specific®

ActiveOffice

The UK's first energy-positive office space

www.specific.eu.com | info-specific@swansea.ac.uk

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

The Active Classroom

The SHED

The POD

Building Demonstration

The Active Office is the UK's first energy positive office, designed to generate more energy than it uses over the annual cycle.

It is the latest building in SPECIFIC's full-scale demonstration programme, which aims to test and prove the 'Buildings as Power Stations' concept with a range of building uses. Our demonstration programme is vital for this new approach to be adopted more widely by the construction sector, regulators and consumers.

The Active Office is located next door to The Active Classroom: the UK's first energy positive classroom, which was named Project of the Year 2018 by the RICS Wales. In its first year of operation, the classroom generated more than one and half times the energy it consumed.

The two Active Buildings will be able to share energy with each other and electric vehicles, which demonstrates how SPECIFIC's 'Active Buildings' approach can be applied in an energy-resilient solar-powered community.

Whilst the Active Classroom was used to test technologies at different stages of development, the Active Office only uses commercially available technologies and existing supply chains. It demonstrates that the 'Active Building' approach is applicable now – there is no need to wait for new technology to become commercially available.

The Active Office will provide functional office space, as well as another full-scale building development facility for SPECIFIC and its industry partners.

"It's difficult to overstate the potential of developing a building that powers itself. The concept could genuinely revolutionise not only the construction sector but completely change how we create and use energy, so the opening of the Active Office in Swansea is an exciting step forward. Developing technologies like those demonstrated in the SPECIFIC Active Office can play a strong role in the Government's modern industrial strategy to create 'clean growth' and fulfil our mission to halve the emissions of new buildings by 2030"

[Ian Campbell, Executive Chair of Innovate UK]

Project Sponsors

Cicso's Smart Network Infrastructure:

The Cisco Network Architecture underpins the communications and intelligent building systems that manage the building. It is capable of DC power distribution for services such as integrated, smart, low voltage lighting, which will be controlled by occupancy detectors via the infrastructure.

The Cisco Wi-Fi design supports location based services enabling personal hot desking and building utilisation assessment. The Cisco solution supports innovative IOT applications with smart sensors and is scalable for future data and communication requirements.

Electric vehicle charging points will be linked to the system, adding the ability to locate vehicles, determine their state-of-charge, and ascertain whether any charging points are available.

Coretinium® Wall Cladding:

The office showcases Tata Steels' Coretinium® in the form of an internal 'ideas wall'. However, the product is suited to a wide range of construction, office & general applications.

Manufactured from thin gauge pre-finished steel, the cladding provides exceptional rigidity at a relatively low weight compared to commonly used alternatives. Coretinium® is also coated with Colorcoat Prisma® - which combines durability with aesthetics.

Colorcoat Urban® Roof and Wall Cladding:

Tata Steel's Colorcoat Urban® is manufactured in the UK and delivers aesthetics, performance and eco-credentials. The Active Office utilises these panels on the external walls as well as on the BIPVco roof.

Colorcoat Urban® is available in a range of different colours from the latest Colorcoat Prisma® range – the colours chosen match the adjacent buildings enabling the Active Office to blend seamlessly with its surroundings.

The panels are supplied in a 'quick-fit' system and have been developed to require little or no maintenance.

Project Suppliers

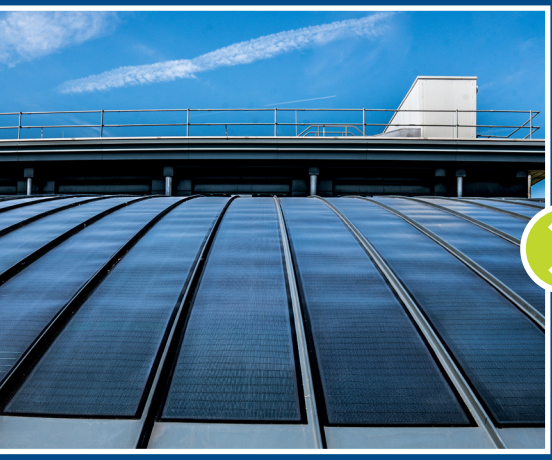
Wernick Modular Construction:

The Active Office was constructed off-site by Wernick. The 12 modules were delivered to site and carefully craned into position in just three days!

