



Low Carbon
Built Environment

Amgylchedd Adeiledig
Carbon Isel



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Achieving affordable low carbon and better quality housing through a whole house energy systems approach

The need for to focus on housing



The role of low carbon housing

- Reduce dependence on fossil fuels
- Increase low-carbon energy sources
- Mitigate the impact of climate change
- Reduce fuel poverty
- Improve the built environment



Whole house energy system



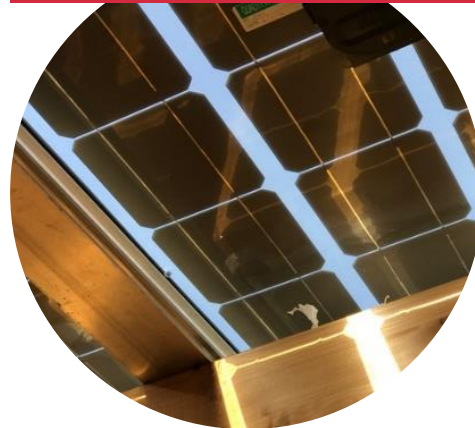
Demand reduction



Renewable supply



Energy storage

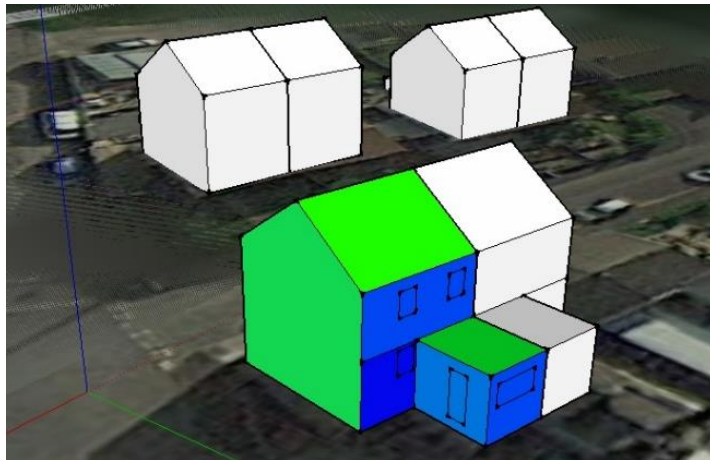
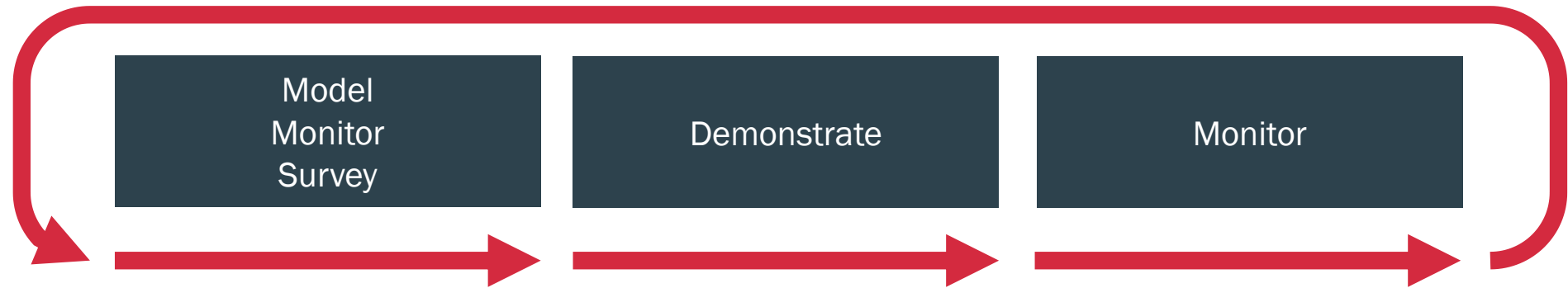


Whole house energy system

- Affordable
- Appropriate
- Replicable
- Low energy
- Comfortable
- Low maintenance



