits 15.11 – 18.12

Revisions

Chapter / Pages changed	Version	Object and Reason of Change/ Reference to Change Requirements	Author
	V0.1	First Draft	Andrew Smyth

Contents

1 Introduction

This document captures the findings and outcomes from the recent site visits to property 04 and property 18.

2 15.11.13 – Property 04, 18 & Sub01

Date: 15.11.13
Property's Visited: P04 / P18 / Sub01
Attendees: Andrew Smyth (Siemens)
Steven Walmsley (PE Systems)
Surendra Kaushik (University of Bath)
Chris Wright (Moixa Technology)

2.1 Aims

- Visual inspection of the system, establishing the current state of communications / ensuring the batteries are in working condition
- Upgrade of the DC/DC firmware, this includes the high thermal cut-out recently included within the system
- Perform diagnostics of the e-mic
- Take a copy of the current Studer settings and upload the re-baselined parameter set
- Revise IP configs within the e-mic
- Update Moixa software
- Sign-off of 'Commissioned Software Revision' document

2.2 Notes

- Arrived at P18, circa 09:00
- Inspected SoLa consumer unit, error light shown on e-mic. Ran diagnostics which showed communications error to the Moixa over the Modbus network – CW advised that e-Mic and Moixa were polling and receiving data from BSP and Studer inverter.

```
SSE detailed diagnosis  SM-3499/MODMT0 Rev:02  ZBG #130

K     Communication error

 Error__rec 42 (2AH): Communication error to station nos. 0 - 15
 Error_bit 02:        Communication error to station no. 2
 Error_status 01 :    Acknowledgement error
```

- AS & CW updated the logic within the e-Mic and Moixa, the e-Mic update contained the work-around to allow both P04 & P18 to communicate with Sub02 even though they are on different distribution networks. Moixa added latest firmware which had been based on the final settings tested during the FAT.
- Studer parameters collected along with all data held within the unit for diagnosis.
- SW & SK focused on the loft equipment, see Visit Report – Sola BRISTOL Property Visit – 15.11.13 for full description of works, battery voltage noted and visual inspection of the battery showed no damage.
- Studer parameters logged for review, these were updated to remove any erroneous relay operation.

- Once all units powered-up the system was OK in terms of communications, with some data being seen at the Data Concentrator (DC) at Siemens.
- Due to time constraints the DC/DC firmware could not be updated – this is now to be completed during the LVD installation.

- Arrived at P04, circa 13:00
- Same process and outcomes found in terms of communications between the eMic and Moixa unit, code updated in both.
- Nothing untoward noted within the battery given the high voltage noted by SK / MD during previous visit, again see Visit Report – Sola BRISTOL Property Visit – 15.11.13 for further detail.
- Again the firmware could not be updated within the DC/DC due to time constraints; this will be completed upon the installation of the LVD.

- AS visited Sub01 to re-programme the P55 meters, this ensured the correct scaling of measurements from the installed CT's.
- Once complete correct values could be seen at the DC
- Also updated the code within the substation to allow 'un-authorised' P04 connection for data visualisation purposes. Due to time constraints it was not possible to diagnose if this was fully functioning during this visit – communications error was however noted

```
K    Communication error

 Error__rec 40 (28H): Communication general
 Error_bit 01:        Remote station with incorrect IP address tries to
connect
 Add_inform:           IP address byte 0:      +1
                       IP address byte 1:    +255
                       IP address byte 2:    +168
                       IP address byte 3:    +192
```

2.3 Actions

- Discuss Studer & system operation based on data obtained from both P04 / P18
- Update of the DC/DC firmware and installation of the LVD within P18
- Update of the DC/DC firmware and installation of the LVD within P04
- Diagnose Sub01 communications error

3 04.12.13 – Property 04

Date:	15.11.13
Property's Visited:	P04
Attendees:	Mark Dale (Western power Distribution) Andrew Smyth (Siemens) Steven Walmsley (PE Systems) Surendra Kaushik (University of Bath)

3.1 Aims

- To understand the outcomes of recent system operation given the system appeared to have discharged the battery leading to the disconnection of all lighting and load from the system – switching the lighting from DC to AC lighting
- Restore battery charge & installation of the LVD

3.2 Notes

- Arrived at P04, circa 09:00
- Measured the battery voltage, this was as advised of circa 5vDC. Reviewed the system and found the following –
    - All MCB's within the SoLa Consumer unit were open
    - PV grid feed / SoLa BRISTOL Grid Connection MCB (located within the existing consumer unit) was open
    - AC feed from existing consumer unit to the SoLa BRISTOL consumer unit was open
    - No power to BCTB, though FS22 / FS26 / SW2 / SW3 all appeared to be OK and were closed
- Connected battery charger to restore battery to acceptable level for Studer operation, charged as per Visit Report – Sola BRISTOL Property Visit – 04.12.13.
- During this time the LVD was installed - *The LVD device has been configured to open the DC load connection to the battery when the DC voltage has been below 21V (1.75 VPC) for above 90 seconds. The LVD device will then reconnect the DC loads to the battery once the DC voltage has reached 24V (2.00 VPC) or over. There is an LED on the LVD device which is ON when the connection is closed and the DC voltage is above the low threshold and is switched OFF when the connection is open and the DC voltage is below the high threshold.*
- Also the DC/DC converter firmware was upgraded to the latest version, it was noted that the calibration within the DC/DC unit had been corrupted. A similar failure had been noted during a deep battery discharge during testing at NaREC. The firmware upgrade is intended to remove this possibility.
- After a settling time of around 15 minutes, the battery voltage had stabilised to around 24V. The battery was reconnected to the DC/DC equipment and the PV was switched back on. The DC/DC converter powered up and attempted to provide current to the battery, but solar activity was very low as it was 16:00 hours. SK & AS then proceeded to activate all other aspects of the system. It was agreed that the Studer should provide a full charge to the battery to ensure that it was as charged as possible before being put back in to service.
- This grid charge was started from the RCC controller.
- AS then reconnected the communications between Moixa and Studer – this immediately stopped the grid charging showing the SoLa system had control of the Studer's operation. AS advised that due to the conditions of the algorithm no grid

charge would be possible at this time unless it was forced, therefore hoped this would return battery charge to a suitable level if left to run automatically.

