



# Buildings as Power Stations

Energy from Waste 2017

Dr Jonathan Williams

22/02/17



**specific**

Led by



Swansea University  
Prifysgol Abertawe

**specific**<sup>®</sup>

Funders

**EPSRC**

Engineering and Physical Sciences  
Research Council

We work with  
**Innovate UK**



Strategic Partners



**TATA STEEL**



Generate



Store



Release

# Transforming Buildings into Power Stations that Generate, Store & Release Energy at Point of Use



## UK National Innovation & Knowledge Centre (IKC)

**LEAD:** Swansea University      **PARTNERS:** Tata Steel / BASF / NSG Pilkington

**FUNDERS:** Innovate UK / EPSRC / Welsh Government (ERDF) / Industry / Academia



@ BBIC



@ SAIC



@ PMRC



@ SHED



- 150+ People
- State of the art Laboratories - £450M Bay Campus
- 50+ Partners (Research and Industry)
- A pipeline of technology to be commercialised by industry
- Functional coatings on glass and steel
- Systems integration and demonstration at buildings scale
- Unique facilities to scale up (PMRC) & demonstrate (SHED & Active Classroom) technologies
- Bringing together construction and energy for a distributed energy system

**Building Integration of Solar Thermal and Heat Storage in conjunction with PV and electrical storage**

## SPECIFIC: what is it?

Shared vision: 'To functionalise the outside surfaces of buildings ... new and existing.'