'Modular construction' is the process of using modules manufactured in a factory environment which are transported to site and connected together to form a complete building. This method of construction has many advantages over traditional build techniques: no delays due to on-site conditions like weather; less waste, and subsequently cost, is minimised; plus, delivery & installation of modules is very quick.

Dulas Battery Installation:

The office has 110kWh of BYD lithium batteries supported by Victron charge controllers and inverters, the system was installed by Dulas as a turn key solution to the electrical storage requirements. The equipment enables a flexible and controllable way of determining where the electrical energy comes from and is delivered to. We have the option to operate entirely off grid via solar generated power and we can supplement the solar power with grid electricity directly or via the battery system. The system also enables export of both spare power being generated at that point in time, or previously stored power to investigate timeshifting of export to enable peak shaving or tariff benefits.



BIPVco Solar Roof

First commercial installation of BIPVco's photovoltaic roof on a curved profile, which uses CIGS technology (Copper Indium Gallium Selenide) thin film solar cells to convert sunlight to electricity. Factory applied PV cells are bonded directly onto the approved pre-painted steel to create a roofing system that can be installed in the same way as a conventional roof.

The panels are more flexible and lightweight than traditional crystalline based panels and they also perform better in low light conditions (which is essential for Welsh weather!) The 93 PV modules will provide an energy output of 22kWp.

Akzo Nobel Paint:

Dulux Forest Breath is used in some of the interior walls at the office. The paint contains an anti-formaldehyde formulation and active bamboo ingredient which can effectively capture and purify harmful air pollutants; such as formaldehyde and benzine to keep indoor air fresh. It also contains natural tea tree oil extracts which can kill germs and bacteria to create a healthy environment.

NSG Glass:

Pilkington EnergiKare™ Advantage glass provides the performance of triple glazing with just two layers to improve the thermal efficiency of the office. The windows contain an optimised combination of high performance glass, with gas fill to achieve the best Window Energy Rating (WER).
EnergiKare™ not only reduces the amount of heat lost through the windows, but it also allows more heat energy from the sun in through the glass. This so-called passive solar gain provides additional energy free of charge.

Naked Energy PVT Tubes:

The Virtu® PVT (photovoltaic thermal) tubes by Naked Energy® provide electrical energy (2.4kWp) as well as thermal energy (9.6kWp) to the office.
By efficiently drawing heat away from the solar panel for space heating, the photovoltaic cells are maintained at an optimum operating temperature which results in a significantly higher electrical output than standard photovoltaic panels.
The vacuum tubes have low thermal losses and can produce abundant hot water / heat regardless of being installed in hot or cold climates.

The Living Wall:

The living wall was planted with the help of local school children and contains 450 plants and 10 different native species. It links the built environment to the natural world and is a great way to further enhance the building's appearance. The living wall also helps to: regulate temperature and reduce carbon footprint; foster biodiversity; protect building façades; and improve air quality.

Kelda Technology Shower:

Kelda Technology Shower Systems use half the water of a standard shower without compromising the experience. Most eco showers either inject bubbles into the water flow or simply restrict flow; however, Kelda showers inject water into an air flow to produce a highly efficient shower. The water and air mix is then accelerated using a jet-type nozzle to create a spray force that has over two and a half times the power of a standard shower.