- AS / MD / SK reviewed the information pulled from the x-com unit, this showed a loss of monitored mains from 21.11 to 25.11 with the system not importing or exporting from the 08.11 – the tenants noted that an iron fault tripped an MCB within the existing consumer unit on both the 08.11 and 21.11.

3.3 Actions

- Return to P04 @ 12.12.13 for further diagnosis of the system operation
- Further analysis of the x-com data required
- Understand how this AC fault could have affected the SoLa system

4 12.12.13 – Property 04 & BCC Meeting

Date:	12.12.13
Property's Visited:	Sub02 / P04 / KWMC
Attendees:	Mark Dale (Western power Distribution) Andrew Smyth (Siemens) Surendra Kaushik (University of Bath)

4.1 Aims

- Assess installation at Sub02, confirm progress
- Review P04 data & comm.'s network
- Hold project meeting at KWMC with BCC / KWMC / WPD / Siemens to review training and support

4.2 Notes

- Arrived at Sub02, installation looked OK with the unit ready for power-up.
- Headed to P04, found communications error on the Modbus network affecting all three nodes, DC/DC / Moixa / P50 – investigations showed a poor connection internal to the SoLa BRISTOL consumer unit

```
SSE detailed diagnosis  SM-3499/MODMT0 Rev:02  ZBG #130

K    Communication error

 Error__rec 42 (2AH): Communication error to station nos. 0 - 15
 Error_bit 01:        Communication error to station no. 1
 Error_status 01 :    Acknowledgement error
 Error__rec 42 (2AH): Communication error to station nos. 0 - 15
 Error_bit 02:        Communication error to station no. 2
 Error_status 01 :    Acknowledgement error
 Error__rec 42 (2AH): Communication error to station nos. 0 - 15
 Error_bit 03:        Communication error to station no. 3
 Error_status 01 :    Acknowledgement error
```

- Checked the battery, showed no grid import.
- Discussed findings between the team on site and also with remote Siemens support. These discussions eventually pointed to an issue with the e-Mic logic, specifically that which controls the grid request which is issued to Moixa.
- It appears that the workaround issued to integrate both properties on the single substation had an unidentified error; this was essentially placing the grid request (controlling both import and export) at 0. Due to time constraints no further work could be completed within the property, it was left with AC lighting & the control system powered.

- AS & MD attended the meeting at KWMC with BCC / KWMC / WPD / Siemens.
- Discussions mainly around support and issue resolution. AS confirmed that Siemens have no support contract, though all warranty issues would be handled as per WPD / Siemens agreement.
- Discussed around the switching of the system back to AC from DC operation, AS advised he would supply an Isolation Procedure for all on-call electricians to follow.
- BCC advised that 25 electricians are assigned to be on-call at any point; only 6 of these have direct experience with the SoLa BRISTOL system. AS confirmed that Siemens would facilitate a 'training' day at the Ecohome to run through the Isolation

procedure with the 25 tradesman, this will ensure that each would be comfortable with returning the system to AC in the event of a concern at any point.

- MD and AS also advised that WPD / Siemens had scheduled a return to NaREC to complete further testing on the domestic system, for familiarity and a deeper understanding of the system they requested the three lead BCC electricians would attend this two day session. The lead electricians would then need to feed this understanding to their colleagues.

4.3 Actions

- Retesting of the final eMic software required, remove temporary substation links and fully test.
- Provide Isolation Procedure to WPD / BCC
- BCC to confirm availability of electricians to attend Ecohome training day
- BCC to confirm the availability of the three lead electricians to attend NaREC testing

5 18.12.13 – Property 04 & 18

Date: 15.11.13
Property's Visited: P04 / P18
Attendees: Mark Dale (Western power Distribution)
Andrew Smyth (Siemens)
Surendra Kaushik (University of Bath)
Jen Rolfe (KWMC)

5.1 Aims

- To return P18 to AC for the festive period
- To compare system operation data from the previous visit to P04
- Issue the tablet, with the agreed beta System Interface, to both tenants in P04 & P18

5.2 Notes

- Arrived at P18 circa 08:30am
  AS advised BCC electricians to perform switch from DC lighting to AC, this was in-line with the agreed actions from the meeting held on 12.12.13 @ KWMC, see 12.12.13 – Property 04 & BCC Meeting
- AS / SK gathered the Studer x-com data collected since installation for review
- It was noted that the electricians do not switch the pendants, simply have procured Edison screw AC bulbs. This will undoubtedly save time whenever performing a switch from DC to AC, though it must be noted that the AC bulbs with the Edison screw fittings should be removed from the property upon return to DC. This screw fitting was chosen due to the relative lack of non-AC bayonet lighting, therefore reducing the risk of adding an AC unit into the DC system. In total this process appeared to take circa 1 hour
- Jen, KWMC, had brought both tablets for P04 & P18. AS proceeded to start linking to the SoLa BRISTOL system as shown within document, SoLa BRISTOL – Tablet Functionality Overview – noted that SoLa WiFi ariel had not been issued, MD picked up a unit from the commissioned Marwood Rd substation, this was fitted when available and allowed connection to the SoLa BRISTOL system. Web Interface working OK once commissioned
- Set-up the 3G connection next, this would not connect to the network at first, eventually removed the SIM, powered down, re-inserted, powered-up which did find the required network
- AS explained the requirement to send feedback e-mails, this involves switching between the WiFi and 3G networks due to the security procedures applied within the system
- Tenants OK with the overall operation and limitations of the Beta software. Visit completed circa 10:45

- AS / MD / SK then visited P04, arriving at 10:45.
- Upon arrival Lee advised of 'power-loss' to the system as no LED's were powered in the loft equipment or the SoLa DC distribution board.
- Investigations showed that the battery voltage had dropped below the minimum required set point of 21vDC set within the recently installed LVD. All expressed that as no 'real' load was on the system (AC lighting was being

used) the PV should have supported the system and held charge over 24vDC. This showed that the failsafe of the LVD was successful in protecting the battery from deep discharge.

