specific®

The Active Classroom

An award-winning, energy-positive building

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Led by

Swansea University
Prifysgol Abertawe

Funders

EPSRC
Engineering and Physical Sciences Research Council

We work with Innovate UK

UNDEB EWROPEAIDD EUROPEAN UNION
Llywodraeth Cymru Welsh Government
Cronfa Datblygu Rhanbarthol Ewrop
European Regional Development Fund

Strategic Partners

TATA STEEL

NSG GROUP

AkzoNobel

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

Active Classroom Suppliers

BiPVco
The Building Integrated Photovoltaics Company

MATRIX STRUCTURES
What the future's built on

moixa TECHNOLOGY

Solar Plants
Renewable Energy for Your Future

KIER

WIND&SUN
Powering the future
Since 1984

AQUION ENERGY

Cardiff Metropolitan University | Prifysgol Metropolitan Caerdydd

C3 CONSULT

WARMTH & WELLBEING

victron energy
BLUE POWER

sprinovale
sustainable insulation values

vellacine
architectural glazing systems

Smile Plastics

IPS roofing

AECOM

generate › **store** › **release**

SPECIFIC's vision is buildings as power stations - a world in which buildings can generate, store & release their own solar energy...

Building Demonstration

The Active classroom brings the 'buildings as power stations' concept to life and demonstrates the latest renewable energy technologies being developed at SPECIFIC and collaborative companies.

Proving the design and concept works is vital before it can be adopted by the construction sector, regulators and consumers. And since being built, the classroom has produced 1.6 times the amount of energy it has consumed. This proves SPECIFIC'S energy-positive design concept and demonstrates an innovative and sustainable approach to constructing buildings.

Our demonstration programme has been designed to test and prove the buildings as power stations concept in a range of uses...Whilst the **Active Classroom** is designed for use in the education sector, previous demonstrators include **The Pod,** our first building as a power station. The **Solar Heat Energy Demonstrator** (SHED) warehouse; which has been running without gas since 2012. The **SOLCER House**, which was constructed in partnership with Cardiff University and is now used as an office. And finally, our two-storey **Active Office** was completed in June 2018 and will share energy & information with the Active Classroom.

The Active Classroom

The SHED

The Active Office

Built by Collaboration

It is only by working together on real projects with real companies, by bringing together those in the construction, energy and systems industries, that our vision of a more sustainable, more prosperous environment can be achieved.

"We are proud to be involved with this game-changing project, this classroom challenges commercial property design norms, and if successful will help shape the way buildings are designed going forward." [Ian Hewson, Off-grid Engineer, Solar Plants]

The Living Wall

The living wall was planted with the help of local schoolchildren. It links the built environment to the natural world and helps to:
- Regulate temperature & reduce carbon footprint
- Foster biodiversity (using native species)
- Improve aesthetics
- Protect building façades
- Improve air quality

The Solar Wall

The south facade is covered in solar air collectors (Colorcoat Renew SC®), a perforated Tata Steel cladding that generates warm air for space and water heating.

It can collect around 50% of the energy falling on its surface, which equates to approximately 500Wp/m² of the collector's surface area

Printable Underfloor Heating

Conductive ink printed directly onto the modular floor panels provides structurally integrated electrical underfloor heating, enabling:
- rapid installation and low build height
- compatible with renewables and BMS
- responsive, localised heating control

"This could be the default floor of the future" [MD, Permaflor]

BIPVCo Integrated Solar Panels

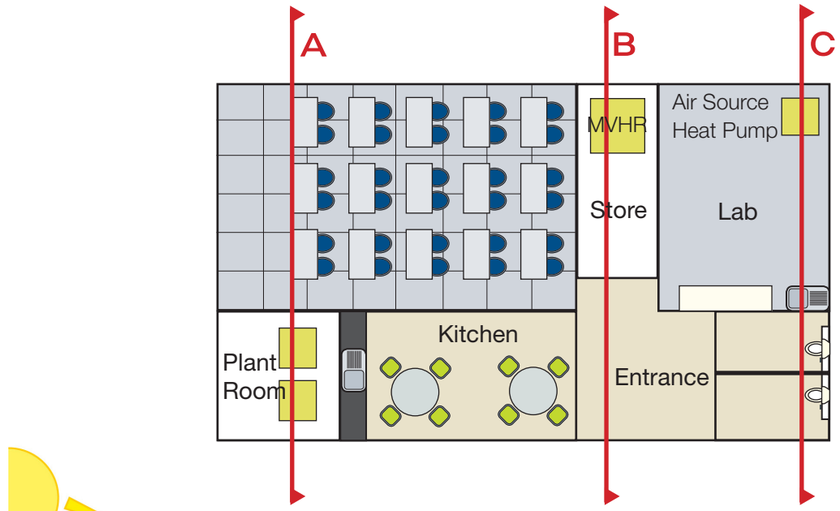
The classroom uses thin-film solar cells integrated into the steel roof panels. BIPVCo uses CIGS technology (Copper Indium Gallium Selenide) which offer the following benefits:
- cost efficient, due to reduced installation costs
- lightweight and flexible
- performs well in low light conditions
- requires very little maintenance

