Installing PV from design to delivery – EastHEAT case study

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APSE ENERGY

Wednesday 20th April 2016

Ensuring you get it right – an installers' perspective & Case Studies

John Conway – Edison Energy Limited
Joan Pisanek – Sunamp Limited

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INTRODUCTION

Background to Edison Energy

Designing & Delivering Solar PV

Background to Sunamp Heat Batteries

EastHEAT Project

Our Capability

Renewables

Solar PV
Solar Thermal
Air Source Heat Pumps
Sunamp Heat Storage

Energy Efficiency

Solid Wall Insulation
Loft Insulation
Cavity Wall Insulation

Ventilation

Maintenance

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Our Projects

- Clackmannanshire Council – 100 Solar PV
- Knowes Housing Association – 350 Solar PV
- Social Housing New Build – 300 Solar PV
- Commonwealth Games Athletes Village – 250 Solar PV
- Berwickshire Housing Association – 650 Solar PV
- Grampian Housing Association – 450 Solar PV
- Gateshead Council – Leisure Centres / Schools
- Various Commercial Buildings.
- East Lothian Housing Association – 350 Solar PV
- Castle Rock Edinvar HA – 550 Solar PV

In total over 3000 installations.

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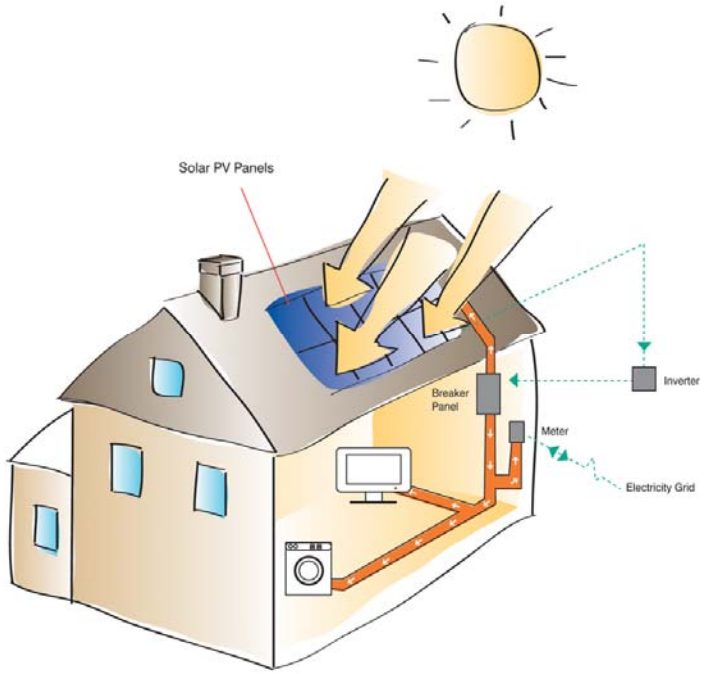
The Basics

Solar PV

- In roof System or Retrofit
- Facing between E and W.
- System size ranging from 1.5 KwP to 4KwP
- This equates to 6 Panels to 16 Panel systems



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Development Considerations

- **Technical**
  - Orientation – East through to West.
  - Roof Structure.
  - Shading.

- **Yield / Output**
  - Scotland 10% lower than England – but not that simple!
  - Detailed output calculations using industry recognised Software.
  - Existing systems available as evidence – Live Portal.

- **Grid Connection / DNO Approval**

- **Planning & Approval Process – Building Warrant etc..**
  - Permitted development rights.

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Design Considerations

- **Stage 1 Design**
  - Orientation - EST Home Analytics System. (95% accurate).
  - PV Sol Design produced for each compass point for each geography.
  - Yield - PVSol (Climate SAF data imported) – more accurate Yield.
  - System Size – social housing average is 11 panels. (2.75kwp).
  - LA Input & Drivers – EESSH Compliance / Fuel Poverty.

- **Stage 2 Design**
  - Roof Survey Report (structural) – desktop / house type.
  - EPC (pre or post) / Site Survey.
  - Planning Application (conservation area only)

- **New Build Design – early stage engagement.**

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Delivery Considerations

- Tenant Consent / Engagement.
- Site planning and logistics.
- Qualified and Experienced installers. (DLO)
- Health & Safety.
- Testing & Commissioning.
- Audit & Compliance (pictures/MCS Cert/RAMS/Surveys)
- Operation and Maintenance / Monitoring.