- Noted that a water leak was present within the loft space, this had resulted in a damaged Studer RCC controller (no-longer operational) as well as the Studer inverter itself. Discussions advised that could not be sure what other equipment this may have affected, therefore change out of hardware will be required before return to DC operation.
- The system was left fully isolated; everything from the PV to grid connection was opened. No power will be returned to the system until the water ingress concern has been removed, a hardware switch out will follow.
- AS issued the tablet to the tenant, same issue with the 3G connection as P18 was noted. Issued without system connection, though 3G (surfing) is fully operational.

5.3 Actions

- JR requested that both she and Sue are the automatic recipients of any feedback e-mails, AS to advise DW to perform this code change.
- Detail process and requirements to bring P04 back on-line
- Confirm dates for the return of P18 to DC – suggest this is post NaREC testing & will include installation of the LVD

6 Reference Documents

6.1 Visit Report – Sola BRISTOL Property Visit – 15.11.13

Location: Bristol council properties 04 & 18

Date: 15th November 2013

Personnel

Siemens: Andrew Smyth

University of Bath: Surendra Kaushik

Moixa Energy: Chris Wright

PE Systems: Stephen Walmsley

Reason for visit

The aim of the visit was to review the system installation after instances of over voltage had been recorded via data supplied by Surendra Kaushik

Property 18 (32 Padstow Road, Bristol, BS4 1EN)

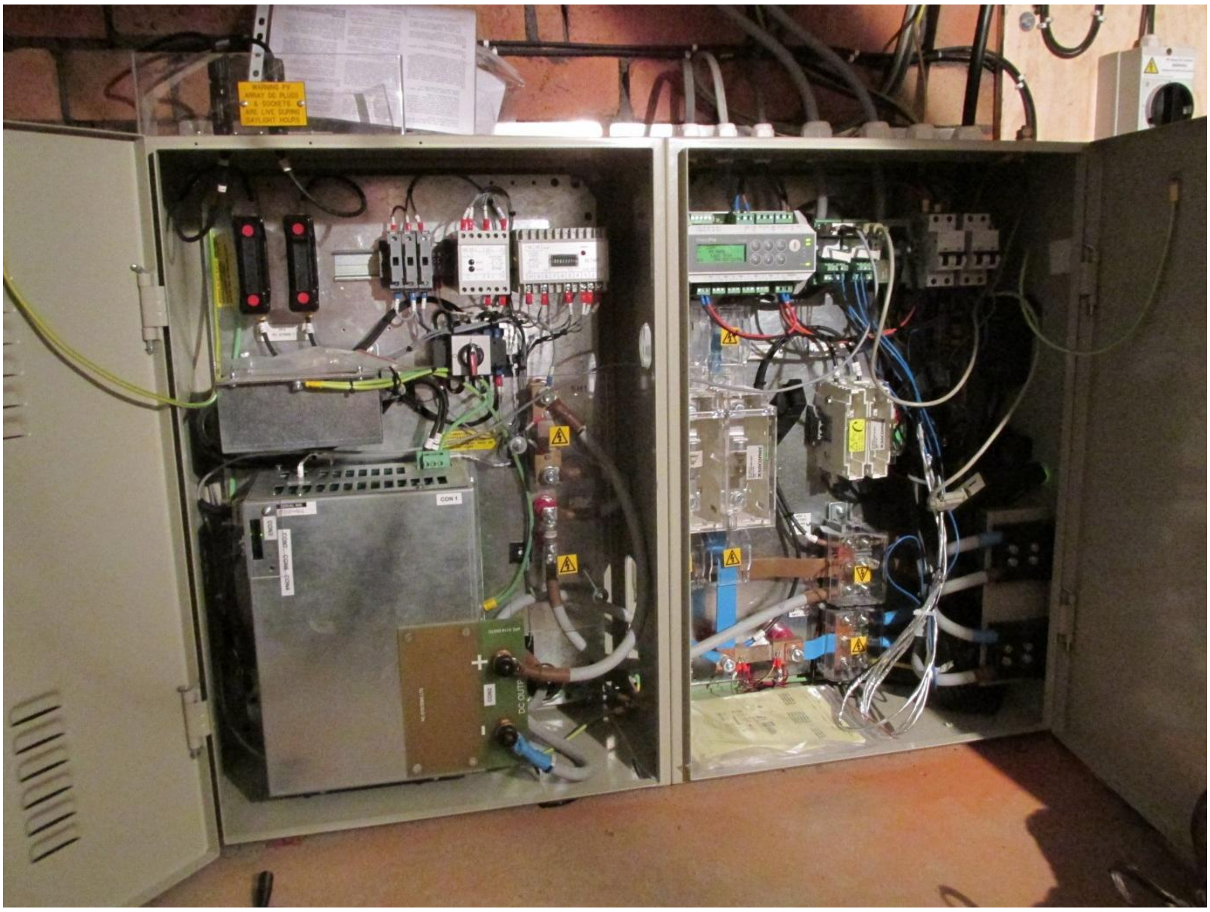
All parties met at the property and proceeded to review the installation. AS & CW were based in the hall area of the property downstairs. SK & SW proceeded to the loft area to investigate the PV DC equipment, batteries & Studer. Whilst SK interrogated the Studer equipment & checked the various parameters, SW checked the batteries & DC/DC converter. See Table A below for battery check results.

Table A – Battery check (Property 18 Padstow)	
Visual Inspection :- 4 x GNB Sonnenschein Solar Block No sign of excessive gassing/liquid marks around the vents BTS-01 mounted between middle blocks Ventilation around blocks good	
Ambient Temp	**14°C**
Total Battery (Voltage / VPC / Surface Temp)	**28.25V / 2.35VPC / 14°C**
Block #1 (Voltage / Surface Temp)	**14.18V / 14°C**
Block #2 (Voltage / Surface Temp)	**14.07V / 14°C**
Block #3 (Voltage / Surface Temp)	**14.11V / 14°C**

