Early feedback from an ambitious thermal storage trial
• Founded in 2005 in Edinburgh
• UK R&D and manufacturing
• 23 people directly employed, growing fast
• In serial production, 1 MWh of cells, 250 products per month
• First large deployment project in >700 homes in social housing
• Commercial sales started – mix of Direct, Installer & Distributor
• Strong OEM interest
• Recently raised £3.2M for sales & manufacturing expansion
• Seeing global demand – USA, China, Korea, Pakistan, Australia, South Africa, Chile, …
Introducing Sunamp Heat Batteries

Sunamp Heat Batteries are probably the world's most energy efficient Thermal Stores

And they're certainly the most compact, packing in three to four times more Energy Density than hot water.

High power (>30 kW per cell) means high flow rate hot water and heating on demand is assured.

Very reliable and safe. Non toxic, non flammable, >14000 cycles proven, 10 year warranty.
• Innovation-led R&D trial to reduce fuel poverty
• Use of advanced Heat Battery thermal storage in multiple configurations to impact over 1000 tenants in over 650 homes across two housing associations
  • East Lothian Housing Association: Urban & Rural
  • Castle Rock Edinvar: East Lothian, Edinburgh, Midlothian, West Lothian, Falkirk, Stirling, Clackmannanshire
• Target: Reduce heating/hot water bills by at least 20%
• Funded by public and private money:
  • Sunamp-led Heat Battery project funded by Scottish Government via Local Energy Scotland (80%) plus partner contributions from ELHA, CRE and Sunamp (20%)
  • Edison Energy-led PV install programme funded by a chinese investor using the Feed-in Tariff
Multiple types of housing

- Social rented accommodation
- Individual homes and assisted living/sheltered housing
- Detached, semi-detached and terraced houses
- 4-in-a-block & 6-in-a-block housing
- Larger blocks with 20 – 45 apartments
- Insulated to Scottish Quality Housing Standard (SQHS)
- Needing upgrade to new Energy Efficiency Standard for Social Housing (EESSH) – mandatory by 2020
  - Fabric improvements often exhausted already
  - Ready for energy system innovation
EastHeat footprint & key stats

Over 1000 tenants positively impacted
766 Heat Battery Products installed in over 650 homes
4.4 MWh total storage in 2028 Heat Battery 'Red Cells'
Peak employment of over 50 people in R&D, manufacturing and installation
EastHeat: PV + Storage at the core

**Funded PV on the Roof**
- 850 PV rooftops installed (ELHA & CRE)
- £5.6M invested by a Chinese investor
- Delivered by Edison Energy with R3
- Rural, Semi-Rural and Urban Settings
- Average system size: 2.9 kWp
- Tenant electricity savings of over £160 a year

**Heat Batteries inside the Home**
- 766 installations of Sunamp Heat Battery thermal stores in homes
- 426 homes with enhanced self-consumption: PV charges Sunamp PV Heat Battery
- £3.2M from Local Energy Challenge Fund as a large R&D Trial + £800K from partners
- Delivered by Sunamp with Edison Energy, Castle Rock Edinvar, ELHA & R3
- Extra £90 – £300 per year saving on gas / electric hot water bill forecast
- Saving on hot water costs to be monitored in this project
SunampPV energy storage

- Majority of homes in trial (>400) had gas Combi boilers
- New energy storage product needed to absorb excess PV production and reduce gas consumption in the combi boiler
- Developed SunampPV during 12 month EastHeat project, V1 and then V2
- V2 designed for enhanced installability
- Went from zero to 80 units per week manufacturing rate

Excess electrical production diverted and stored as heat

SunampPV

Most hot water is delivered without the combi-boiler firing, using solar energy previously stored in SunampPV.

Up to 75% of annual hot water FREE

Image Credit Nicole Koehler
Amazing 12 months progress
Typical Installation

Original kitchen

Step 1 – remove cupboard and move dishwasher

Step 2 – move carcass to end unit and fit SunampPV

Finished kitchen with SunampPV neatly tucked away and working with the PV panels and gas combi

Key Learnings:
• Plumbing SunampPV is quick and easy
• V2 was re-designed to disassemble and reassemble for ease of install, but this is rarely needed
• Electrical works and joinery often the dominant tasks
• No two installs are identical
• We were right to choose GSM data comms for monitoring as can’t rely on WiFi or Broadband being there
• GSM fails in some places – can’t have perfect data comms

Householder Comments:
• Installation was smooth and very neatly done.
• The lads were very helpful.
• Job started after lunch and finished by the time I came home.
**Flexible solutions**

Phase 1 learning: No one single solution fits all buildings. Using a “pick one from each of column A, B, C” approach to maximise benefits delivered.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
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<tbody>
<tr>
<td>mCHP</td>
<td>Heat Pump</td>
<td>SunampPV</td>
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<td>PV</td>
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<td>SunampStack</td>
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<tr>
<td><em>OurPower</em></td>
<td>Resistance Heat</td>
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<tr>
<td>Off-Peak Tariff</td>
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</table>
Newcarron Court, Falkirk
28 Assisted Living Apartments
Night Storage Heaters
Three floors, three solutions

Allowing comparison between traditional district heating and innovative Heat Battery solutions

<table>
<thead>
<tr>
<th>Floor</th>
<th>Gas In</th>
<th>Plant Room</th>
<th>District Heating</th>
<th>Apartments</th>
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<td>EC Power 6kW</td>
<td>Daikin 11kW</td>
<td>SunampStack 120 kWh</td>
<td>Danfoss Flatstation</td>
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<td>F1</td>
<td>Intergas Boiler</td>
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<td>GF</td>
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<td></td>
<td>1000 Litre Buffer Tank 20 kWh</td>
<td>Danfoss Flatstation</td>
<td>x9</td>
</tr>
</tbody>
</table>
Comparison

0 local storage

100 litres of hot water from local storage
Three locations, four problems

Two Sheltered Housing complexes (~60 apartments) + ~50 individual apartments in general occupancy

Electric Flow Boiler heating:
• Too costly
• Uncomfortable (14 to 24°C temperature swings)

Hot water via Plumb-pack cylinder:
• Poor pressure – low flow rate hot water
• High heat loss – extra cost of >£100/year
Three locations, one solution

Two Sheltered Housing complexes (~60 apartments) + ~50 individual apartments in general occupancy

Electricity In  Heat Source & Storage in Cupboard  Conventional Heating

Off-Peak, Economy 10 Electricity
Conclusion

- Developing a new product, getting regulatory approval, scaling to full production, installing in over 650 homes – all in under 12 months! What a team!

- Team working across 'client', 'supplier', 'installers' worked for us

- New systems working well – few equipment issues, dealt with quickly – no heat storage failures

- Heat, gas and electricity savings being monitored – too early to see if impact is >20% across the board and some teething issues to be dealt with

- 3 years of monitoring and support ahead

- Business modelling under way to replicate with other Housing Associations & local authorities. Maybe yours?