

WESA – the Whole Energy Systems Accelerator

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11/05/2023



Agenda

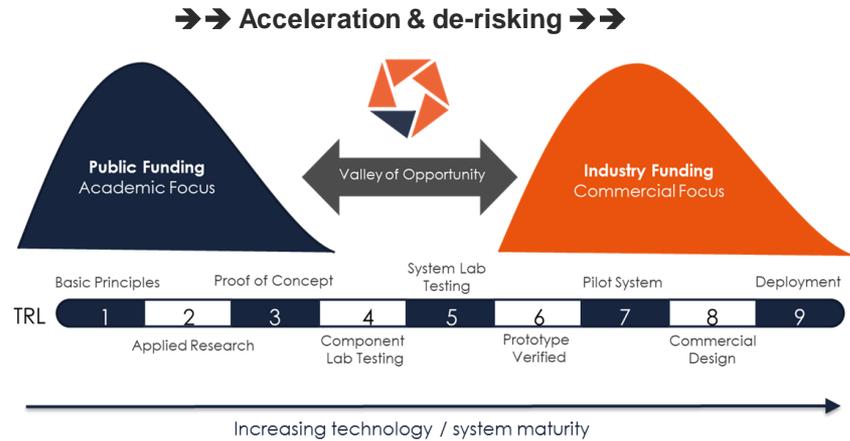
- About PNDC
- About ESC
- Whole Energy System Accelerator
- Case studies