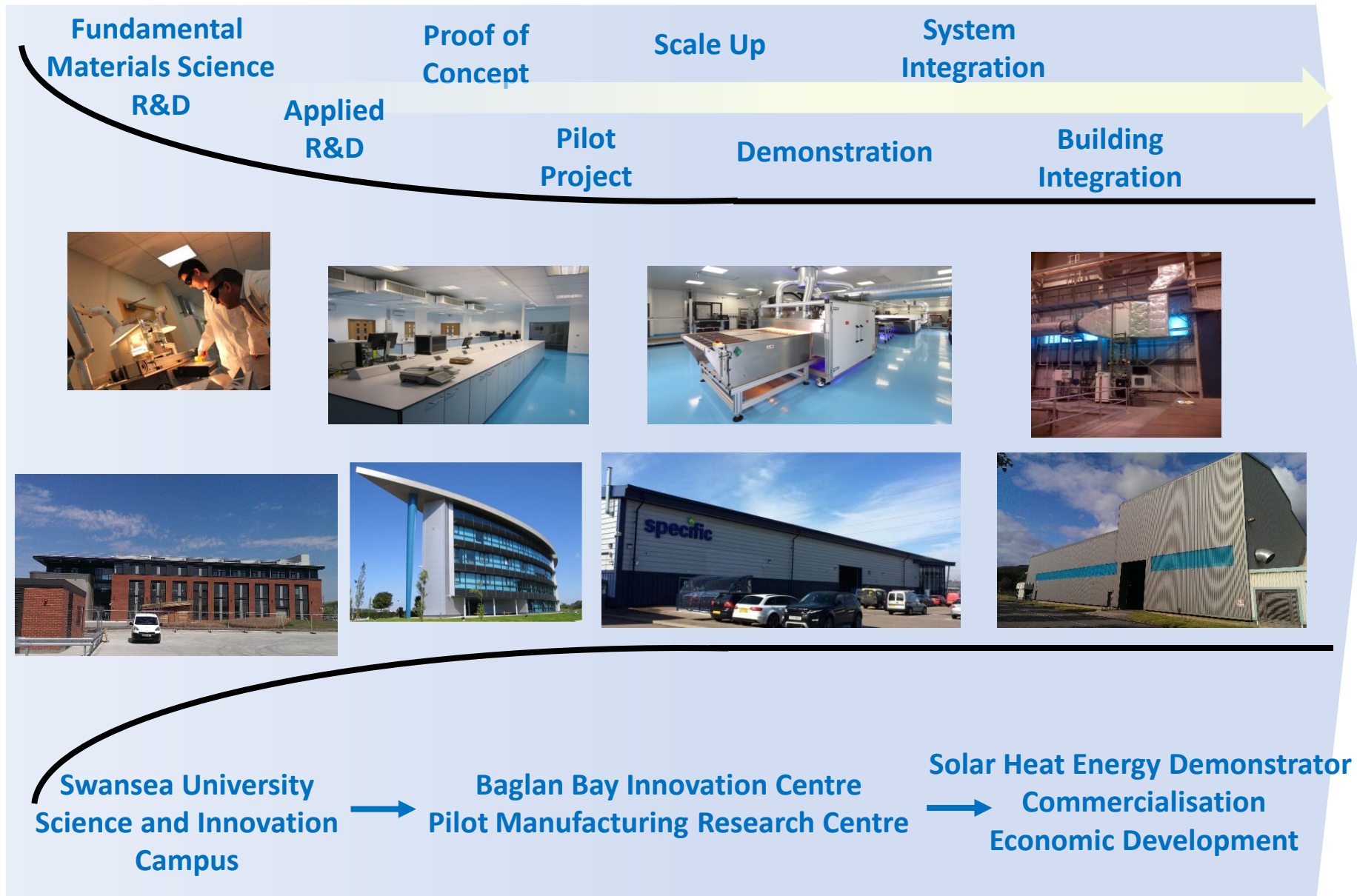


**Generate Store Release**



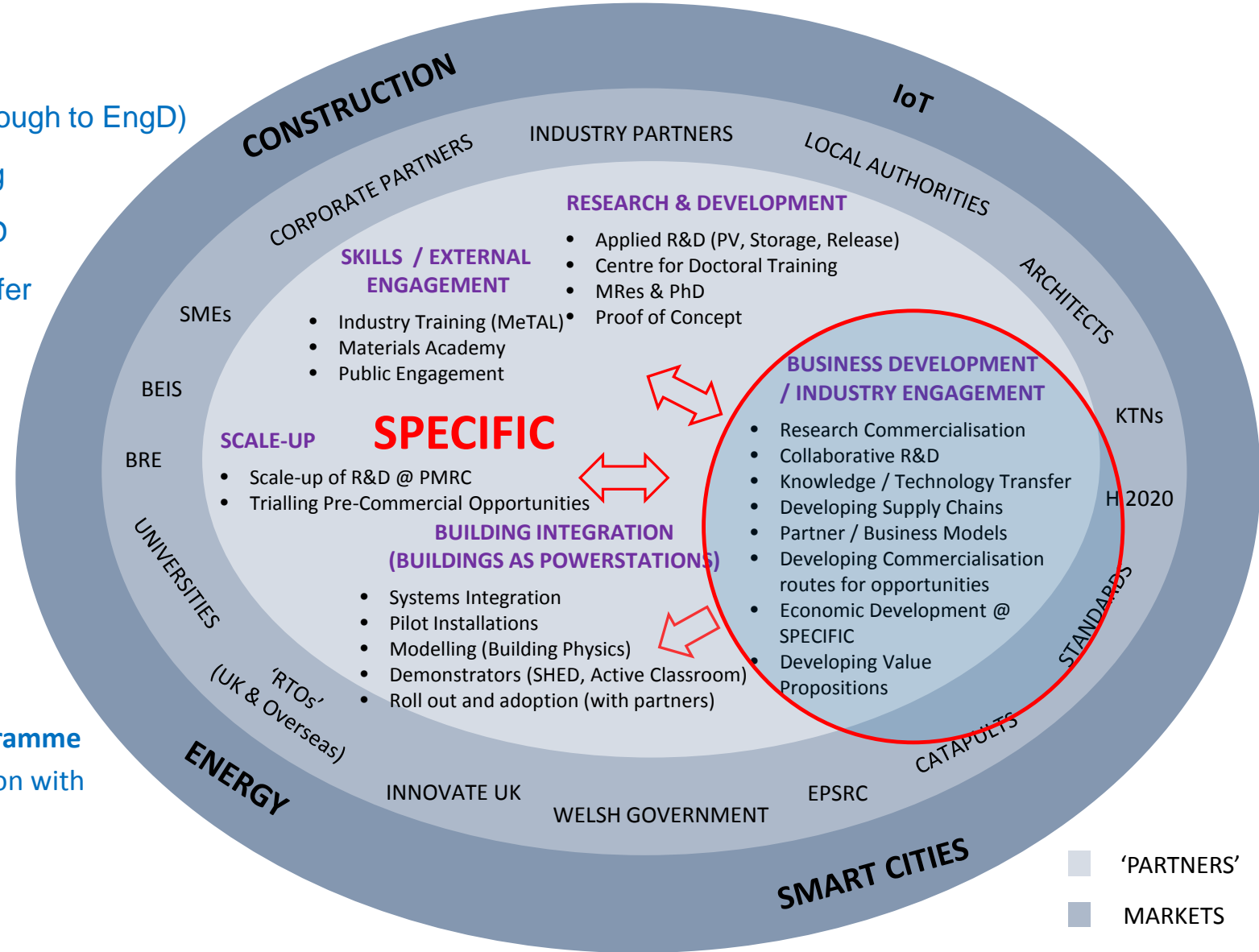
# Functional Coatings

# Buildings as Power Stations



# What do we offer?

- Advice
- Training (WBL through to EngD)
- Analysis & Testing
- Collaborative R&D
- Technology Transfer
- Proof of Concept
- Scale Up
- Demonstrators
- .....
- Building**
- Demonstrator Programme**  
(Roll out and adoption with partners)



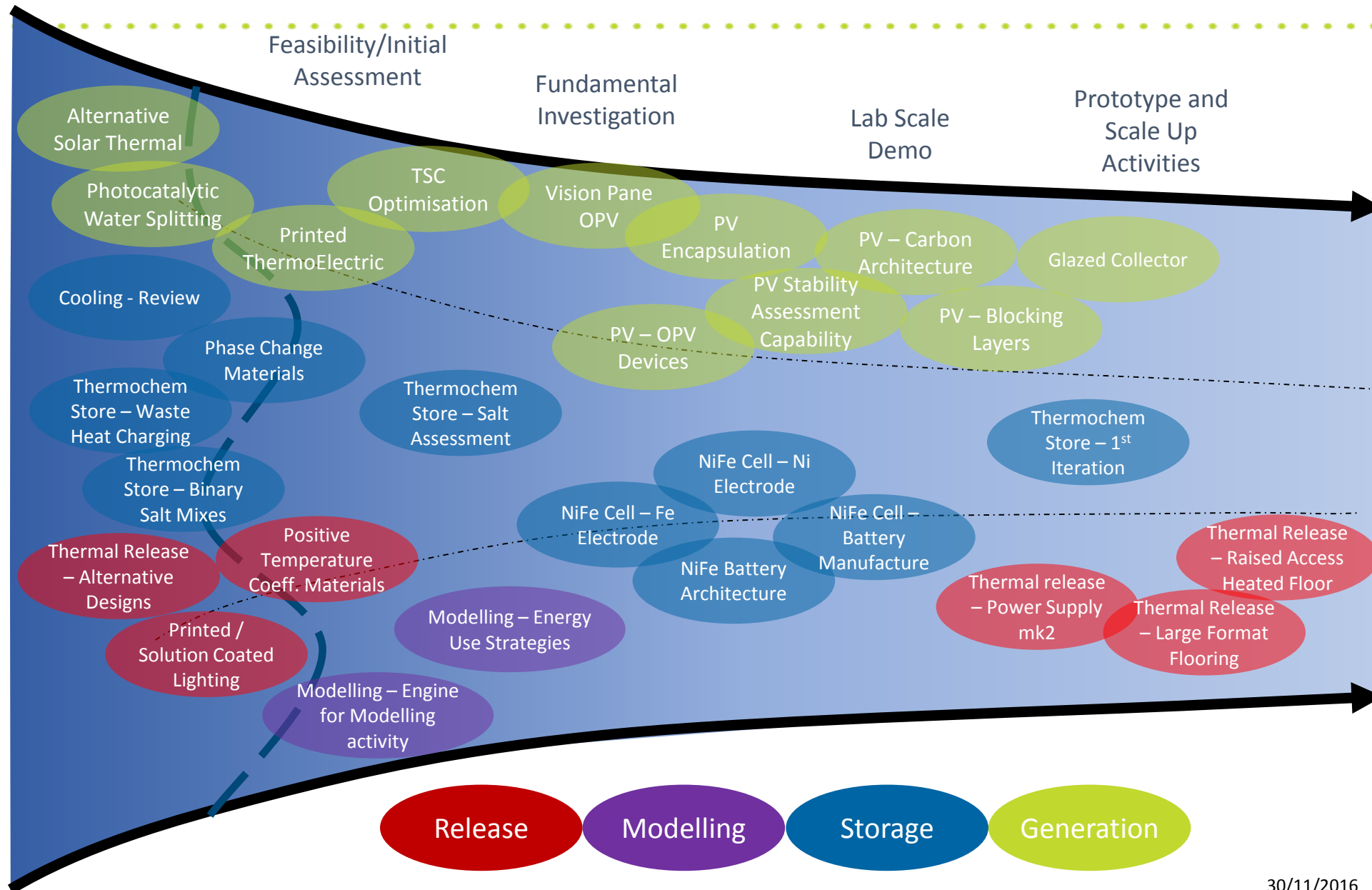
■ 'PARTNERS'

■ MARKETS

# Applied R & D

[www.specific.eu.com](http://www.specific.eu.com)