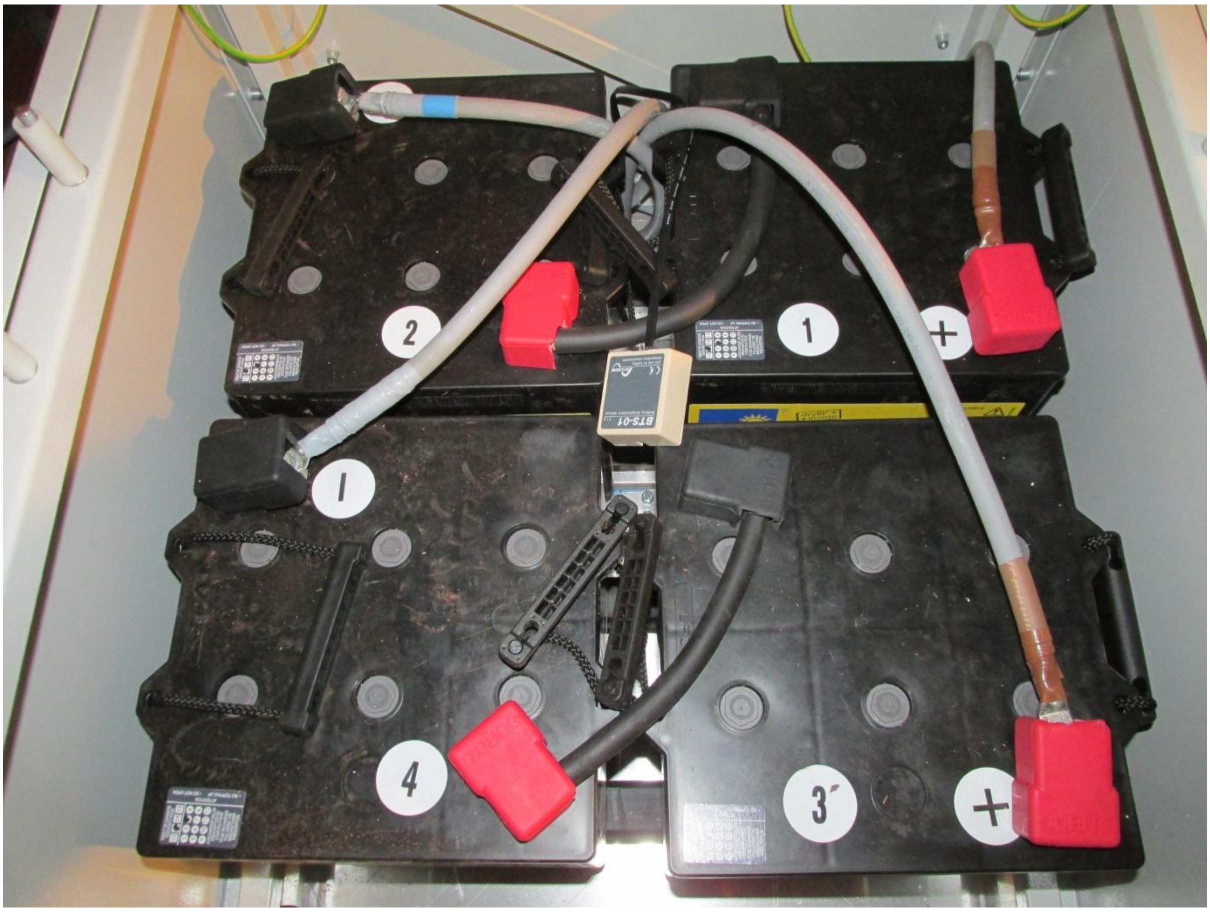
Block #4 (Voltage / Surface Temp)	**14.14V / 14°C**

SW opened the DC/DC converter boxes and noted that the DC/DC converter had a Green LED illuminated which showed that the battery was at or above float voltage, with no DC current being output from the DC/DC converter. The PV voltage was measured at 275V to 280V.

DC/DC Converter (Property 18 Padstow)



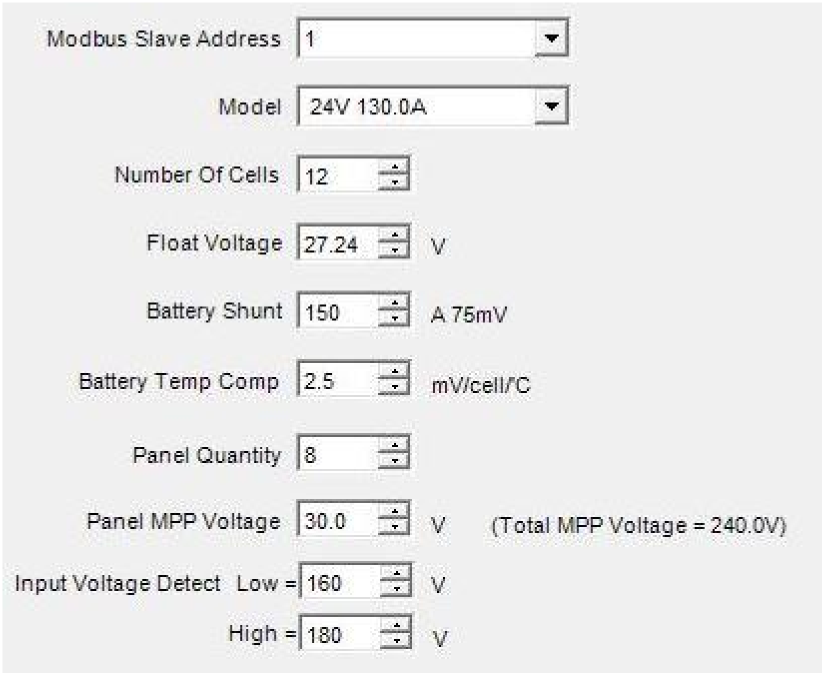
Battery (Property 18 Padstow)



The initial plan was to update the firmware in the DC/DC converter to the latest version which includes a high battery temperature alarm. Therefore SW checked if the PES battery temperature probe had been fitted to the battery & DC/DC converter. The PES battery temperature probe was not present so SW proceeded to fit a battery temperature probe which had been brought to site.

SW then proceeded to check the current configuration of the DC/DC converter.

DC/DC Configuration (Property 18 Padstow)



Firmware installed in DC/DC converter = SC2.05.0

Unit Serial No = 1320510964

DC/DC converter Serial No = 13202630584

The battery temperature compensation was active. However, due to time constraints, it was not possible to upgrade the firmware version to the latest version (SC2.07.0) and this work was left as outstanding and is to be done when the LVD hardware is fitted.