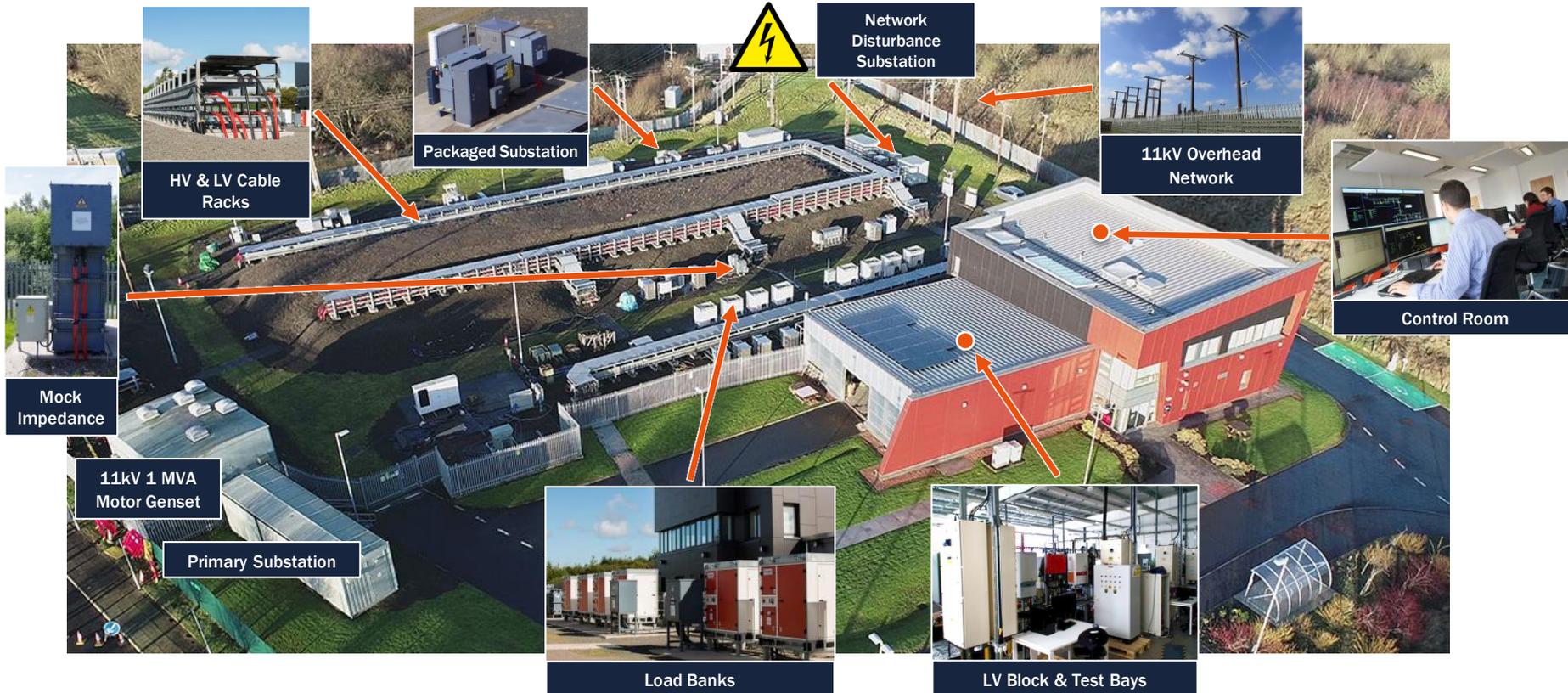
About PNDC

PNDC Overview

- University of Strathclyde industry-facing innovation centre opened in 2013 and currently celebrating a decade of innovation throughout 2023
- Focused on accelerating the development and deployment of novel energy, marine and aerospace technologies supporting net zero initiatives
- Multiple engagement models:
 - Collaborative programmes in partnership with members
 - Open access for supporting all industry
- Dedicated expert team (~ 50 staff)
- New cutting-edge whole systems facility due in 2024

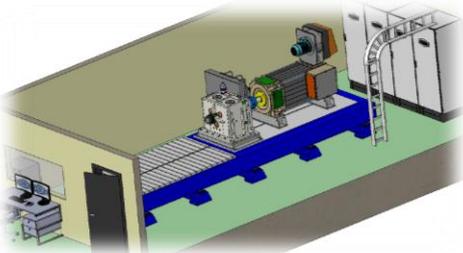


Existing Facilities (Wardpark)



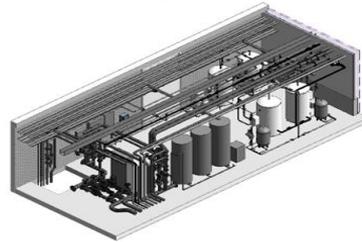
Electrical equipment (in procurement)

- ❖ 11kV distribution network
- ❖ 2.5MVA s/stn & LV network
- ❖ 1MVA DC power supply
- ❖ 1MVA AC power supply
- ❖ Real-time digital simulation
- ❖ 2 x 1MW dynamometers



Thermal facility (awaiting funding decision)

- ❖ For low carbon heating, cooling, thermal storage and heat recovery system testing and validation
- ❖ Scalable up to ~750kW, 5-90°C flow temp, system ΔT 5-40°C
- ❖ Heat and cooling emulators to mimic building heat demand



Hydrogen facility (existing + to be upgraded)

- ❖ Existing facility - 80 kg H₂ storage, 12 bar supply pressure, 9kg/hr max flowrate
- ❖ Upgraded facility - 160 kg H₂ storage, 20 bar supply pressure, 30kg/hr max flowrate



← Whole system capability →



About ESC

Catapult Network

Supporting business in transforming great ideas into valuable products and services



Technical capabilities, equipment, and other resources



Open up opportunities for innovators, in the UK and globally



Solve key problems and develop new products and services



Bridge the gap between stakeholders in the sector

CATAPULT
Energy Systems

W E S A 
WHOLE ENERGY SYSTEMS ACCELERATOR



 Main Base
 Centre

-  Cell and Gene Therapy
-  Connected Places
-  Compound Semiconductor Applications
-  Digital
-  Energy Systems
-  High Value Manufacturing
-  Medicines Discovery
-  Offshore Renewable Energy
-  Satellite Applications