Space and Water Heating

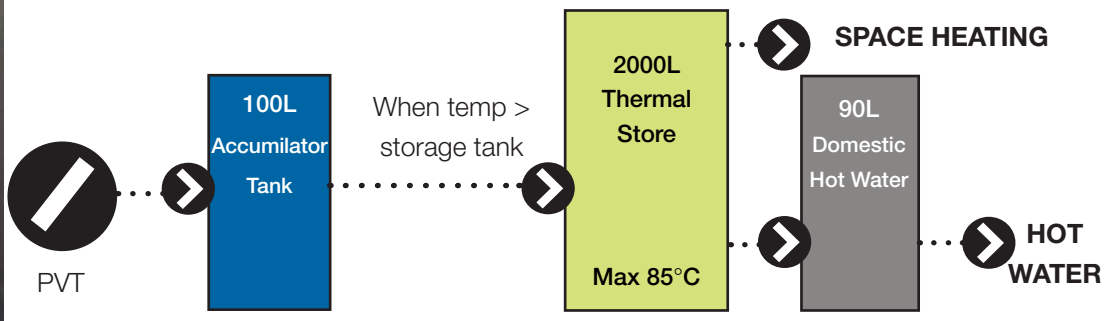
The Active Office contains a 2000 litre water-based themal store, which is capable of storing sufficient energy to provide space heating for the following day and enables time-shifting of electrical heating demand.

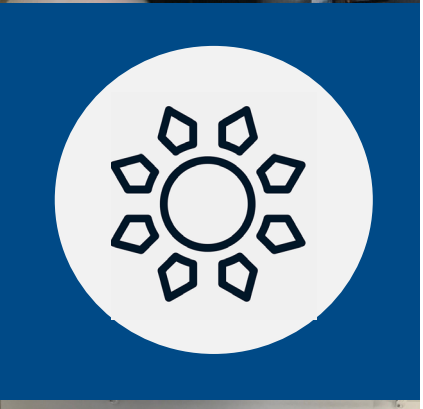
The system also includes a 100 litre accumulator tank, this buffers the output of the PVT system until it can be charged into the 2000L thermal store. If required an air source heat pump acts as a top up or backup to the solar thermal generation used to charge the thermal store. The thermal store provides all space and water heating for the Office via an intelligent building control system.

The graphics below explain how these systems interact in different situations and demand scenarios:

Sunny day:

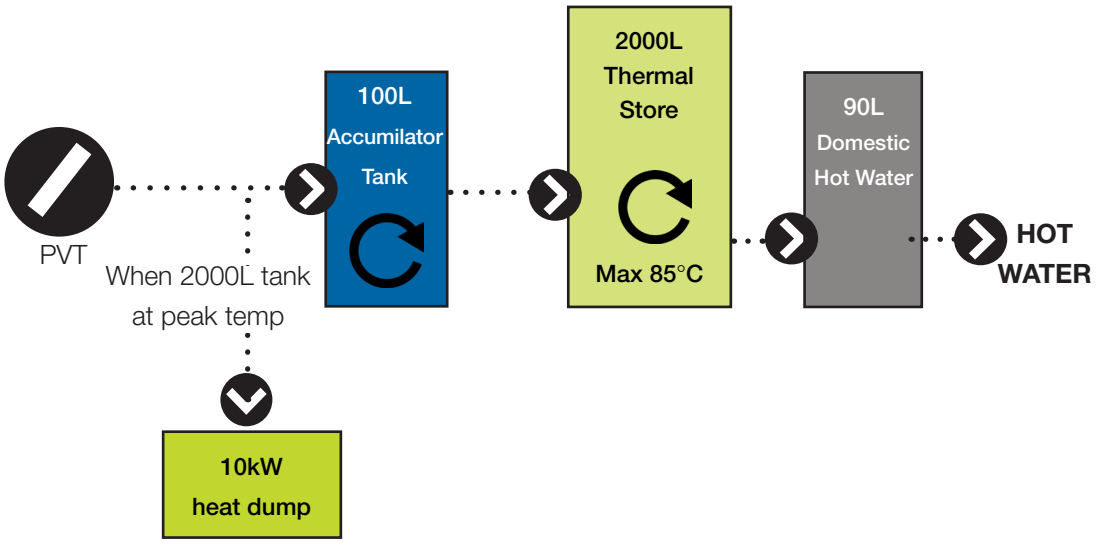
The PVT system charges the thermal store to a maximum temperature of 85°C. The thermal store is then used to supply space heating if needed and provides hot water via an indirect hot water cylinder.