SK investigated the configuration of the Studer and will include his findings in a report which PES would like a copy of when available.

<u>Property 04 (48 Broadbury Road, Bristol, BS4 1JT)</u>

Once work had been completed at Property 18, all parties met at Property 04 and proceeded to review the installation there.

Whilst SK interrogated the Studer equipment & checked the various parameters, SW checked the batteries & DC/DC converter. See Table B below for battery check results.

Table B – Battery check (Property 04 Broadbury)	
Visual Inspection :- 4 x FIAMM Block No sign of excessive gassing/liquid marks around the vents BTS-01 mounted between middle blocks Ventilation around blocks good	
Ambient Temp	**15°C**
Total Battery (Voltage / VPC / Surface Temp)	**25.25V / 2.10VPC / 15°C**
Block #1 (Voltage / Surface Temp)	**12.61V / 14°C**
Block #2 (Voltage / Surface Temp)	**12.65V / 15°C**
Block #3 (Voltage / Surface Temp)	**12.62V / 15°C**
Block #4 (Voltage / Surface Temp)	**12.62V / 14°C**

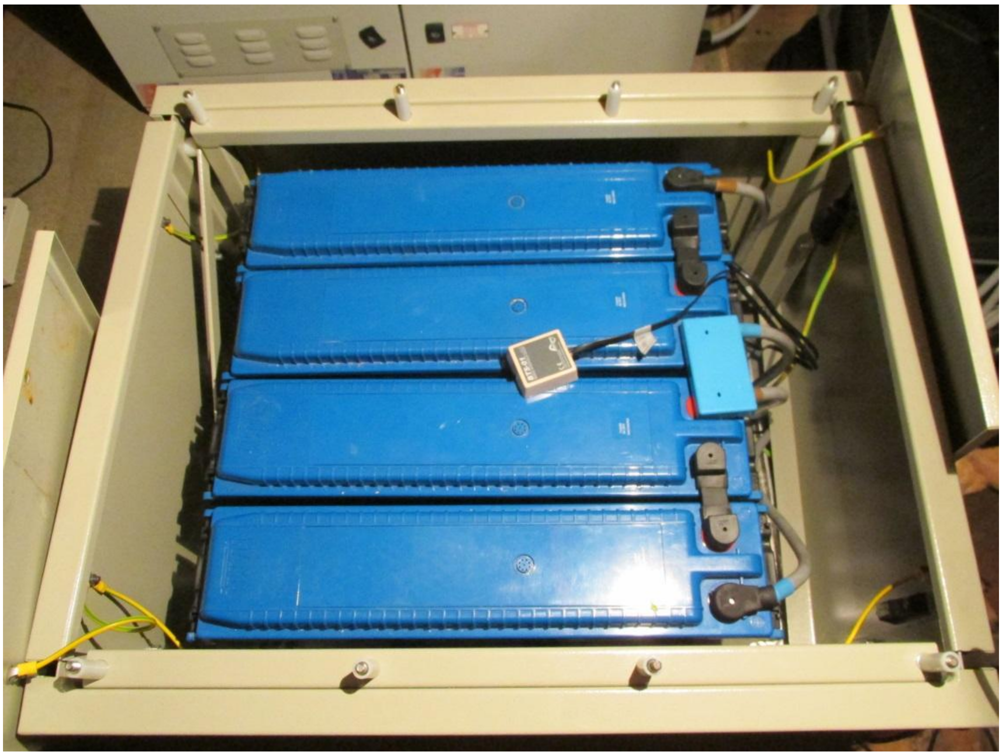
SW opened the DC/DC converter boxes and noted that the DC/DC converter had a Yellow LED illuminated which showed that the battery was below float voltage. However, no DC current was being output from the DC/DC converter as the PV voltage was measured at only 165Vdc. The LED on the DC/DC converter power module was occasionally going off indicating that the PV voltage was dropping below 150Vdc which is the lowest working voltage for the DC/DC module.

When SW subsequently interrogated the configuration of the DC/DC converter it was noted that the configuration was set to 6 panels, as this is the number of panels installed at the property. This gave a MPP control voltage of 180V (6 x 30V) which is close to the PV input voltage low threshold of 160Vdc.

It was also noted that the battery case had been installed directly in front of the DC/DC converter (as opposed to Property 18 where it was at the side) due to space restrictions and subsequently the doors to the 2 boxes could only be opened to approximately 45°. Whilst this was not an immediate problem for the work which was to be carried out it may become an issue in subsequent visits if full access is required to the DC/DC converter for maintenance or repair work, which would probably necessitate removal of the doors, if access to the hinges was available.

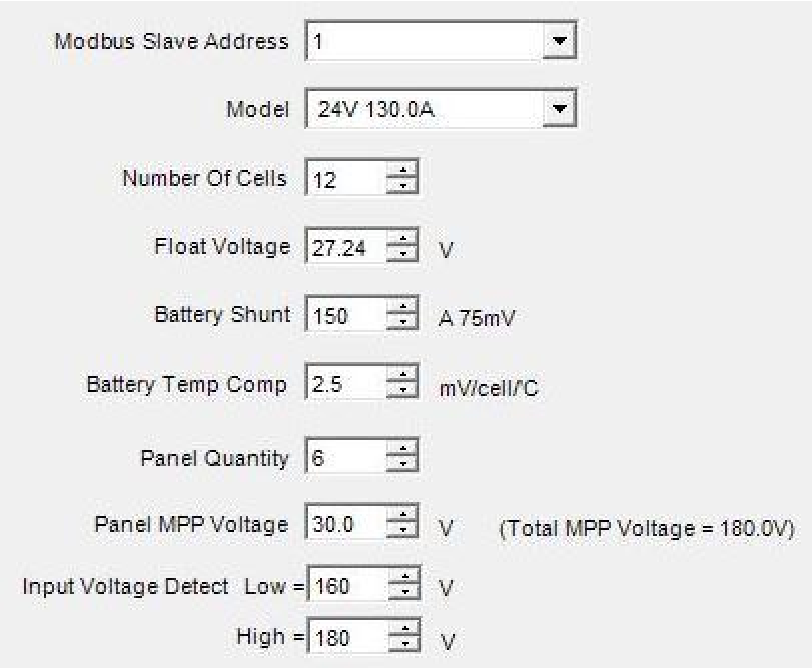
DC/DC Converter (Property 04 Broadbury)

Battery (Property 04 Broadbury)



SW checked if the battery temperature probe had been fitted to the battery & DC/DC converter. The temperature probe was not present so SW proceeded to fit a battery temperature probe which had been brought to site. SW then proceeded to check the current configuration of the DC/DC converter.