Data collection and learning from experiences



Stakeholder communication and collaboration



WSA Collaboration with Swansea Council

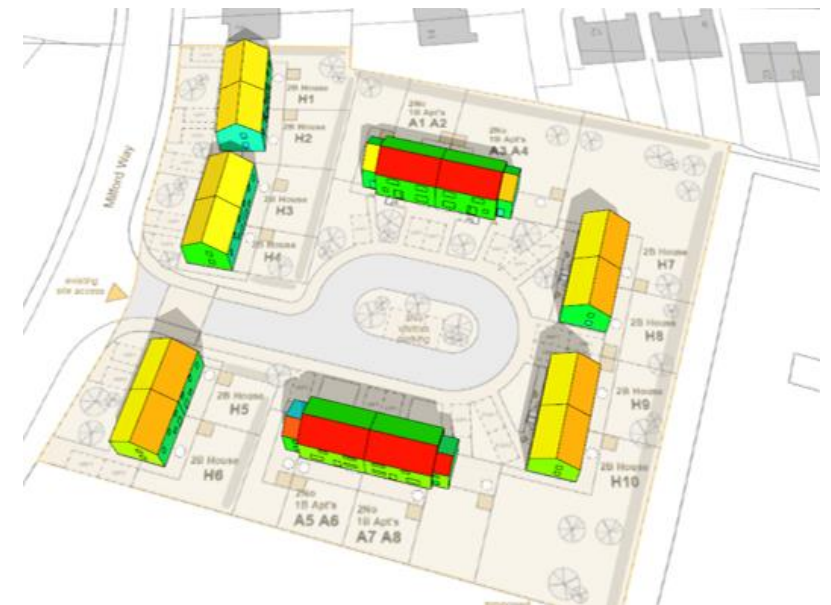
Phase 1

18 Passivhaus homes in Penlan, complete 2017

Built by Swansea Council

Monitored by the WSA team

- Fabric-only approach
- Passivhaus standards
- Gas boiler, no renewables or storage
- Average daily energy consumption 19 kWh compared to average UK 30-40kWh



Solcer House - whole house energy system

Designed and built by WSA – 2014-15

- Energy import from the grid was just 2,557kWh in 2020.
- 82% lower than a typical Welsh home.
- EPC rating of A.