# Project Pipeline

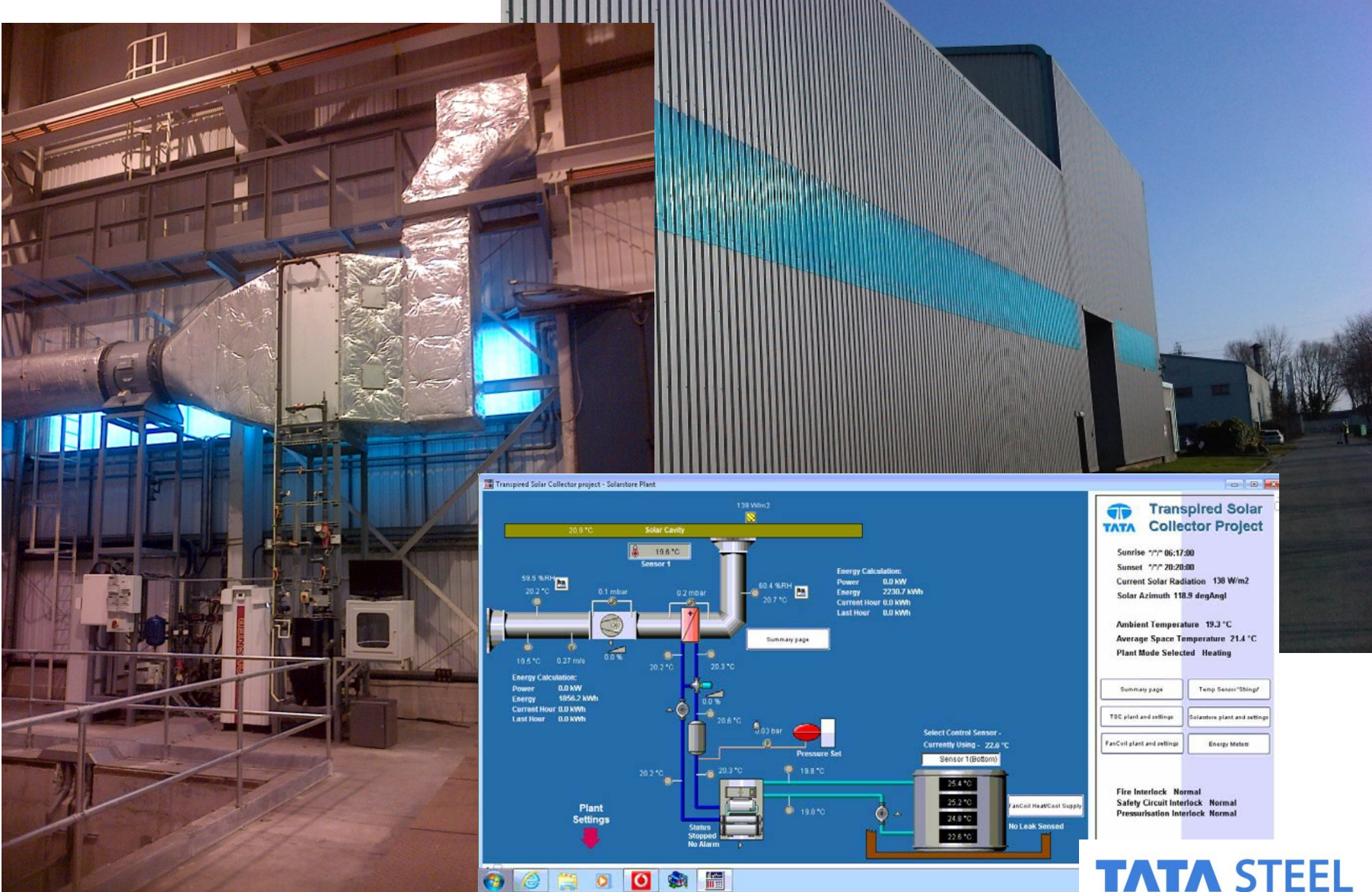




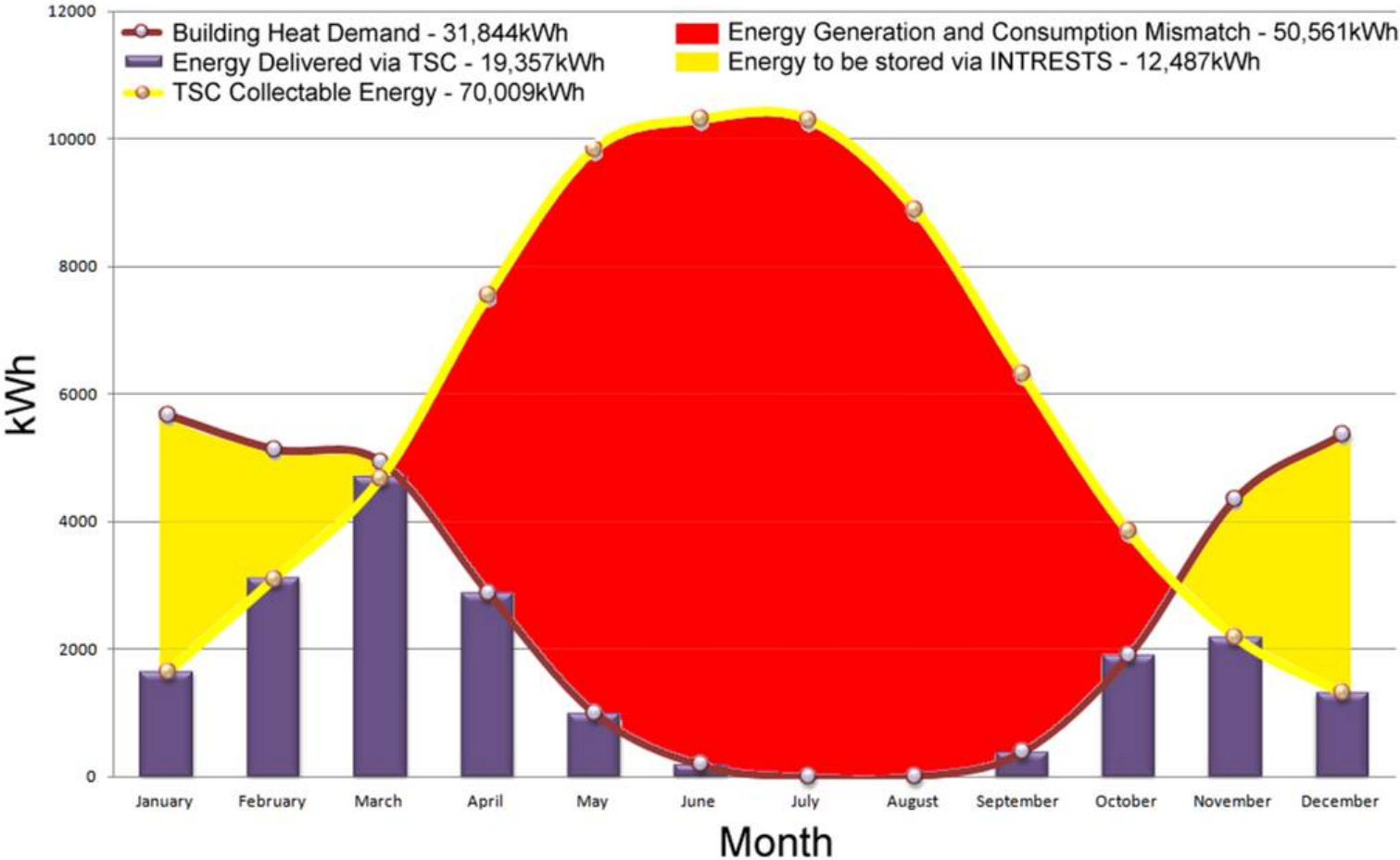
# Building Scale Demonstrators

[www.specific.eu.com](http://www.specific.eu.com)