DC/DC Configuration (Property 04 Broadbury)



Firmware installed in DC/DC converter = SC2.05.0

Unit Serial No = 1238263036

DC/DC converter Serial No = 1322510921

The battery temperature compensation was active. However, due to time constraints, it was not possible to upgrade the firmware version to the latest version (SC2.07.0) and this work was left as outstanding and is to be done when the LVD hardware is fitted.

SK investigated the configuration of the Studer and will include his findings in a report which PES would like a copy of when available.

Actions

1. DC/DC converter firmware to be updated to SC2.07.0 on subsequent visit when LVD hardware configuration has been confirmed
2. SK (U of B) to provide report on Studer configuration at both properties and any parameters which required changing and what the old & new values were (i.e. what were the EQLS & ABS levels within the Studer and had they played any part in the over voltage events?)

6.2 Visit Report – Sola BRISTOL Property Visit – 04.12.13

Location: Bristol council property 04 (48 Broadbury Road)

Date: 4th December 2013

Personnel

Siemens: Andrew Smyth

University of Bath: Surendra Kaushik

WPD: Mark Dale

PE Systems: Stephen Walmsley

Reason for visit

The aim of the visit was to reinstate the system after a battery discharge event during 29th November 2013. The work scheduled included recharging the battery, installing the Studer Battery Guard (LVD) device and upgrading the DC/DC converter firmware to the latest version.

Battery Charging

On arrival at the property SW & MD situated the single phase 24V40A PES charger, which SW had provided, on the 1st floor landing of the property.

SW & AS then built DC cables to connect the charger to the battery which was in the loft space. Both battery strings were wired in parallel (as is the case during normal operation) and the charger was switched on – initially in Float mode (27.3V / 10A). The charger was switched to Boost mode (31.2V / 15A) after 1 hour.

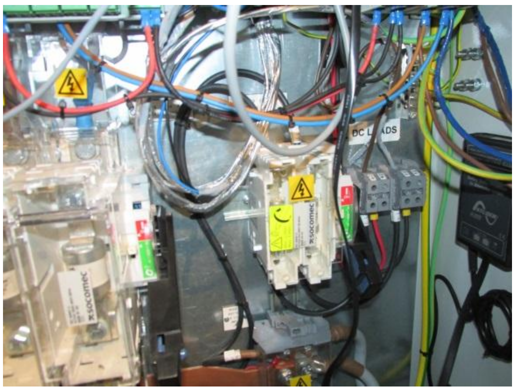
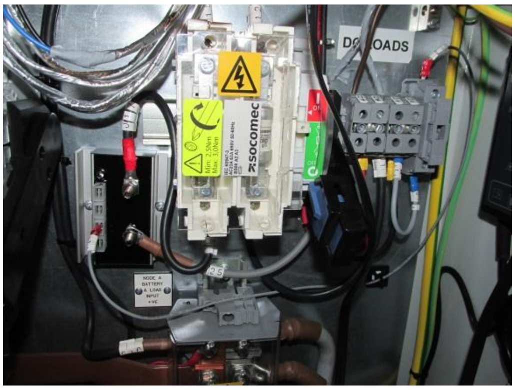
Table A shows the progression of battery voltage as recorded during the battery recharge period

NB) Block 1 is the block nearest to the DC/DC converter box).

Table A – Battery voltage (Property 04 Broadbury)						
Time	Block 1	Block 2	Block 3	Block 4	Total V	Charge Current
10:15	4.66V	4.00V	5.34V	3.32V	8.66V	-
11:30	13.61V	13.32V	13.27V	13.66V	26.93V	10A
12:20	13.49V	13.32V	13.30V	13.51V	26.81V	15A
13:36	12.78V	12.63V	12.59V	12.82V	25.41V	15A
14:23	12.75V	12.61V	12.57V	12.79V	25.36V	15A
15:20	11.94V	11.93V	11.93V	11.94V	23.87V	-

<u>Studer Battery Guard (LVD) Device Installation</u>

SW removed the door from Box 1 of the DC/DC equipment to allow better access to the wiring as the battery case was blocking full access. SW then fitted the Studer Battery Guard MBW40 (LVD) equipment to Box 2 (see pictures).

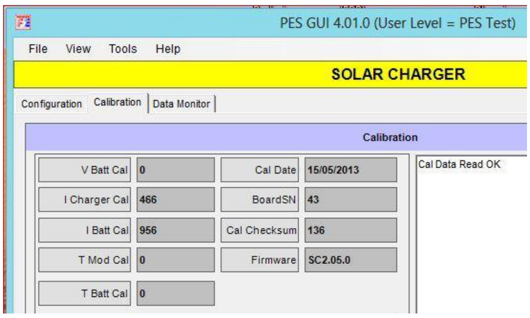
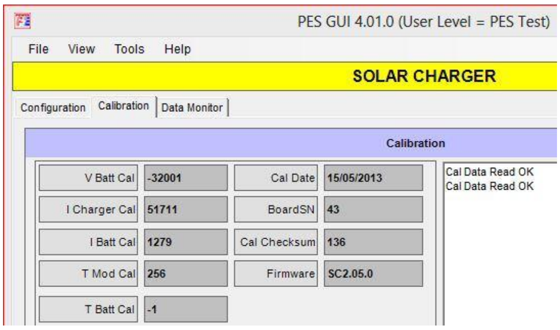
Before LVD fitted	After LVD fitted
	

The LVD device has been configured to open the DC load connection to the battery when the DC voltage has been below 21V (1.75 VPC) for above 90 seconds. The LVD device will then reconnect the DC loads to the battery once the DC voltage has reached 24V (2.00 VPC) or over. There is an LED on the LVD device which is ON when the connection is closed and the DC voltage is above the low threshold and is switched OFF when the connection is open and the DC voltage is below the high threshold.