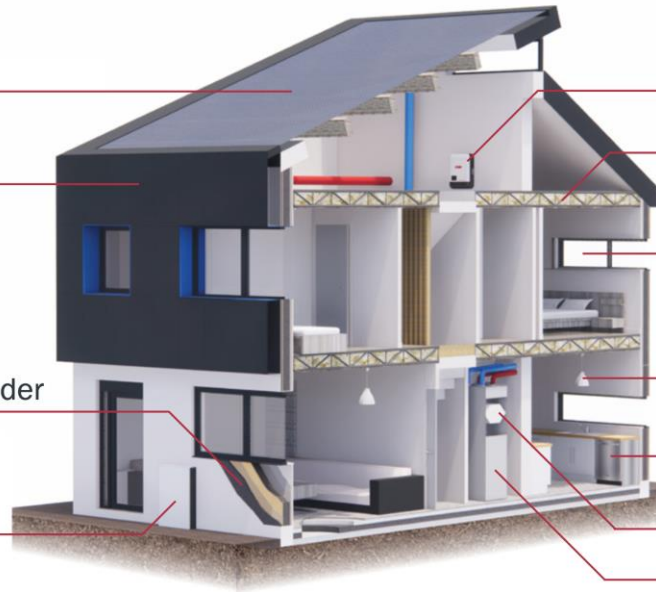


4.3 kWp integrated PV panel

Transpired Solar Collector

SIPs panel with insulated render

Retrofitted Tesla Powerwall 2
13.5 kWh battery



Solar inverter

Loft insulation

Low e double
glazed windows

LED lighting

Energy efficient
A+ appliances

Exhaust Air Heat Pump
with heat recovery

Hot water tank



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Phase 2

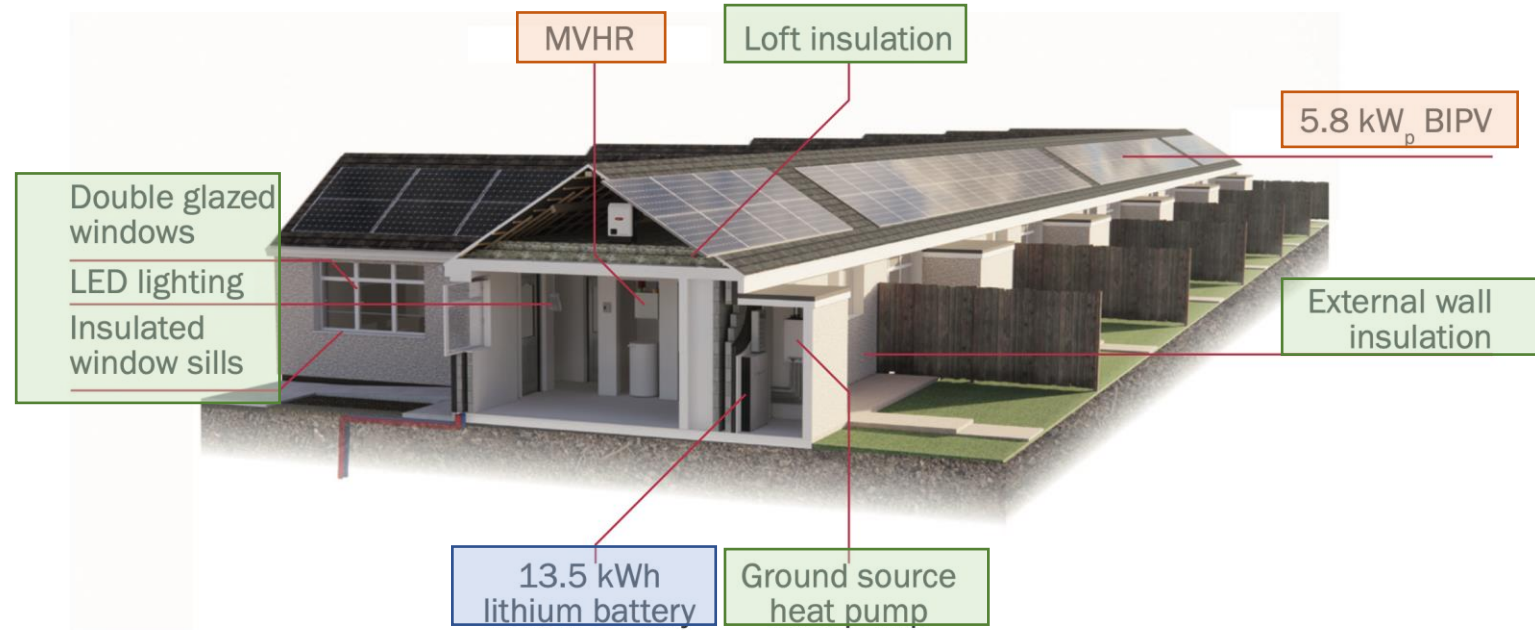
6 1960s bungalows, retrofit complete 2020.

- Very inefficient.
- High heating costs.
- Very low SAP ratings.
- Low levels of comfort.
- Damp and mould.



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- Energy import - fell from 16,000 kWh (electricity and fossil fuels) to 2,000kWh (electric only).
- 2,000 kWh exported to the grid.
- Very low energy bills, reducing fuel poverty.
- Energy Performance Certificate (EPC) rating from G (12) to A (95).
- No mould or draughts.



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Phase 3

65 new build homes across County

Whole house energy systems approach

Designed and built by Swansea Council – The Swansea Standard

WSA monitoring homes

- High thermal performance and airtightness but not to Passivhaus;
- PV panels, battery, Ground Source Heat Pumps.



4 Swansea Standard sites

Mix of 1 bed flats, 2, 3 and 4 bed semis and 3 bed terraces.