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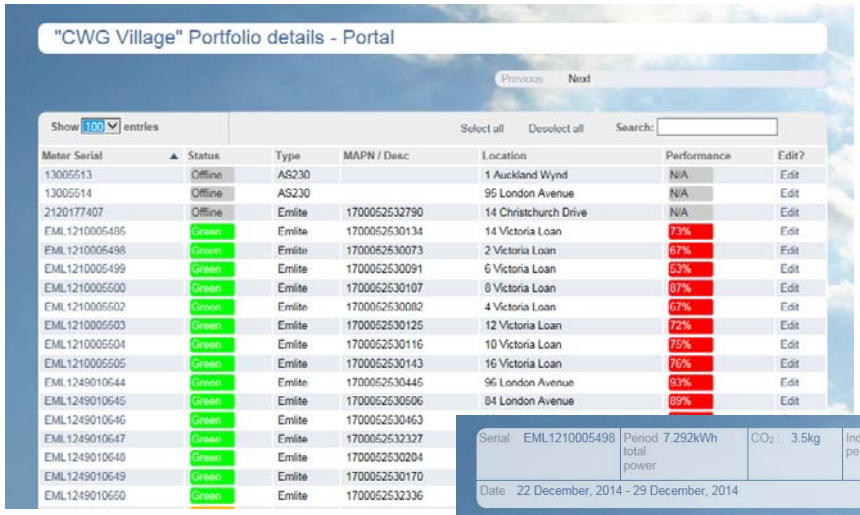

MAINTENANCE & SYSTEM OPTIMISATION

Case Studies

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Knowes Housing Association – Clydebank, Glasgow.

- Delivered over 3 phases.
- 350 Solar PV & 105 External Wall Insulation.

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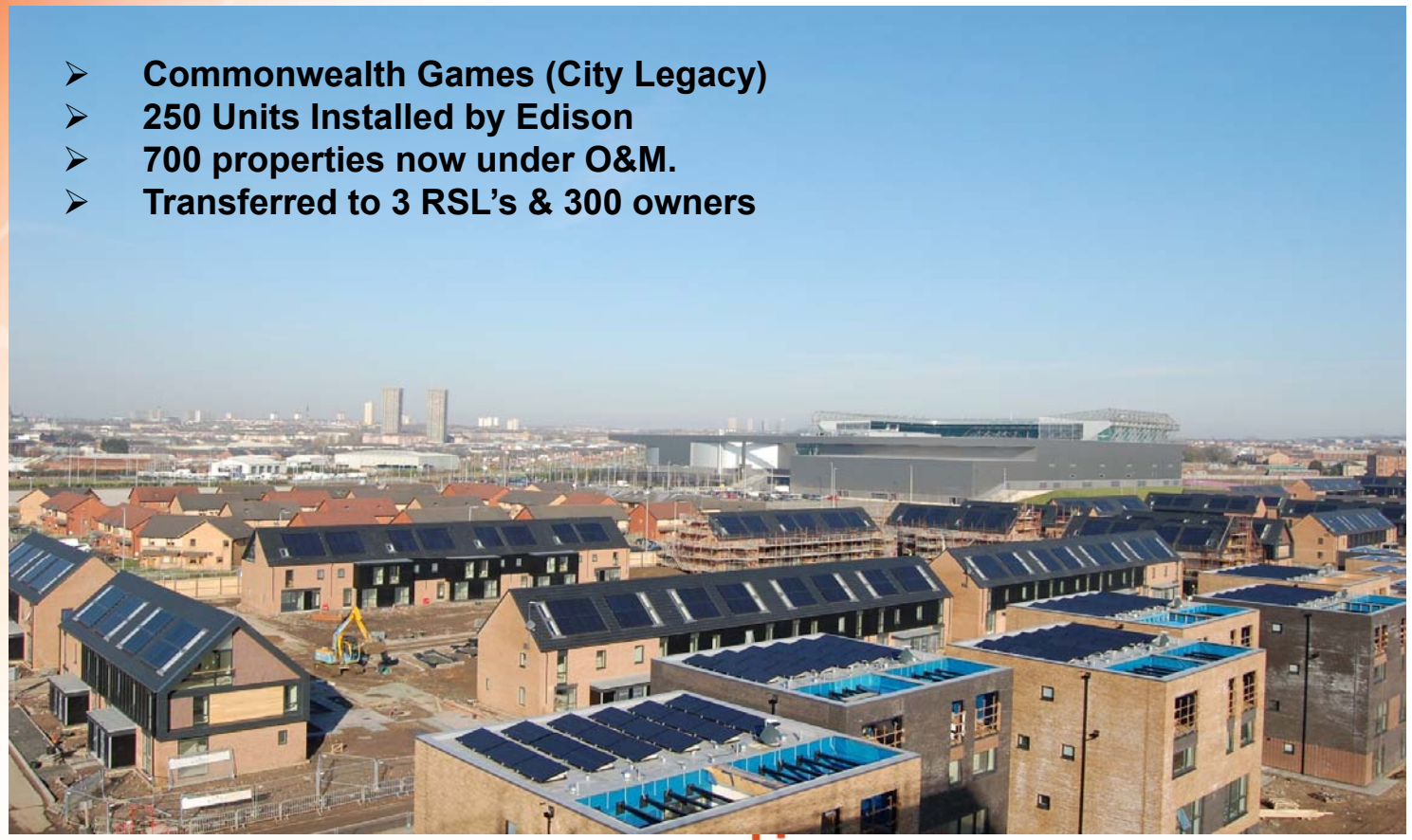
Commonwealth Games – Athletes Village.