A pdf copy of the latest circuit diagram will be included with this visit report.

<u>PES DC/DC Converter Firmware Upgrade</u>

SW gained access to the programming port of the DC/DC converter by removing the filter & top face plate. When power was applied to the DC/DC converter through the programming unit, without upgrading the firmware, it was noted that the red LED was on permanently indicating a calibration or configuration error had occurred. Using the PES GUI it was possible to retrieve the calibration data from the DC/DC converter.

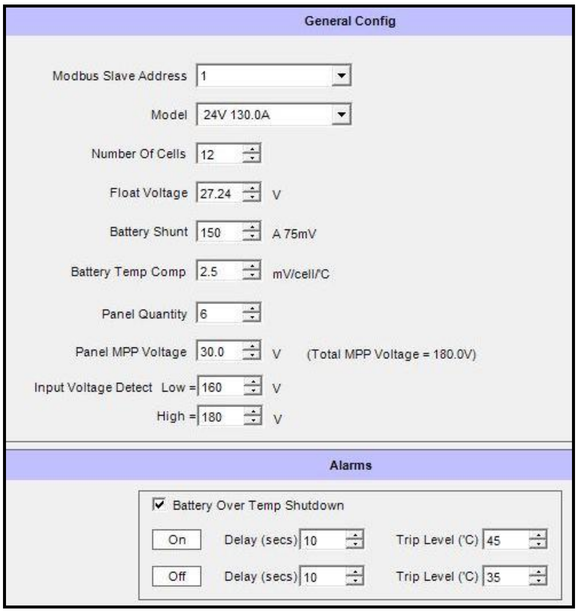
Calibration data on 15th Nov 2013	Calibration data on 4th Dec 2013
	

It could be seen that the calibration data had been corrupted. This behaviour had been witnessed previously when equipment had been on test at NaREC and the battery had been heavily discharged to a level below 5Vdc.

The area of memory which is corrupted is accessible via the Modbus comms bus and could be potentially overwritten by comms traffic accessing the correct address locations. The corrupt data is then loaded into running memory once the micro in the DC/DC converter is powered off then back on. This sequence would only occur when the battery voltage dropped below 5Vdc and was subsequently restored.

Therefore, whilst the DC/DC converter would not have been converting any PV power since November 29th, when the battery discharge event occurred, this would have been a symptom of the battery discharge and not a cause.

The new firmware (SC2.07.0) has had routines added which will prevent any unsolicited access to the calibration data. A “double key” method has been implemented which the Modbus user must utilise to open access to the calibration data. Therefore, once the new firmware had been loaded into the DC/DC converter this issue will be removed.



SW reported these findings to the other members of the team and then continued to load the new firmware (SC2/.07.0) into the DC/DC converter and perform the relevant calibration & configuration procedures.

The new firmware also includes a "high battery temperature" alarm which was activated. The configuration of the DC/DC converter is shown in the picture opposite, with default settings for the "high battery temperature" alarm,

System Restore

The charger was disconnected from the battery and the voltage was monitored for 15 minutes to ensure that it would settle to a viable level. The charger had been on for approximately 4 hours and had returned around 55Ah to the battery.

After 15 minutes, the battery voltage had stabilised to around 24V. The battery was reconnected to the DC/DC equipment and the PV was switched back on. The DC/DC converter powered up and attempted to provide current to the battery, but solar activity was very low as it was 16:00 hours. SK & AS then proceeded to activate all other aspects of the system. It was agreed that the Studer should provide a full charge to the battery to ensure that it was as charged as possible before being put back in to service

Actions

1. SK (U of B) will provide a summary diagram showing the flow of current & charge through the system (sketch shown to SW during visit)
2. An explanation for the initial battery discharge event is required. If the Studer device has responsibility for ensuring that the battery is charged why did the Studer not switch to charging the battery from the grid once it had detected that the battery voltage had fallen to a very low level (i.e. less than 1.9VPC / 22.8V)?
3. SW will provide an updated copy of the circuit diagram to report recipients which includes the LVD device as fitted within the property
4. AS will review the topology document, which has been previously issued, to determine if all data is correct, as the number of panels for Property 04 is currently listed as 8 whereas actual installed configuration is 6 panels
5. A further visit will be required at a later date to complete the LVD & firmware upgrade modifications on the 2nd property (32 Padstow Road / Property 18)

6.3 Isolation Procedure

Transmission and Distribution Ltd
Infrastructures and Cities Sector

STDL – Smart Grid – Energy Automation
So-La Bristol (WPD)

SoLa BRISTOL – System Isolation Procedure

Key Points of Contact

Knowle West Media Center

Representative Name:
Contact Number:
E-Mail Address:

Bristol City Council

Representative Name:
Contact Number:
E-Mail Address:

Western Power Distribution

Representative Name:
Contact Number:
E-Mail Address:

Introduction & Aims

This document captures the required steps which the appointed electrician should follow to ensure the SoLa BRISTOL system is left in a safe state when switching the lighting from DC (Direct Current) to AC (Alternating Current).

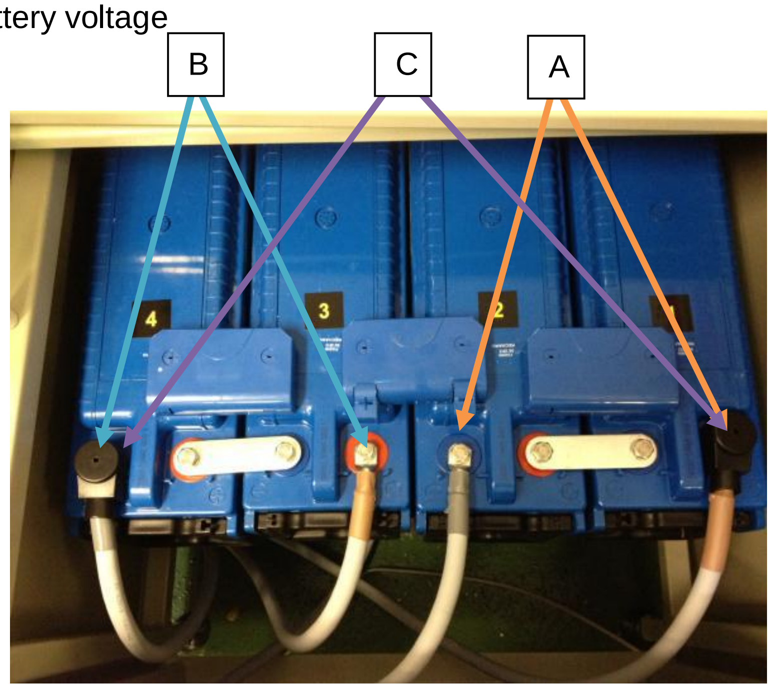
This procedure would be followed in the case of battery discharge within the properties, which would result in a loss of lighting for the end user.

