Project Partners

Bristol City Council
Deploying technology at their sites, engaging with schools and offices

Knowle West Media Centre
Leading the domestic properties engagement

Siemens
Designing and providing technology for the project

University of Bath
Academic partner, Knowledge dissemination, tariffs and design
SoLa Bristol

Three Methods:

• Batteries.
• DC Network.
• Tariffs.

Three Outcomes:

• Permitted PV Connections.
• Improved voltage profiles through controlling the batteries.
• Consequent reduction in peak demand (postponing network re-enforcement).
Domestic arrangement

- 26 Domestic Local Authority homes with Battery storage linked to PV Panels. 24v DC lighting throughout.
- PV Panels on roof can charge the battery using excess PV generated electricity.
- Battery runs the 24v DC lighting in the home
- Battery can export if required at high demand periods to support the electricity network.
SoLa Data Paths & Loads

- GPRS connected Installations
- Bath Data Repository
- Sub- Stations: 11
- Domestics: 26
- Schools: 5
- Commercials: 1
- DC Load types
  - LED lighting
  - Laptop/Desktop

Energy Storage UK Summit
Smart Tariffs Design (Battery Storage)

- Half hourly domestic tariff to reflect the cost of electricity generation over a 24hr period will enable certain customers to maximise the benefits of energy storage
- Although Customer profiles do not necessarily follow this profile,
Three Types of Domestic Homes

- Normal
- Hi-Load
- Eco-7
State of Charge for Three Types of Domestic Homes
Battery Capacity Management

The Charging / Discharging of the battery is determined by:

- The cost of the electricity (Tariff at the time)
- The State of charge
- The battery voltage
- Capacity at either end can be DNO controlled for Network support if required

This charging envelope can be tuned to a customer's individual profile to maximise the efficiency.
Charging Envelopes to Optimise the Storage for Customers and DNOs

The SoLa Bristol - LV Connection manager (in home intelligence) optimises the use of the batteries for both the customer and the DNO through the use of battery charging envelopes.

What are Charging Envelopes?

Battery charging envelopes comprise of both the minimum and maximum state of charge available to the LV Connection manager, reflecting the degree of network constraints.

Key Characteristics

- initial state of charge,
- charging/discharging rates,
- charging/discharging start time,
- Duration,
- Slopes.
Impact to Demand from Forced Battery Charging and Discharging

- **Impact to house demand**

  Batteries were forced to charge between 2.30pm – 4.30pm & 6.15pm – 7pm
  - Forced discharge was between 5pm – 6.15pm
  - This can be seen in the house demand profile quite clearly
  - Impact on the network is not so clearly defined, due to the sample size (4.3% of customers had batteries) and the varied nature of the overall substation demand profile
  - In order to see a significant impact on network demand, it is estimated that you would need 60% - 70% of customers on a substation to have this solution.

- **Impact to network demand**

  [Graph showing forced charge impact on network demand]
Load Profiles Over time

High Load

Normal Homes

Economy 7

High uncertainty in domestic customers’ load.
Network Investment Deferral

- For the test system (lightly utilized), 4.3% of domestic EMS installation could defer network investment by one year.

- For the same test system, if the penetration of EMS is increased to 30% and 50%, network investment can be deferred by 4 years and 6.5 years respectively.

<table>
<thead>
<tr>
<th></th>
<th>Current penetration (4.3%)</th>
<th>30% penetration</th>
<th>50% penetration</th>
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<tbody>
<tr>
<td>Transformer</td>
<td>£82</td>
<td>£502</td>
<td>£800</td>
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<tr>
<td>Feeder 1</td>
<td>£18.4</td>
<td>£559.4</td>
<td>£903</td>
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<tr>
<td>Feeder 2</td>
<td>£182</td>
<td>£816</td>
<td>£1335</td>
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<tr>
<td>Total</td>
<td>£282.4</td>
<td>£1877.4</td>
<td>£3038</td>
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**Future work:** extrapolate network benefits for differing network conditions, customer mixes, battery management strategies.
Suzanne Wilson
City Innovation Manager
Bristol City Council

Engaging with local residents
Engaging with local residents

- Chose an area with most to gain from a SoLa installation – Knowle West
- One of Bristol’s most deprived wards
- All 26 participants were social housing residents
- Many have pre-paid meters – paying a premium for their electricity
- Chose a local organisation – Knowle West Media Centre – with a very close connection to their local community.
- KWMC – trusted presence. Led on resident liaison
- Council worked closely with KWMC to install SoLa, resolve customer issues and decommission
Communication approach

- Important for participants to understand the objective of the project and how they fitted in
- Worked hard to demystify the jargon and explain the project and its technology
- KWMC used their creative / design experience for a very visual approach
- Named contacts within KWMC for queries / issues
- Built rapport with participants – frequent contact
- Communication approach designed to maintain participants’ engagement through a long and involved innovation project
Ongoing engagement

• SoLa involved frequent visits to residents
• 1-2-1 personal visits needed to check understanding

so they can tailor the support packages to those individuals, when they are using the technology.
Co-design

• Focus group decided name of project
• Residents were involved in project design
• Helped design the tablet interface so they could better understand their energy use – key to changing energy behaviour
• Built a sense of belonging to a group and the project with visits to the Eco-home