# Solar Heat Energy Demonstrator SHED



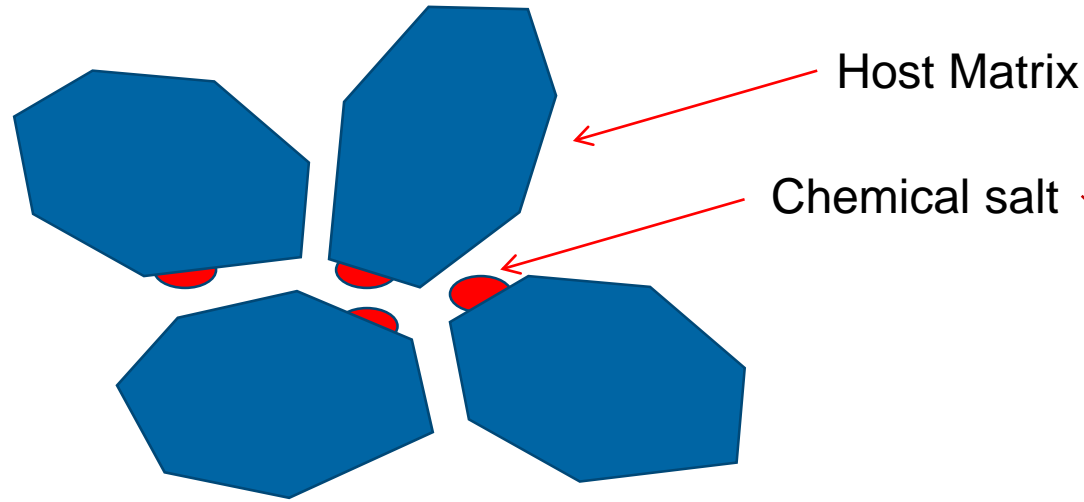
### Total Energy Delivered via TSC vs. Building Heating Demand



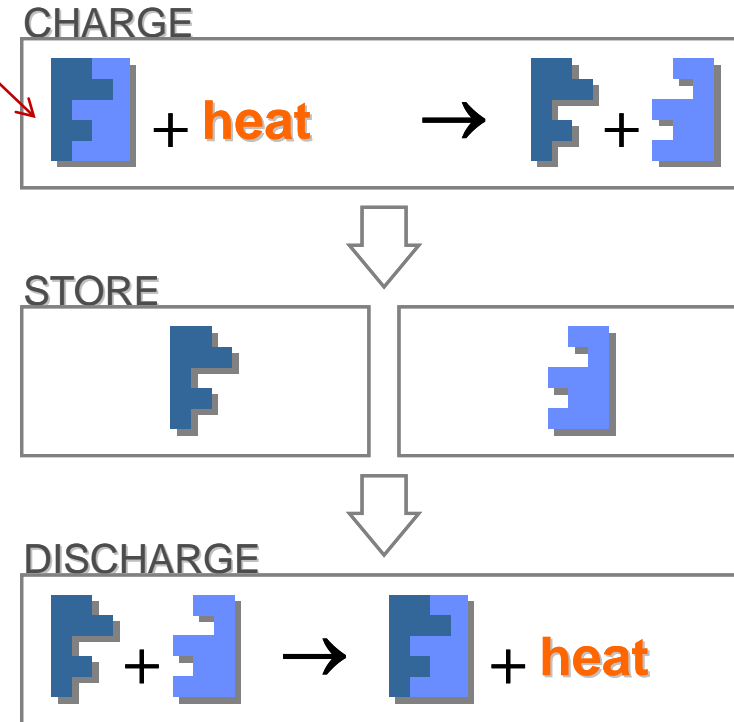
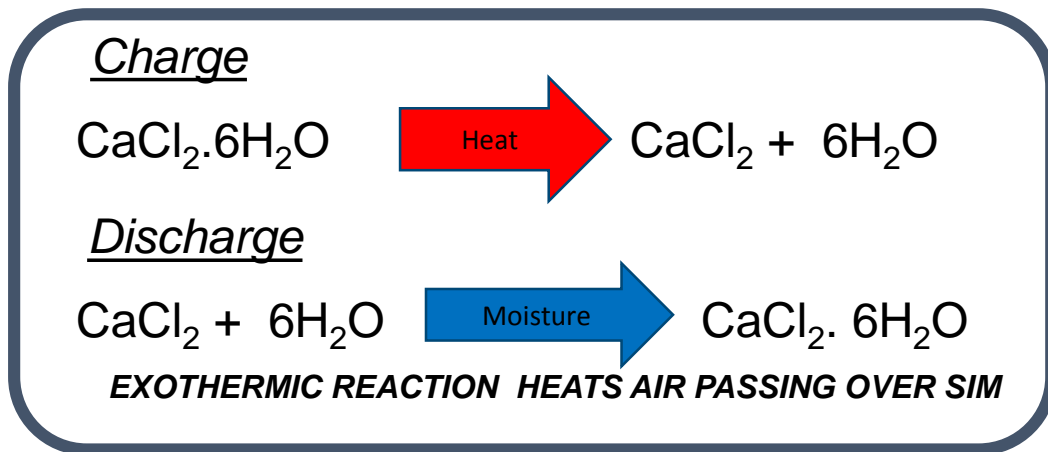




# Storage system – SIM (Salt in Matrix)



For example...



Assessment rigs Gen  
2 + 3



Nottingham University



SPECIFIC

# Solar Heat Energy Demonstrator SHED





# Our First Building as a Power Station





# Our First Building as a Powerstation

## How it works:

Building Integrated Photovoltaics (BIPV) - electricity



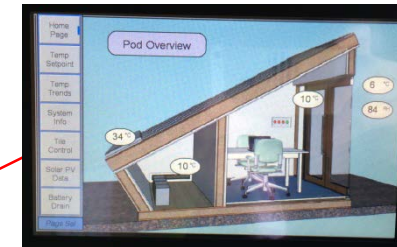
Glazed solar air collector - heating

Control System – regulates temperature and selects heating method



Batteries

It now provides a home for the Security staff on the Bay Campus



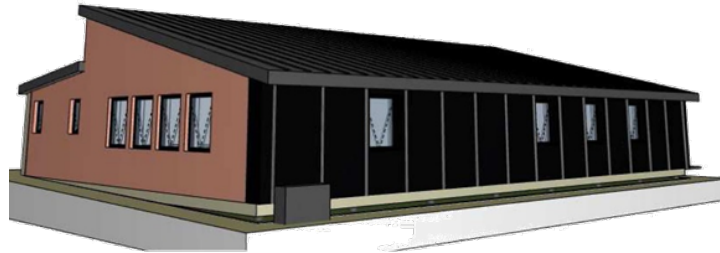
User Interface Panel

Heated coating



It does this by cleverly combining electricity and heat **generating** technologies with **storage** and **release**.