All findings should be documented and reported to the applicable Key Contact to ensure all parties are aware of any concerns.

Initial Checks

Upon entry to the property the competent person should seek clarity from the tenant as to the current issues, this data should include (though is not limited too) the following:

- Description of fault & impacts
- Time of occurrence
- Manual interventions which could have caused fault
- Current status of all SoLa BRISTOL MCB's, this is within the existing distribution board, the SoLa BRISTOL distribution board and also the BCTB located within the loft space
- Check operation of the DC lighting and USB power supplies
- A) Battery string voltage, between cells one and two
- B) Battery string voltage, between cells three and four
- C) Total battery voltage



Isolation Procedure

Key Point

As the systems have a Low Volts Disconnect (LVD) installed within the system, it is possible that the battery voltage has slipped beneath the 21vDC threshold. At this point the system will cut off DC load until such a time when the battery voltage has risen above 24vDC – charge from the solar PV array will be needed to provide this charge.
Therefore, if the battery voltage is below 21vDC and the blue LED located on the LVD is not illuminated, the system has temporally shut off load (lighting / USB's etc) to allow charge to be returned to the battery.

During this time all equipment is still to be considered 'live', therefore all applicable safety precautions must be taken.

If this is the case then please inform the appropriate key contact whom will advise how to proceed.

On the basis that the LVD's operational limits have not impacted the system functionality, the competent person should complete the following steps-

- Locate the SoLa BRISTOL distribution board, open the following
  - MCB 2 (Lighting)
  -
  - MCB 3 (Lighting)
  -
  - MCB 4 (USB Sockets)

- Once the above MCB's are opened, disconnecting their feeds from the DC supply, it will be necessary to complete the appropriate works to return only the lighting circuits to AC supply. This will also include any other remedial works required, i.e. changing light fittings and bulbs etc which are suitable for AC operation.

6.4 SoLa BRISTOL – Tablet Functionality Overview

Author: Andrew Smyth
Reference: Tablet Functionality Overview
Date 16.12.13

SoLa BRISTOL – Tablet Functionality Overview

Aims & Functionality

- To create an instantaneous and 24hour data dashboard for interaction with the tenant / end user
- Also to demonstrate the typical cost savings since implementation of the SoLa BRISTOL system within a specific property
- To capture survey data, listing specific topic areas for engagement surrounding energy use and local community issues
- Including local, current, weather conditions to align expectations for potential solar PV generation

Required Information

- Confirmation of the final generation savings price
- Identification of when the savings will be provided to the end user, i.e. will this be a quarterly reading and payment
- E-Mail feedback recipient information required – the nominated individual will receive the direct feedback from the homes when sent.

Current Operational Limitations & Recommendations

- The web interface depends upon a regex processing script which processes multiple files and converts the output from the SCADA system into a JSON format for graphing purposes within the interface. This requirement was an unknown since the request for the interface creation had been established; therefore Dane Watkins has created a php file which completes the above.
    - This has only been tested on a single system, therefore potential risks exist within this php file which will not ruled out until the full quota of homes, schools and office are operation / commissioned.
- 24hour data – the quality of information being passed from both commissioned homes is inconsistent. Therefore the 24hour feeds will not be operational until further testing scheduled for early 2014.
    - Siemens to retest this functionality during further testing at NaREC scheduled for 07-18.01.14. This will ensure that multiple systems can communicate with the sufficient data quality required for correct operation. If any issues are found then support will be requested from Dane.
- Data captured by the local surveys within the properties cannot be automatically forwarded to KWMC's data store. This is due to the Data Concentrator (PC) cannot

forward DNS requests from the tablet to the internet. In addition KWMC's data store is not configured with a static IP address, therefore is subject to change.
    - To remove this concern Siemens would recommend the data store be migrated to a static IP address, this would address both concerns.
- Instantaneous values – the quality of information being passed from both commissioned homes is inconsistent. Therefore the instantaneous feeds will not be operational until further testing scheduled for early 2014.
    - Siemens to retest this functionality during further testing at NaREC scheduled for 07-18.01.14. This will ensure that multiple systems can communicate with the sufficient data quality required for correct operation. If any issues are found then support will be requested from Dane.
- Feedback e-mail's regarding the interface and system, are limited currently, this is restricted due to the security arrangement regarding the internal and external networks employed within the SoLa BRISTOL system. Therefore users must complete an e-mail within the client on the tablet, which is opened from the button on the interface. Once complete the user must switch off WiFi and open-up the local e-mail client, this will close the loop and send the email to the recipient.
    - Note, the recipient must be identified to Dane.
    - Improvements could include a direct e-mail from the interface. This would require extra effort to establish an e-mail server within the data concentrator.
- All homes can potentially gain access to each different system to visualise the data if the UUID is known and correctly imputed into the web page. This UUID is based upon the last six digits of the SIM number assigned to each router.
    - It is possible to change the UUID assignment if deemed necessary.

End User Set-Up

- Install the provided SIM, if not installed
- Power-on, follow Android set-up instructions. This will involve the set-up of a 'g-Mail' account – make note of the user name and password.
- Settings, WiFi 'ON', find applicable 'WHxxx' network and log-on using provided password.
- Find icon 'internet', type '192.168.1.3/?uuid=xxxxxx', save as bookmark

6.5 P04/P18 Studer Parameter Comparison

See spreadsheet provided.