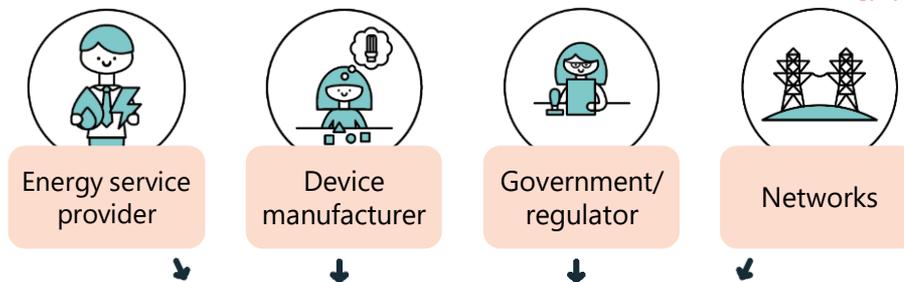
We work with

Innovate UK

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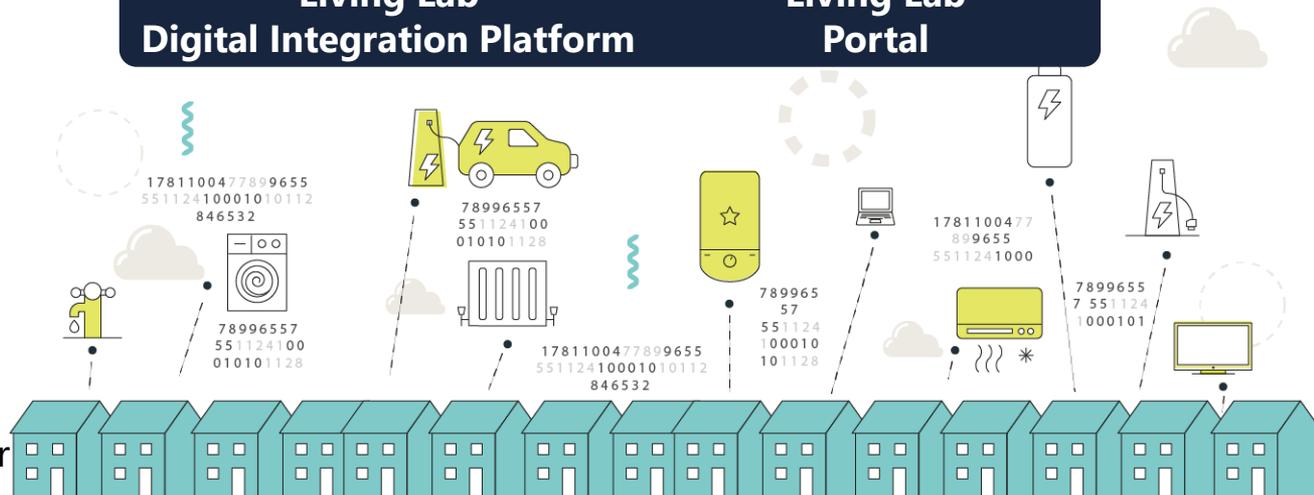
Current Living Lab capability & development

- Simple interaction with consumers
- Easy to modify to include new technologies
- Supports multiple trials
- ~2000 homes have signed up
- Variety of consumers, homes and technologies
- Scalable to '000s of homes
- Combines consumer insight and digital analysis



Living Lab Digital Integration Platform

Living Lab Portal





Whole Energy System Accelerator (WESA)

The challenge & opportunity



Radical changes to the energy system



Rapid deployment without risk to system



Accounting for real consumer behaviour

Representative, real-world test environment for the whole energy value chain



Facilities for electricity, hydrogen, heat & transport



Safe environment for developing innovations



Consumer insights built in



Mission: Unleash innovation and open new markets to capture the clean growth opportunity.



We work with
Innovate UK

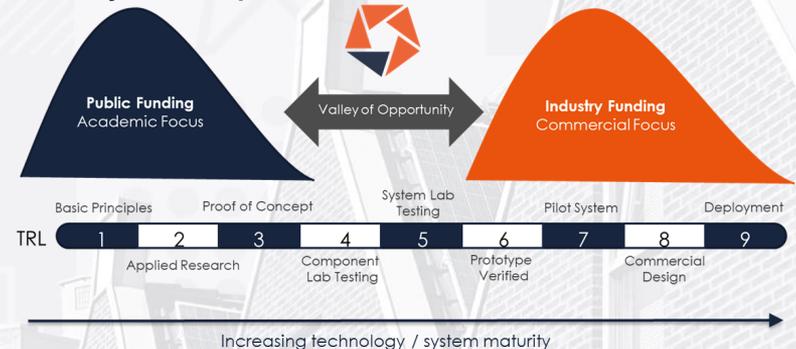
Dedicated whole system innovation facility, opened in 2013

Focus on accelerating the development & deployment of novel energy, marine and aerospace technologies