# Active Classroom

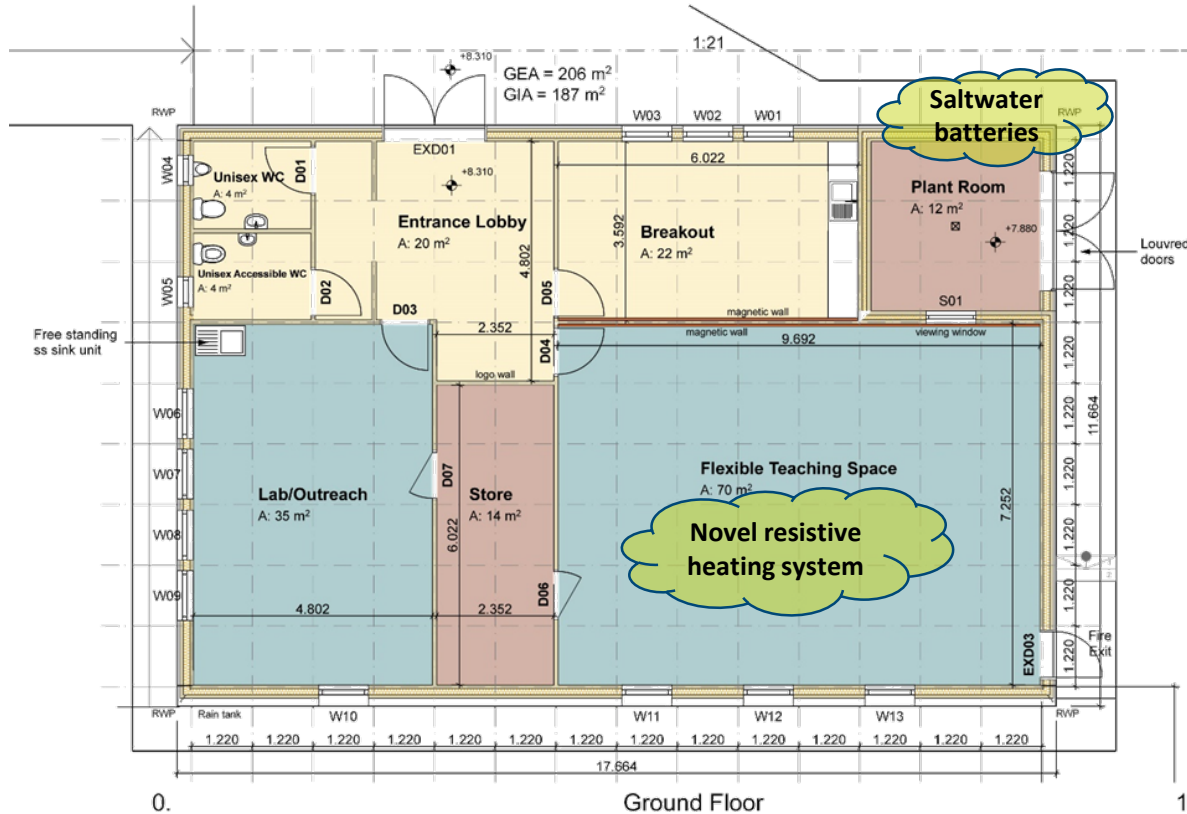


south view



north view

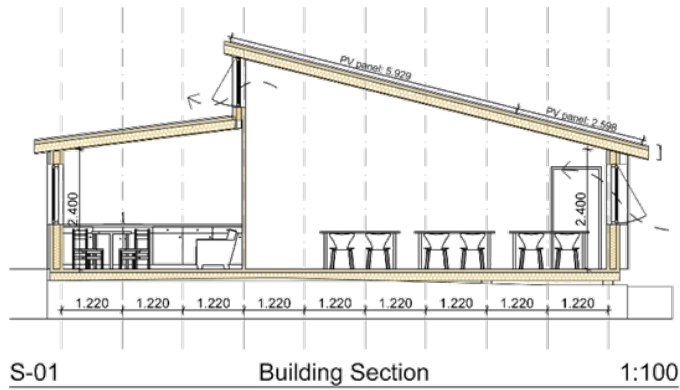
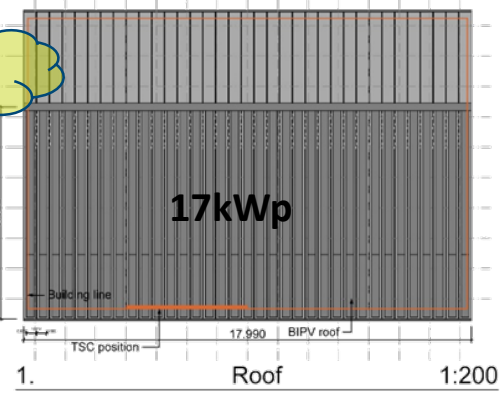
- Integrated novel renewable technologies
- Demonstrator for new technologies
- Sited at our new £450m Science and Innovation Campus
- Showcased during week of **British Science Festival**, Swansea, 6<sup>th</sup> – 9<sup>th</sup> September 2016



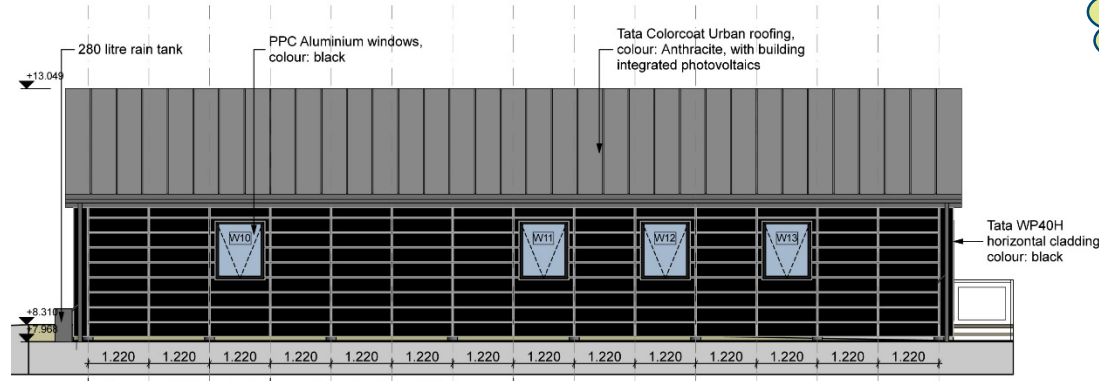
Saltwater batteries

Novel resistive heating system

First BIPV Co roof



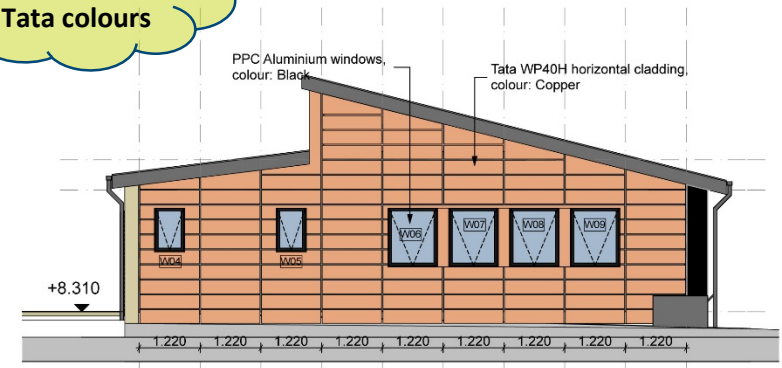
# Design Features



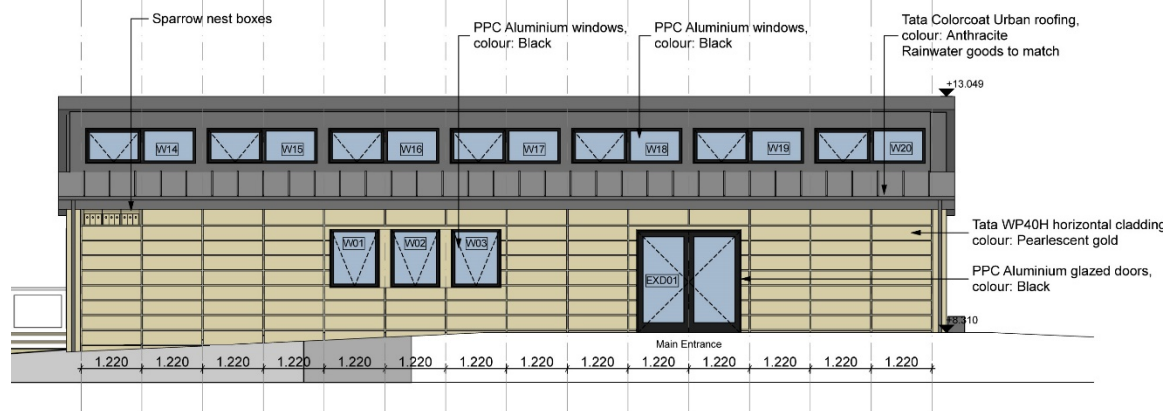
**TSC with ASHP, MVHR and thermal store**