- Commonwealth Games (City Legacy)
- 250 Units Installed by Edison
- 700 properties now under O&M.
- Transferred to 3 RSL's & 300 owners



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Clackmannanshire Council.

- 300 External Wall Insulation.
- 35 Loft Insulation.
- 8 Air Source Heat Pumps
- 8 Solar Thermal.
- 550 HTT Cavity Insulation.
- 100 Solar PV (Pilot).

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Berwickshire Housing Association

- 650 properties
- Average system size - 2.9 kWp
- Producing over 1.7M kWh of electricity per annum
- Tenant Savings of £174 a year
- Delivered over 600 square miles.
- Major DNO constraints.

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Grampian Housing Association

- 450 properties in 10 weeks.
- Average system size - 2.8 kWp.
- Logistical challenges.
- Major DNO constraints.

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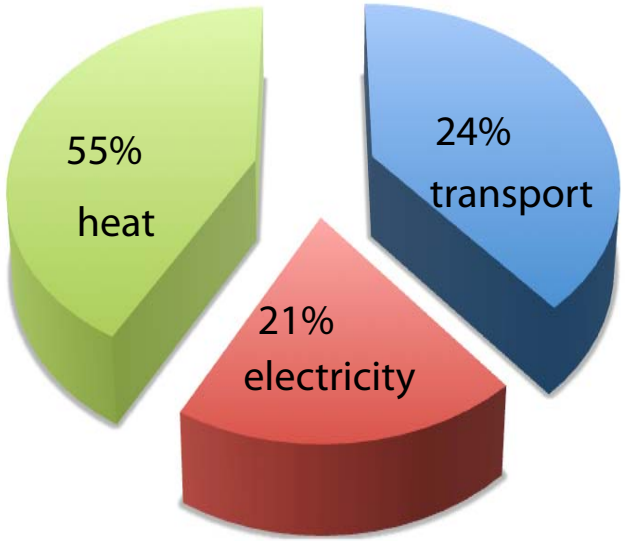
Who are Sunamp?

- 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 ~1000 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, …

Why focus on heat

Heat is over 50% of our energy consumption in Scotland

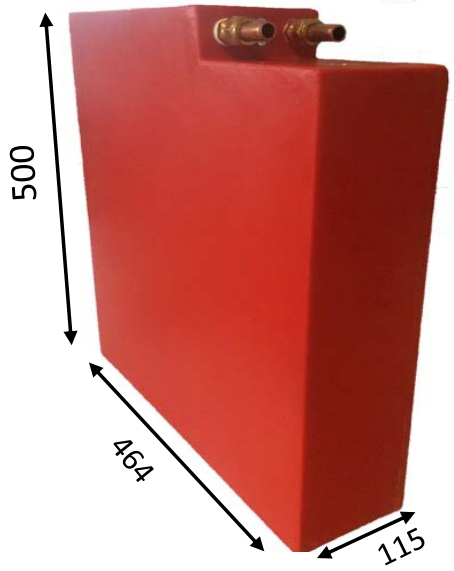
Scotland spends £2.6 Billion annually on heating and cooling



39% of the population of Scotland is estimated to be in fuel poverty

The Heat Policy Statement: Towards Decarbonising Heat: Maximising the Opportunities for Scotland

What is unique about Sunamp ?