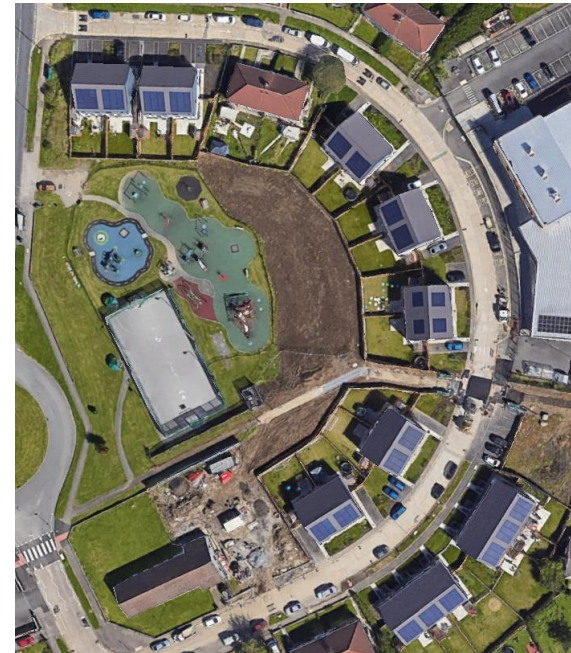
Parc yr Helig



Colliers Way 2



Hillview



West Cross



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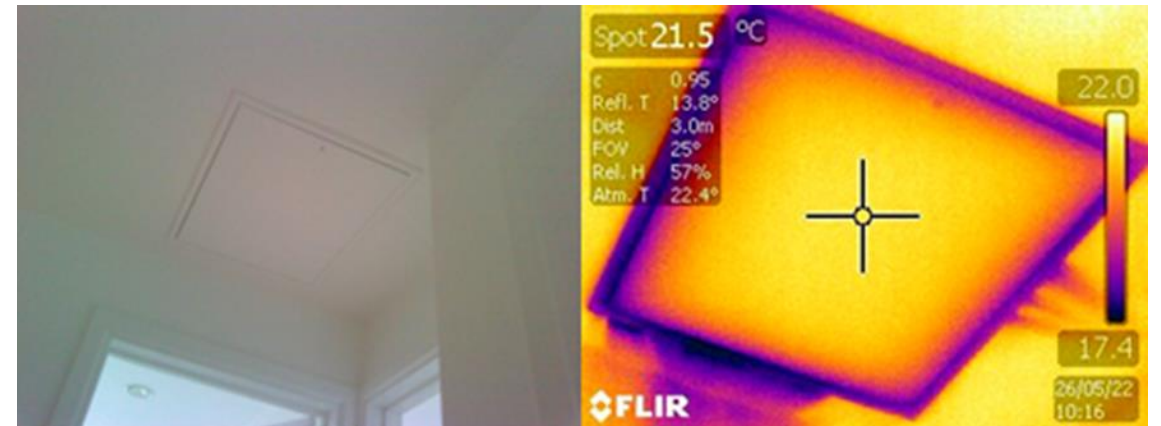
Monitoring sample of homes across 4 sites

Short term measurements

- Performance of fabric - U values and air tightness
- Thermography
- Flow measurements of ventilation systems
- Interviews with residents

Long term

- Energy metering
- Environmental monitoring – temp and humidity
- Weather



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Performance of homes is much better than typical housing in the UK

80% lower imported energy than the UK average.

45% - 60% energy provided from energy systems.

65% lower energy consumed than the UK average.

Houses - PV contributes around 20%, Battery contributes around 25%

Flats – PV contributes around 25%, Battery contributes around 35%

100% reported being satisfied with the overall comfort of their homes

90% responded that their homes were comfortable in winter

WSA Collaboration with Swansea Council



- Lessons have been learnt and applied in later developments - need to be shared widely.
- Not push too hard with Passivhaus standards – systems approach.
- Potential for heat loss to be reduced even further around windows, doors, loft hatches...
- Commissioning critical – particularly ventilation systems.
- Maintenance - ensure systems function as designed.
- Engagement with householders – extend to ensure information is really taken on board.

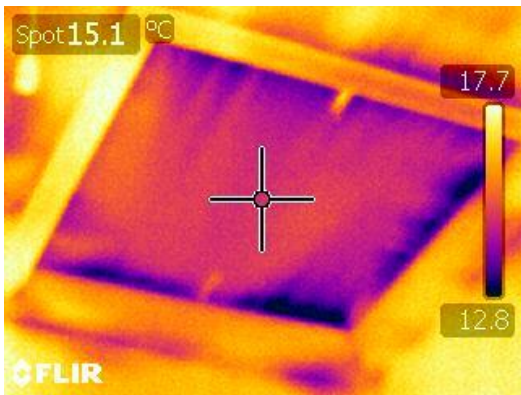
Lessons learnt – whole house energy systems

Benefits

- Carbon reductions;
 - Reduction in energy bills = reduced fuel poverty;
 - Improved living conditions;
 - Better quality of life, health and well-being;
 - Better built environments.
-
- Technology options are increasing rapidly – expertise is needed.
 - Collaboration is critical to share knowledge and expertise.
 - No two houses are the same.
 - Data and information is critical to inform decision making.
 - Skills and supply chain are fundamental to ensure large scale roll out.



What next for WSA?



PRESS 1 - Practical Retrofit Early-Stage Survey

This survey has been designed to be used at the very early stages of a retrofit. Please answer as many questions as you can, as accurately as possible. Please take photos. Use the **Media Boxes** for extra information and use the space on page 4 to draw a plan of the home marking on features that you feel are **relevant or unusual**. The questions in **blue** require responses from the residents which you may want to complete at the same time minimise resident disturbance.

Surveyors Name: _____ House Number: _____
 Role: _____ Address: _____
 Company: _____ Postcode: _____
 Date: _____

1. BUILDING LOCATION

1.1. Front facade orientation North South East West North East South West North West South West

1.2. Urban Context Urban Suburban Rural

1.3. Exposure Open Normal Dense / Enclosed

Notes - for example, complex roof layouts, access issues due to location for deliveries, etc.