South Elevation 1:100

**Brand new Tata colours**

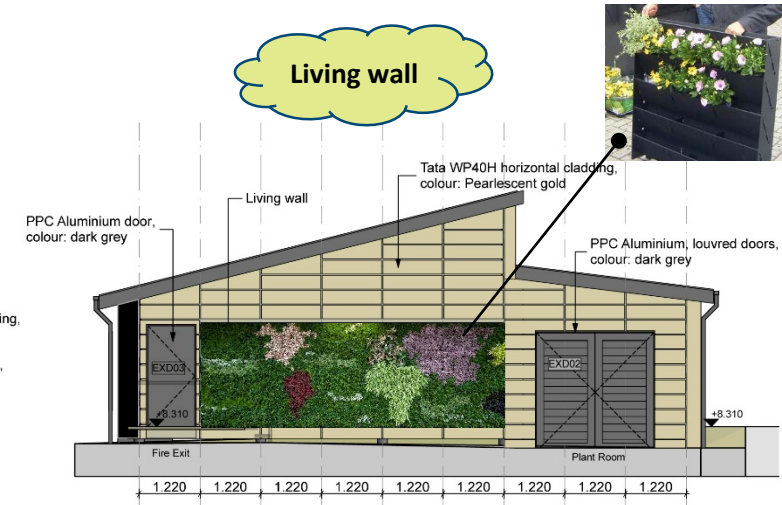


West Elevation 1:100



North Elevation 1:100

**Living wall**



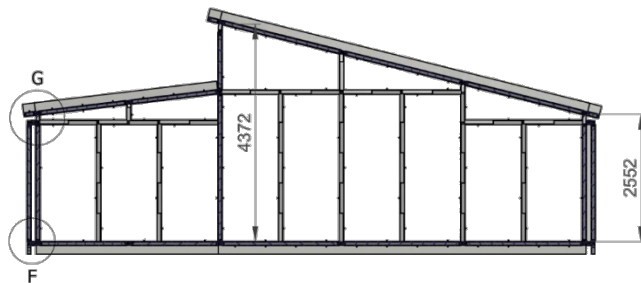
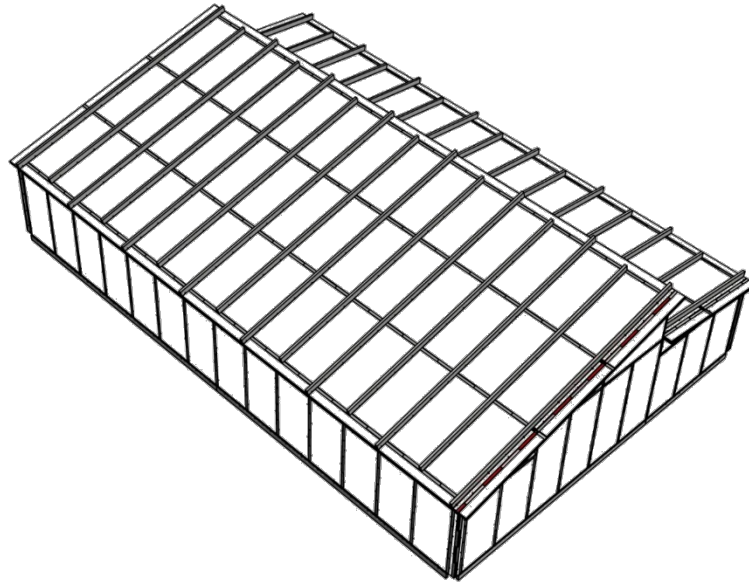
East Elevation 1:100







What the future's built on



E-E ( 1 : 50 )

New construction method – lightweight, steel framed interlocking panels forming walls, floors and roof





## TATA STEEL



New Coretinium wall panels



Brand new cladding colours

High steel content throughout building  
– 16 tonnes in superstructure alone



Two transpired solar collectors integrated into south facade





First BIPV Co roof in the UK – generating approx. 17kWp of electricity

## Solar Plants

Renewable Energy for Your Future

Their off-grid team worked with our Electrical Engineer, Richard, to assist with the design and installation of the solar to storage connectivity, working with Victron controllers and Aquion Salt Water battery technology



**WIND & SUN**  
Powering the future

Since 1984



**AQUION**  
**ENERGY**



# The Completed Building



North elevation



In use!