- **Technology**

  Develop, design and manufacture heat storage batteries, using phase change materials

- **Flexible**

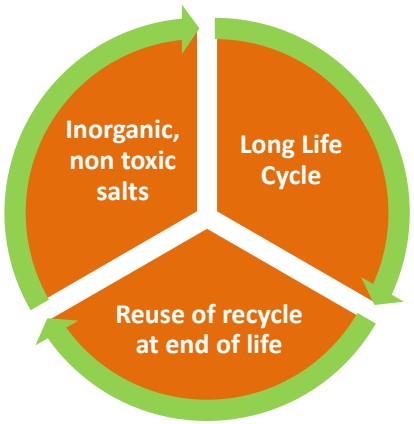
  Works with multiple heat sources to provide space heating and hot water

- **Long Lifecycle**

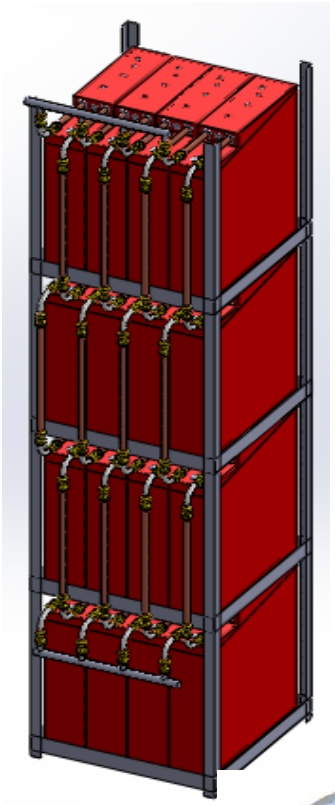
  14,200 cycles, with no degredation, 10 years warranty, low capital cost 3p/kWh round trip.

- **Sustainability**

  Components sourced in the UK, manufactured in the UK and easy to recycle.



Introducing Sunamp Heat Batteries



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

And they're certainly the most compact

Modular, Scalable, Stack & Rack

Packing in three to four times more Energy Density, than a hot water tank

Because they are compact, they enable new applications – and improve existing ones

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Local Energy Scotland is a consortium made up of the Energy Saving Trust (EST), Changeworks, The Energy Agency, SCARF and the The Wise Group

CARES is the Community and Renewable Energy Scheme, which is administered and managed with support for delivery from Ricardo-AEA

THE CHALLENGE FUND

The Local Energy Challenge Fund has been created to demonstrate the value and benefit of local low carbon energy economies. Focused on Large-scale local low carbon demonstrator projects which show a local energy economy approach linking local energy generation to local energy use.

EastHeat

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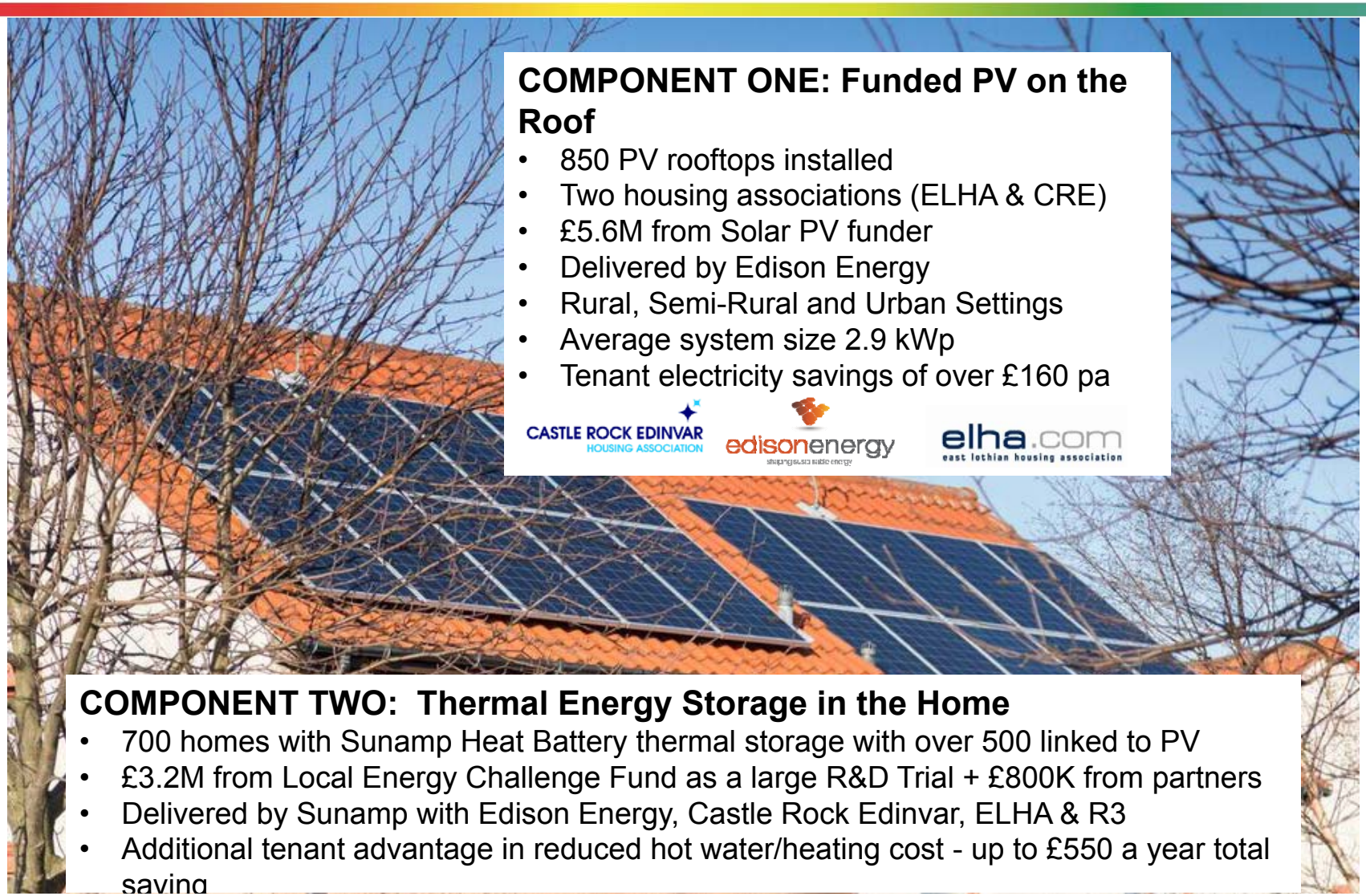