2. BUILDING CONSTRUCTION

2.1. Year of construction Pre 1919 1920 - 1944 1945 - 1964 1965 - 1977 1978 - 1984 1985 - 1994 1994 - 2006 After 2006

2.2. Floor Area
 Total internal floor area _____ m²
 Number of bedrooms _____

2.3. Type of construction Steel frame (low thermal mass) Timber frame (low thermal mass) Cavity wall (medium thermal mass) Solid wall (high thermal mass) Modern Method of Construction Other - Specify _____

2.4. Dwelling type 1 storey house / bungalow 2 storey house 3+ storey house Purpose built flat Converted flat

2.5. Existing retrofit improvements
 External wall insulation Cavity filled insulation Double glazed windows _____ % Loft insulation - approx. thickness _____ Loft hatch insulation Floor insulation

2.6. Location of adjoining properties Above Below Left Right None



Frequently Asked Questions

How can I control the temperature of my home?
 The temperature can be set on the control panel which is located by the entrance. This will activate your gas boiler. Your heating should be set at around 21°C to give you a comfortable temperature.

What can I do if the house gets too cold or hot?
 Your heating should be set at around 21°C to give you a comfortable temperature.
 If your home is too cold:
 • Close windows and curtains.
 • Remove clothes from radiators to allow heat out to warm up rooms.
 If your home is too hot:
 • Close windows and curtains when the sun is shining brightly and the outdoor temperature is high.
 • Open windows during the night to let in cool air.

How does my hot water work?
 Your gas boiler will heat up the water automatically when you run a hot tap.

When should I use my appliances?
 It is best if you use your appliances when it is sunny as they will use energy from the solar PV panels, which is free of charge. Try to do your washing, electric cooking, hoovering and charging equipment such as mobile phones during the day. As best to do this in the morning. If you can, as this will allow the battery to refill during the afternoon for you to use the free electricity from the battery in the evening.

Do I need to switch off/on the ventilation unit?
 The ventilation unit in the attic will deliver fresh clean air to your home and will also reduce the amount of energy that you need for heating your home in the winter. It should always be ON. It costs around 50p per day to run.
 When you are cooking or after a shower the amount of moisture in the air in your home will increase. The ventilation rate of the unit will increase temporarily to remove the extra moisture.
 If your home feels stuffy you can use the boost button by the kitchen to temporarily increase the ventilation rate.

Can I open the windows?
 You can open the windows if you want. The ventilation unit works to provide fresh air, take away moisture and keep out dust and pollen. If you do open windows during colder months extra heating will be required to keep your home warm which will cost you more.

How do the solar PV panels and the battery work together?
 The solar PV panels in your roof generate electricity during the daytime when it is light. Any electricity generated will be used by your appliances if they are on. If more electricity is produced by the solar PV panels than you are using it will be stored in the battery for you to use later. The electricity stored in the battery will automatically be used by your appliances when it is dark instead of using electricity from your energy supplier.

How should the equipment be maintained?
 Wales and West Housing will carry out checks and maintenance for all of the technology in your home. If there are any problems, please contact the Customer Services Centre.

Do I have to do anything if I leave the house for a week or more?
 If you go away during the winter, set the heating the most to 14°C. If you go away in summer, turn your heating down to minimum. Leave the ventilation system, solar PV panels and the battery ON at all times.

What are you monitoring and why?
 Your home has a contribution of features that will help to reduce your energy bills, improve your comfort and reduce impact on climate change. We need to measure how well these features are working.
 Sensors have been placed in your home to measure temperatures, humidity and where your energy is coming from. Please do not move this equipment as it will affect our results. We may need to visit once or twice a year to collect data. You will be contacted before any visits and visitors will carry ID.

Useful contact numbers

Tenancy queries
 Customer Services Centre
 0800 052 2526
 Lines are open 24 hours a day
 Email: contactus@wsh.co.uk

Repairs
 Customer Services Centre
 0800 052 2526
 Lines are open 24 hours a day

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Funding

SPRDFC is funded by the European Regional Development Fund (ERDF) through the Welsh Government, and is managed by the Welsh Government and Physical Sciences Research Council (PSRC).

Led by

Wales and West Housing

CARDIFF UNIVERSITY

PRIFYSGOL CAERDYDD

Funded by

specific EPSRC Innovate UK

Cymru Ddiwydiol Rhwyngwladol European Regional Development Fund



Thank you

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