South and West elevations

# Neath Housing Project – Hafod Site



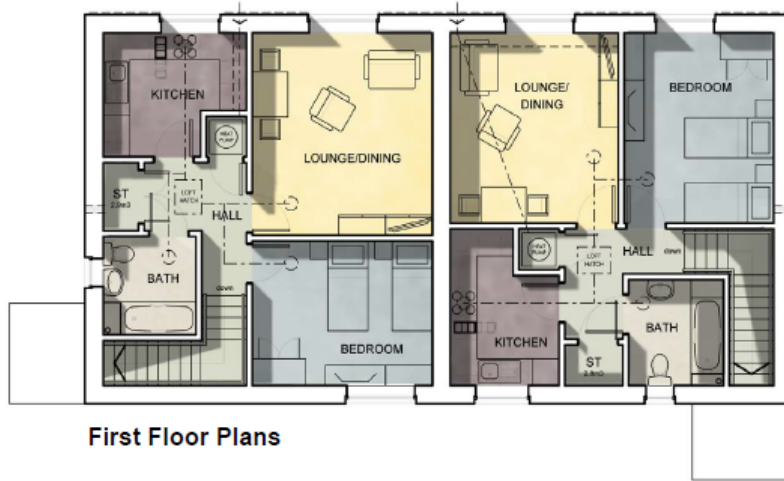
Swansea University  
Prifysgol Abertawe

pentan  
architects

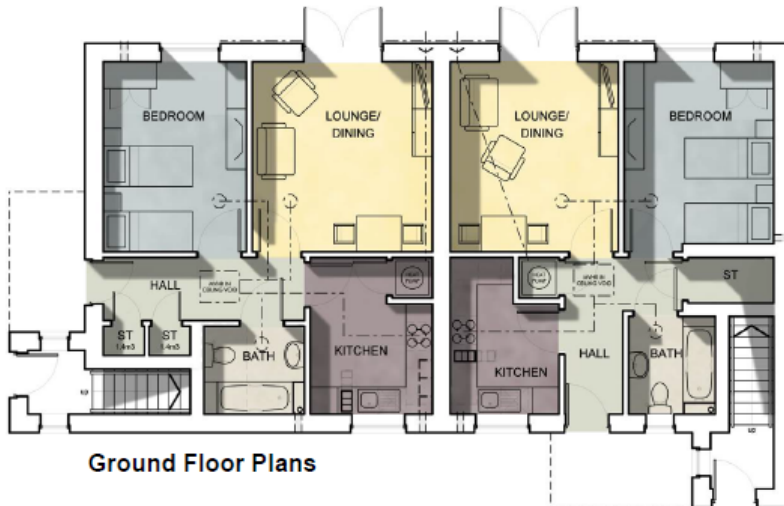




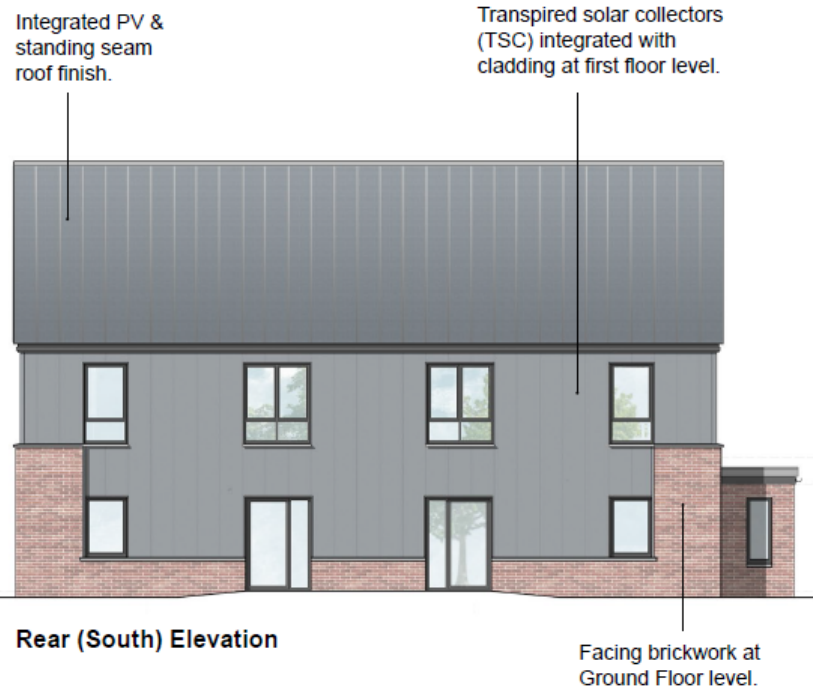
# Neath Housing Project



First Floor Plans



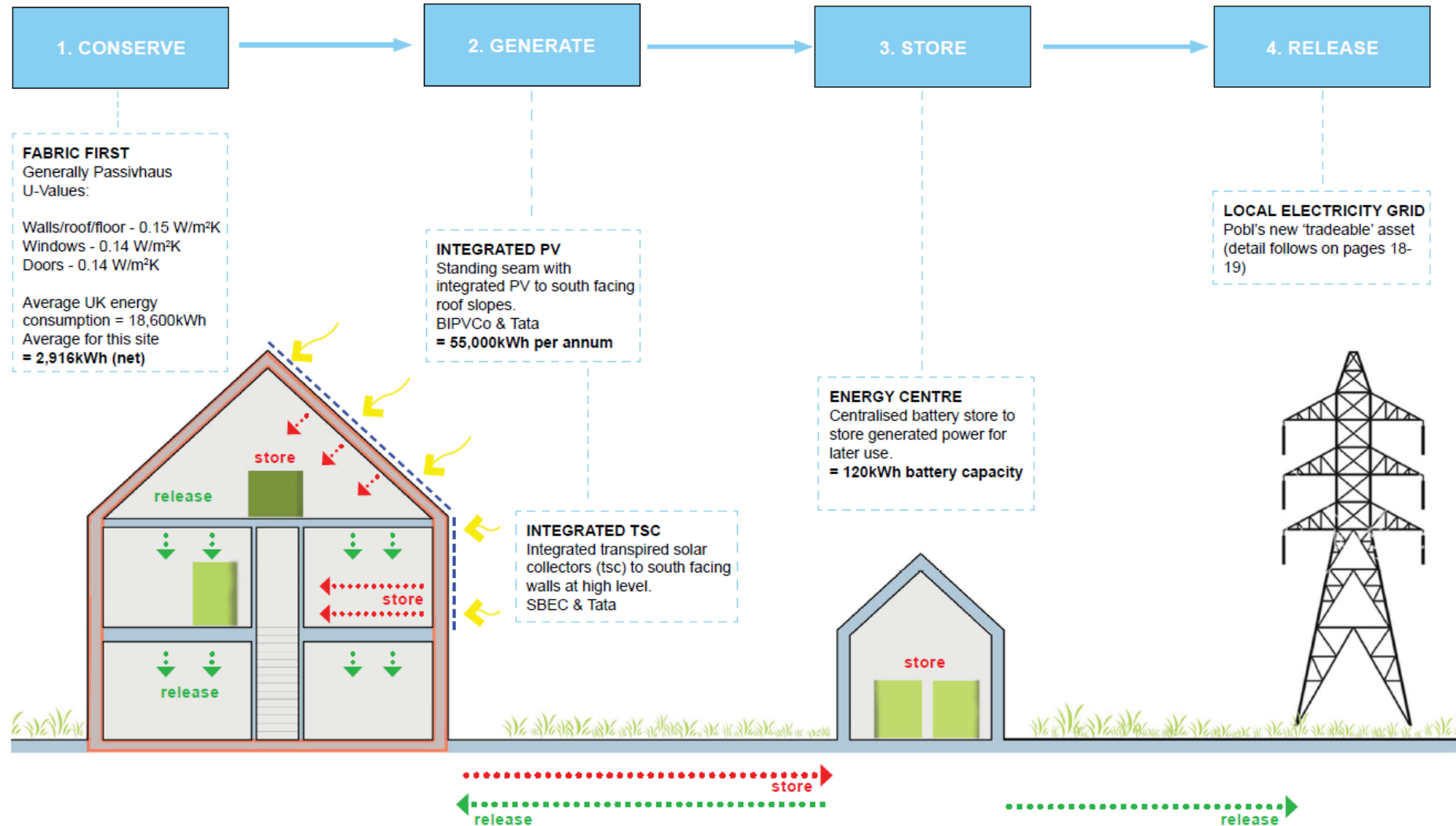
Ground Floor Plans



Rear (South) Elevation

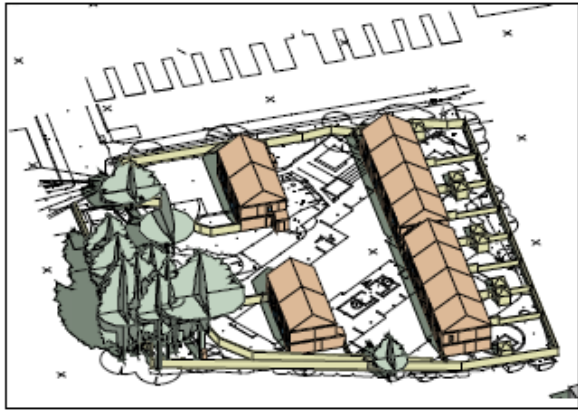


# Heat and power strategy

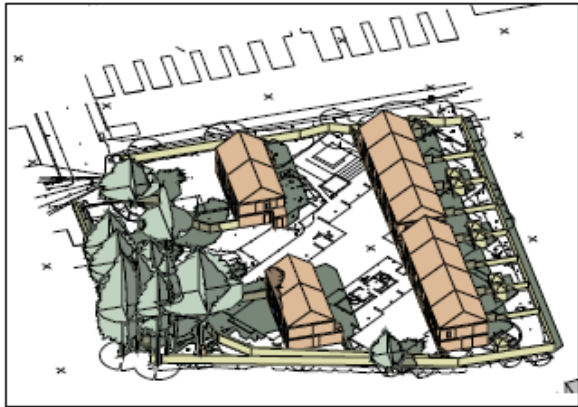


# Shadin

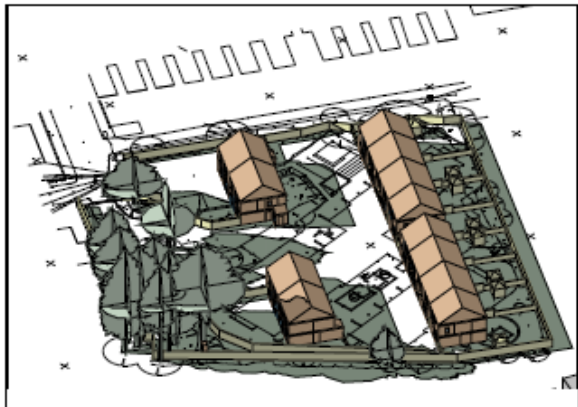
15th SEPTEMBER



09.00

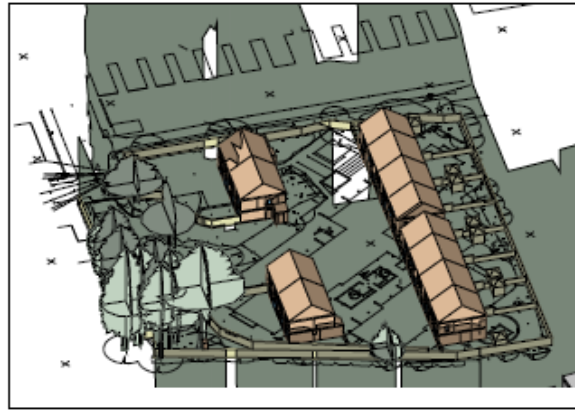


12.00

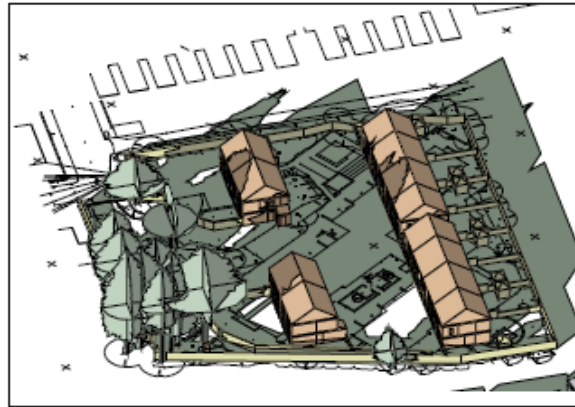


15.00

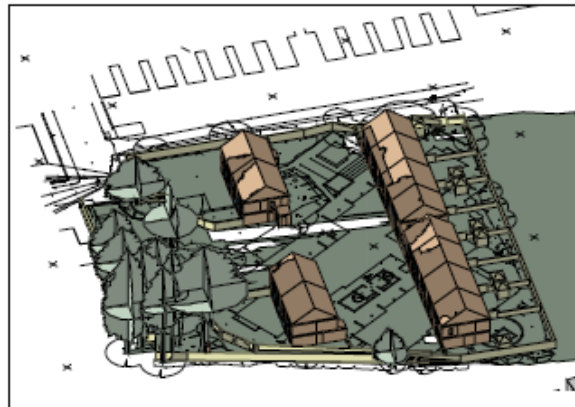
15th DECEMBER



09.00

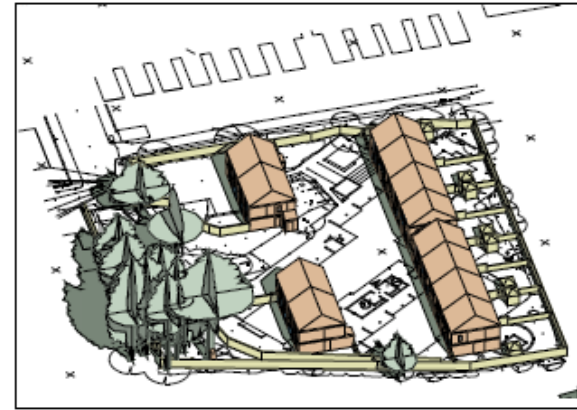


12.00

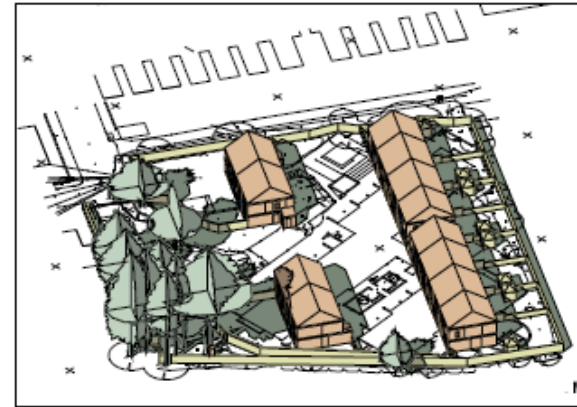


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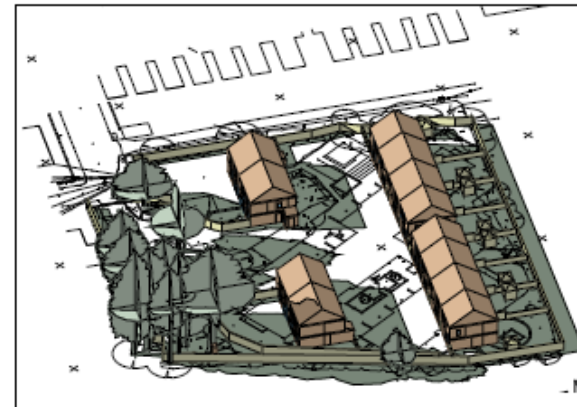
15th JUNE



09.00



12.00



15.00

# Ways of Working with Us

- Strategic
- Project-based

Many routes for collaboration;

**UK** e.g. Innovate UK  
(Energy Catalyst, Collaborative R&D Calls)

**Wales** e.g. Welsh Government  
(Smart Innovation, Innovation Vouchers)

**EU** e.g. Horizon 2020 (various strands)

....plus multi-agency **challenge-led** programmes (SBRI)

- **Direct Funding** of Opportunities / Projects
- CDT (Eng. D £9k / annum - 4 years) & MRes
- **WEFO (ERDF); Innovate UK; EPSRC – Targets / KPIs**
- **Required to report on Activity and Impact**



Led by



Swansea University  
Prifysgol Abertawe

This project has been supported by the European Regional Development Fund, through the Welsh Government in addition to Innovate UK and EPSRC



# *Our Goals...and partnership opportunities!*



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## **We are flexible how we work with others**

### **SPECIFIC will aim to deliver (with its partners) - 2016-2021**

- 20p per watt peak **building integrated photovoltaics**
  - **Building Scale Batteries** that offer off grid parity storage
  - Inter-seasonal **solar thermal generation and storage**
  - **Building demonstrators (new & retrofit)** across residential, industrial and commercial sectors
  - An enhanced **concept to commercialisation** platform
  - Be a **catalyst** for a new £1bn industry
  - 1000's **jobs** through its developed supply chains
- ....hence why we're here today!*

Thank you for listening

Dr Jonathan Williams

Business Development Manager

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07733 322 350