COMPONENT ONE: Funded PV on the Roof

- 850 PV rooftops installed
- Two housing associations (ELHA & CRE)
- £5.6M from Solar PV funder
- Delivered by Edison Energy
- Rural, Semi-Rural and Urban Settings
- Average system size 2.9 kWp
- Tenant electricity savings of over £160 pa

CASTLE ROCK EDINVAR HOUSING ASSOCIATION

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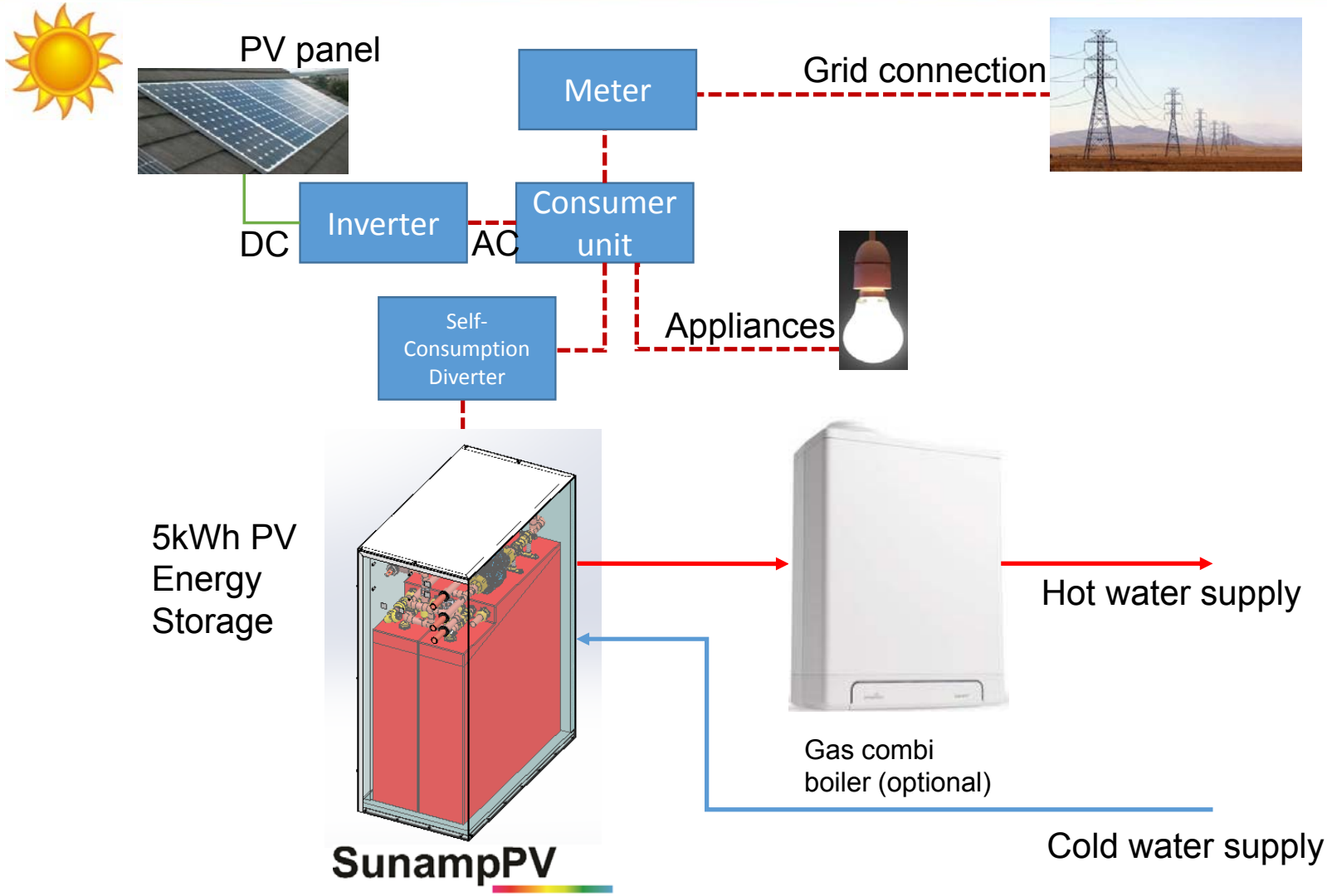
elha.com east lothian housing association