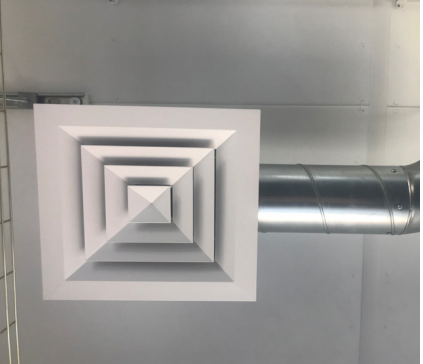




Hot, sunny day:

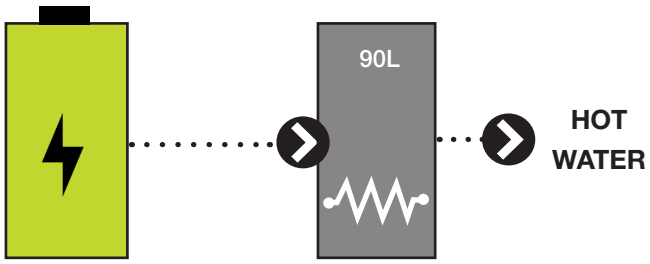
If the thermal store has reached maximum temperature, excess heat will be extracted before it reaches the accumulator tank to increase PV efficiency. The charged thermal store will then feed the hot water tank.





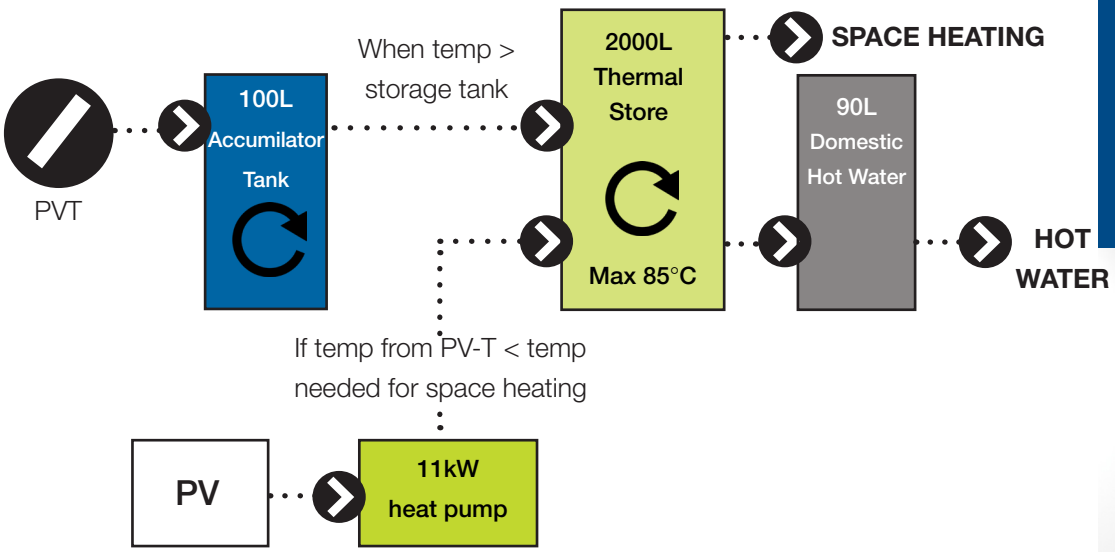
Overcast summer's day:

If the thermal store is cool and not needed for space heating, the 90L hot water tank will be heated via an immersion heater powered directly from the batteries



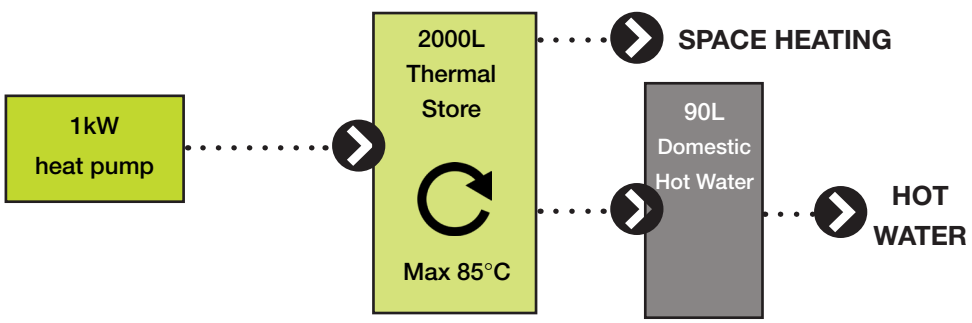
On cooler bright days (spring/autumn):