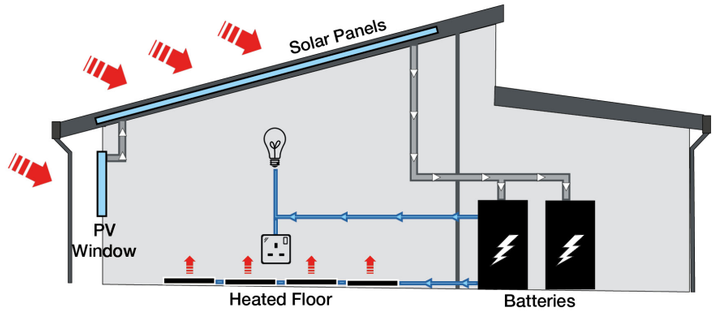
Aqueous Hybrid Ion Batteries

AQUION's batteries use completely organic electrolytes (saltwater) and received "Cradle to Cradle™" certification for environmental sustainability. They are also:
- non-combustible and large scale
- made using abundant, non-toxic materials
- optimized for daily charge / recharge
- maintenance free

Pilkington Sunplus™ BIPV

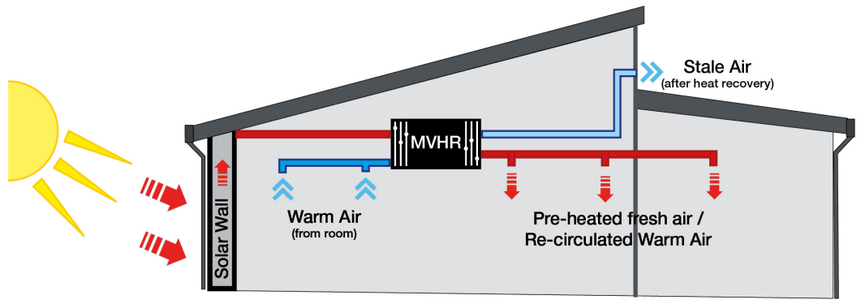
Pilkington Sunplus™ provides power-generating, architectural glass solutions. It was retrofitted into the classroom in 2017 to maximise the use of building environment for energy generation
- peak power output of the window is 77W
- project payback is under 10 years





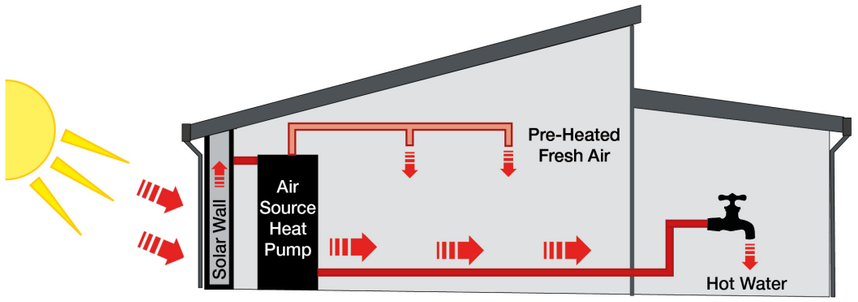
Cross Section A:

The sun's rays hit the solar roof and solar window, generating electricity, which is used immediately or stored in the batteries for use later.



Cross Section B:

Air is heated and drawn into the solar wall cavity through perforations in the cladding; this air re-heats the room. Meanwhile, the MVHR recovers heat from 'stale' air in the building and uses it to pre-heat fresh air before it's circulated into other spaces within the building.



Cross Section C:

The heat pump is supplied warm air from the solar wall. It takes the heat from the air and boosts the temperature using electricity. This then provides space heating and hot water.

20+

companies working in collaboration

The building has been designed to be re-used.

All the major components are

100%

recyclable

8

new building techniques and products used for the first time

generate

The classroom can be controlled by an app

so the teacher can programme in the number of students each day...

and the classroom will be the perfect temperature when they arrive ready to learn!

The living wall has

360 plants

10+ native species

In 2017, the classroom generated..

1.6 times

....the energy it consumed

...saving £880/yr*

[*Based on a standard fixed rate of 13.5p per kWh]

release

10kW

of novel underfloor heating tiles have been used for zoneable, fast action heating

The PV roof produces enough energy to make...

2000

cups of tea a day on average

store

The classroom batteries can store

40kWh

That's enough energy to power the classroom for 2 days just from the batteries

...or 1.5 x the energy consumption of a typical family home

...or enough power to make

600

cups of tea in an hour

ADEILADU ARBENIGRWYDD YNG NGHYMRU

CONSTRUCTING EXCELLENCE IN WALES

renewableUK CYMRU

WALES GREEN ENERGY AWARDS 2017

businessGreen LEADERS AWARDS 2017 FINALIST

British Renewable Energy Awards Finalist 2018

RICS Awards 2018 Winner

Building AWARDS 2017 FINALIST

TUESDAY 7 NOVEMBER 2017 | GROSVENOR HOUSE HOTEL, LONDON

Data for International Research

"The classroom is a vital research tool, with over 50 sensors collecting performance data in real time.

The building is used on a daily basis as an educational facility and the information gathered allows us to investigate the performance of the technologies we use in a working environment, which is just not possible in a controlled laboratory setting. The data collected is being shared with an international team of solar experts across several universities, who use it to validate their models and control algorithms."

[Desmond Brennan, Data Analyst]

Funding for Additional Projects

"The energy-positive classroom we built shows that this technology works, successfully turning buildings into power stations.

This funding will enable us to export this model to support India's plans to boost solar energy ...To have Swansea University leading this project is recognition of our success with the energy-positive classroom, and proof of our research expertise in two of the most important industries of the 21st century, solar energy and steel."

[Dave Worsley, Research Director]

specific®

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