COMPONENT TWO: Thermal Energy Storage in the Home

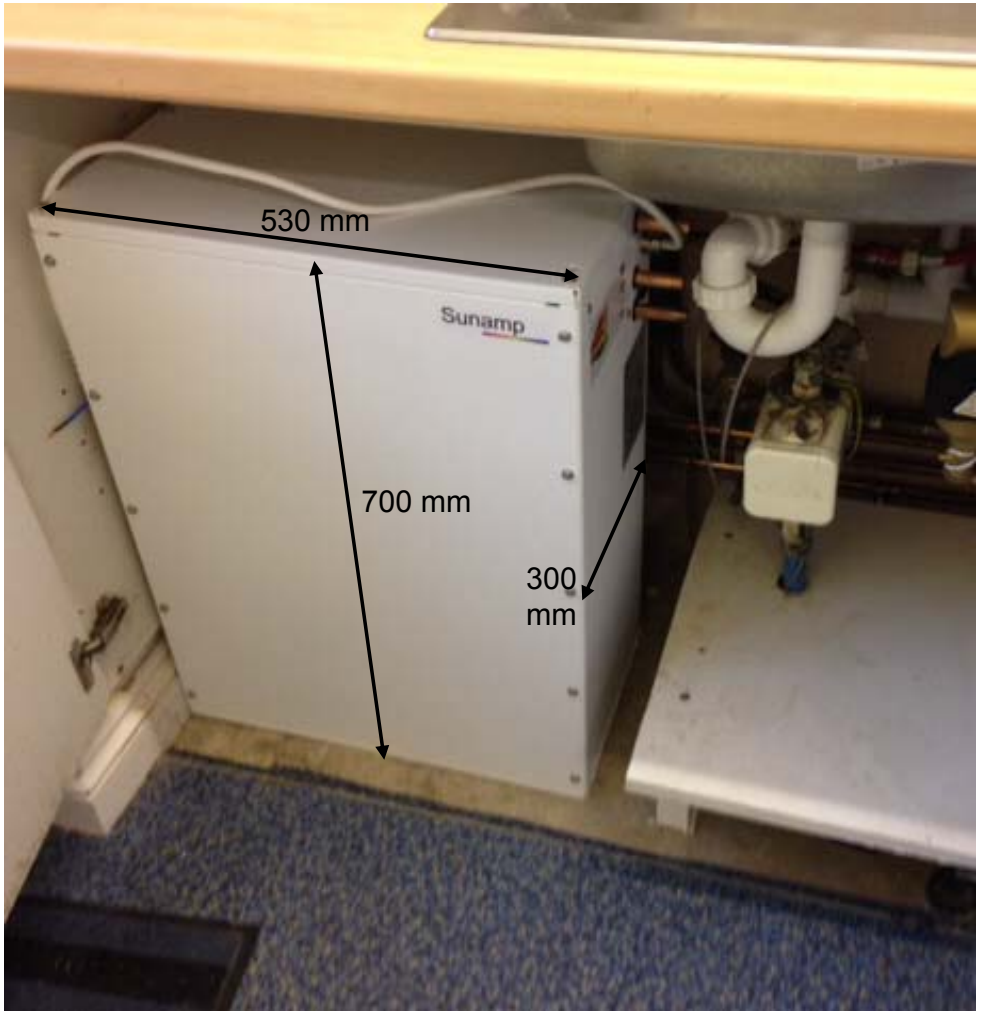
- 700 homes with Sunamp Heat Battery thermal storage with over 500 linked to PV
- £3.2M from Local Energy Challenge Fund as a large R&D Trial + £800K from partners
- Delivered by Sunamp with Edison Energy, Castle Rock Edinvar, ELHA & R3
- Additional tenant advantage in reduced hot water/heating cost - up to £550 a year total saving