A mixed-mode will be used: The PV-T system heats the 100L accumulator tank feeding the thermal store, but cannot provide sufficient heat for the heating system, so the heat pump is also used to boost the temperature in the thermal store sufficient to provide space heating and hot water.



Overnight or cloudy winter day:

To heat the thermal store overnight, or if the temperature inside the tank has dropped below 45°C, an air source heat pump is used. This charges the thermal store directly, which then feeds the air handling units & 90L hot water tank. By charging overnight, the system timeshifts electrical demand for heating to times of lower grid utilisation.



The UK's

1st

energy positive office

Designed by SPECIFIC and built by Wernick

≈8 months

93 building integrated PV modules

≈22kWp

1st commercial installation of **Virtu PVT Tubes**

Total **28** estimated **MWh** generation

≈ 3 x small UK houses

[annual consumption]

100kWh batteries...

18 **wireless access** points for smart building sensors

3 EV charging points

2000L thermal store

Stores enough energy for next-day space heating = **timeshift of electrical demand**

Estimated spare annual generation ≈ 8.5MWh

≈1.4 times around the world [in a Nissan Leaf]

"Our building demonstrators are creating quite an impact within the construction industry, which is evidenced by the number of requests I get to speak at events, as well as requests to visit the buildings and presence on social media, press interest and news articles.

The Active Classroom has won several construction industry awards, which highlights our work and makes us stand out as leading the way for innovation in construction.

The Active Office will build on this principle. One of our key roles, as an Innovation and Knowledge Centre, is to disseminate information and these buildings enable us to do that at all levels, from Government to primary school."

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[Joanna Clarke, Building Integrations Manager, SPECIFIC]

BIPVco has fully bought into the vision of turning buildings into power stations and wish to facilitate the designer / builder with the means of doing so without sacrificing form over function.

In the case of the Active Office, the balance of systems of cables and junction boxes are holistically integrated within the roof construction to protect them from the elements without spoiling the neat lines of the roof.

Working closely with Tata Steel, BIPVco was able to develop an integrated curved 'Powered Metal Roof' solution using state of the art, high performance thin film flexible PV technology pioneered by BIPVCo.

We are delighted to have collaborated with SPECIFIC to "Activate" the roof of the Active Office and to showcase BIPVco technology of METEKTRON "The Powered Metal Roofing Solution."

BIPVco
The Building Integrated Photovoltaics Company

[Daniel Pillai, CEO at BIPVco]

"We're very proud to be involved in the Active Office project, which we hope will serve as a demonstration of the potential of modular construction as well as the technology used in the building.

Thanks to excellent working relationships across the project, we've not just delivered the UK's first energy positive office, but an architecturally designed, high performance building that met a challenging timescale and on budget."

Wernick™
BUILDINGS

[Stuart Wilkie, Managing Director, Wernick]

Designed and conceived by:

Swansea University
Prifysgol Abertawe

specific

Funded by:

We work with
Innovate UK

With support from:

UNDEB EWROPEAIDD
EUROPEAN UNION

Llywodraeth Cymru
Welsh Government

Cronfa Datblygu
Rhanbarthol Ewrop
European Regional
Development Fund

EPSRC
Engineering and Physical Sciences
Research Council

Sponsored by:

TATA STEEL

CISCO

Constructed by:

Wernick™
BUILDINGS

Framework provider:

FUSION 21

Key Technology Suppliers:

dulas

BiPVco
The Building Integrated Photovoltaics Company

naked energy™

NSG
GROUP

AkzoNobel

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