SunampPV use with PV & Combi



Why not just use hot water tanks?

- Compact, energy dense thermal store.
- Around a third of the size of equivalent hot water tank.
- Heat loss of 0.576KwH over 24 hours
- Mains pressure hot water on demand
- Legionella risk is avoided
- Fitted in half a day



Energy Demand Shift

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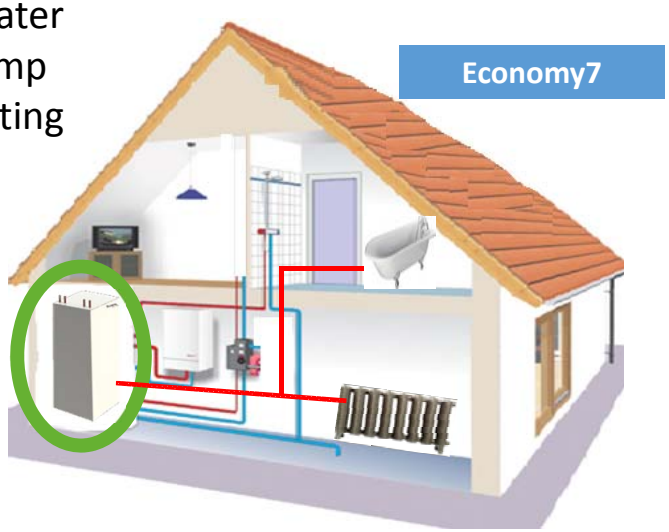
83% of tenants questioned were in fuel poverty paying between £85-£100 per month for heating

In this example within a sheltered housing complex. We removed the hot water tank and added a Sunamp heat battery to the existing wet radiator system



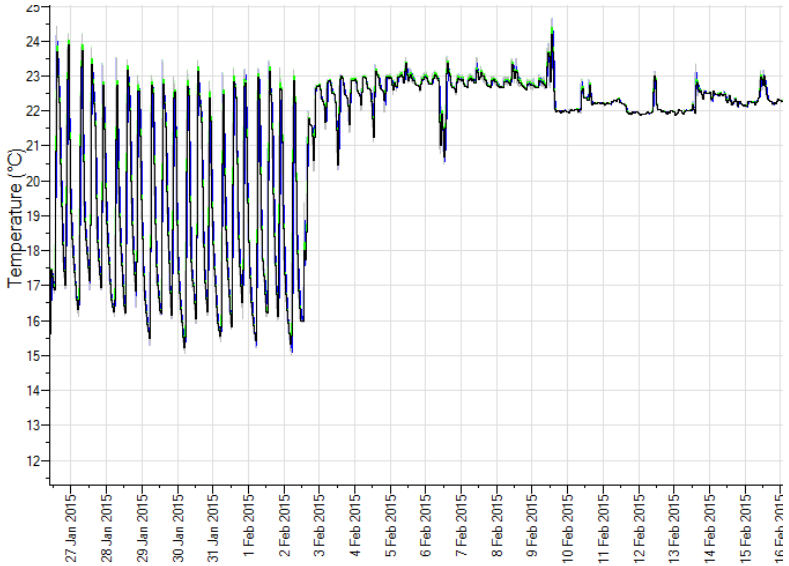
Sunamp Heat Battery Unit

Central Heating and Hot Water

We used the existing Economy 7 tariff, to heat the apartment and charge the battery during less expensive times. The heat battery then provided all the heating and hot water during the expensive times

Energy Demand Shift

Graph shows the room temperature when trying to use an off peak tariff with a traditional boiler and electric heating system from the 27th of Jan and with the Sunamp system installed after the 3rd of February

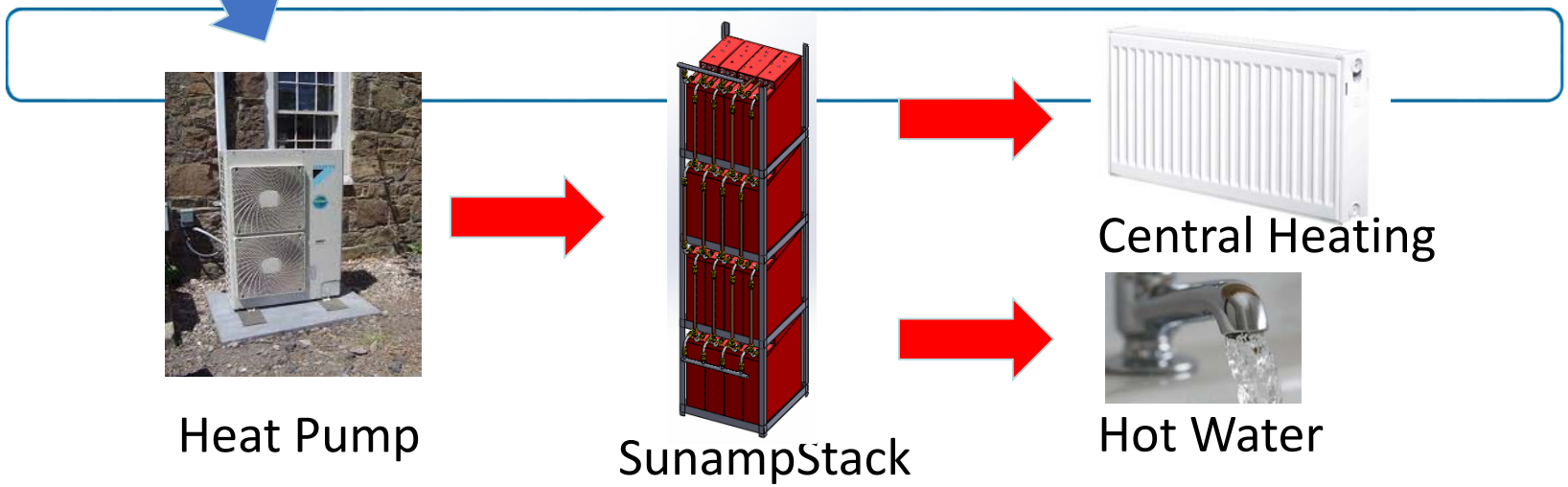


Energy usage was 35% less with a significant improvement in comfort

The installed cost of this battery was £4000 (ex VAT), and it was retrofitted to the existing wet radiator system, so the refit costs were minimal

SunampStack + Heat Pump

- Heat battery allows off-peak electricity or renewable electricity and heat pumping (3x efficiency) to work together;
- Replaces large water tanks with compact, modular, and scalable solutions;
- It can be easily tailored to satisfy different requirements
- Proven in field trial with social housing associations in UK
- **Delivered 40-60% reductions in heating bills**



Energy Savings

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running costs savings range from 45% to 57% and the reduction in carbon emissions range from 17% to 36%. Results and Benefits: The typical

CASE A

This is a 2-bedroomed house with 2 working occupants. They are heavy hot water users having 2 deep baths in the morning and 2 deep baths in the evenings

Annual Savings on Heat and Hot Water		
Energy saving	**Bill saving**	**CO_2 Saving**
59%	56%	29.1%
8,404 KWh	£602.17	1259 $KgCO_2$

CASE B

This is a 3 bedroomed house lived in by a young working couple, their heat and hot water usage is normal. This household had night storage heater. Comfort has improved.

Annual Savings on Heat and Hot Water		
Energy saving	**Bill saving**	**CO_2 Saving**
40%	45%	36%
4,921KWh	£414.78	1596 $KgCO_2$

CASE C

This is a one-bedroom house, semi detached bungalow. The occupier is an retired man who looks after his grandchildren in the early evening so the house must be warm - Achieved

Annual Savings on Heat and Hot Water		
Energy saving	**Bill saving**	**CO_2 Saving**
49%	57%	Not Available
3,291 KWh	£325.91	Not Available

CASE D

This is a 5-bedroomed house with 2 working occupants and 1 teenager child and 1 visiting young adult

Annual Savings on Heat and Hot Water		
Energy saving	**Bill saving**	**CO_2 Saving**
77%	50%	46%
28,476 KWh	£926.77	3645 $KgCO_2$

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QUESTIONS & ANSWERS