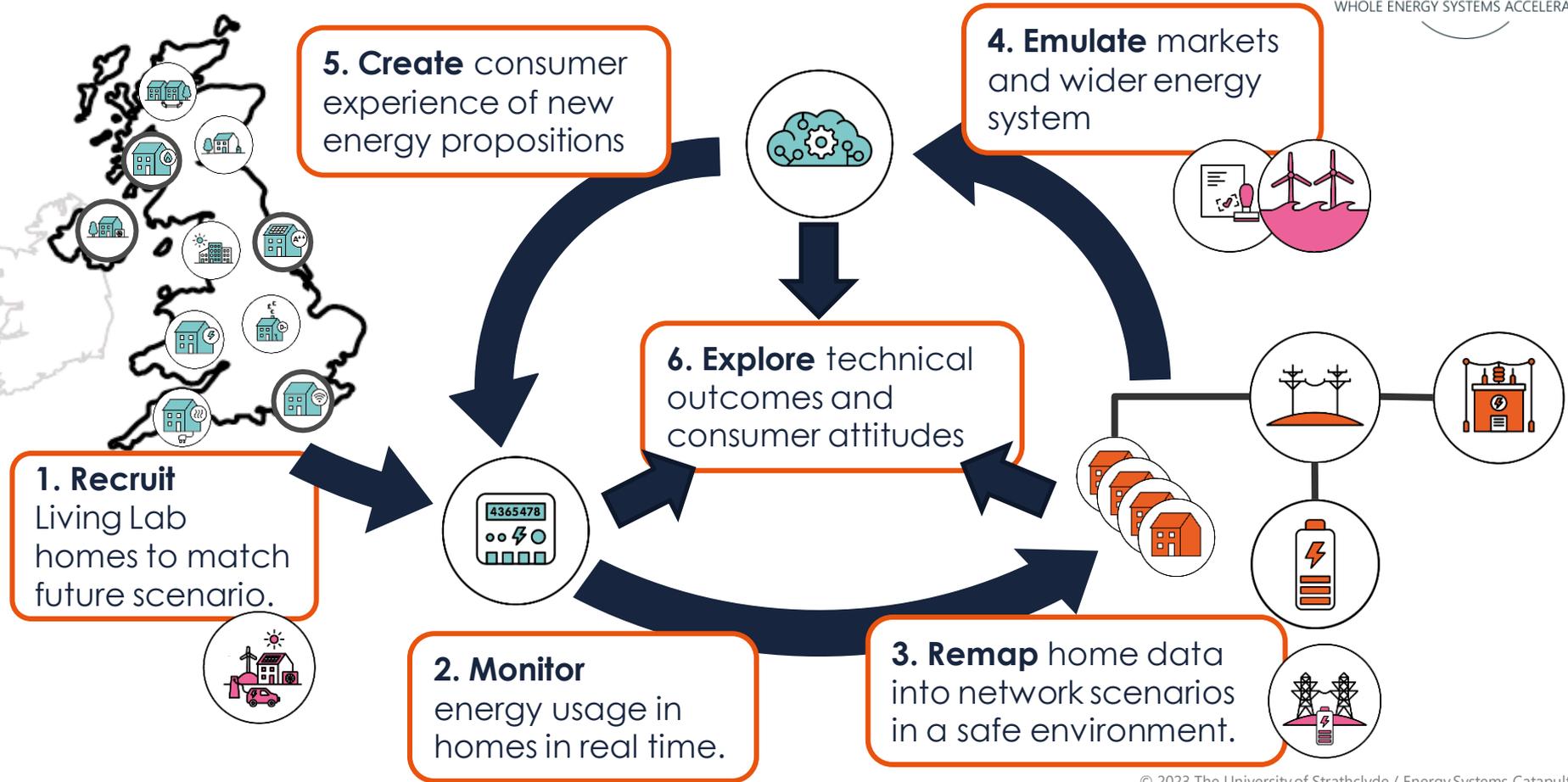
Dedicated expert team (~50 staff)

Operated in partnership with members

Open access for engagement with industry – multiple collaboration models



Feedback loop architecture





Case studies

Neighbourhood Green (Feb 2022 – Sep 2023)

🔧 **Aim:** Assess future normal domestic loads and After Diversity Maximum Demand (ADMD) and its impact on the grid

🔧 **Approach:**

- 🔧 Gather historic data/insight from Living lab homes and other trials
- 🔧 Real world trial at 60 homes with at least one form of LCT to monitor energy usage over time
- 🔧 Virtual clustering of living lab homes and assessing the impacts in different weather conditions including extreme scenarios at PNDC

🔧 **Learnings:**

- 🔧 Under severe weather
 - 🔧 HPs run at full capacity → no ADMD
 - 🔧 ~20% HPs on UK GDN → 20% transformer overloading
 - 🔧 50% HP → transformer overload by 60% → hotspot temperature of around 150 degrees → significant reduction of transformer life

EXTEND: Longer Duration Energy Storage Demonstration (Feb 2023 – Apr 2024)

🔧 **Aim:** Evaluate the effects of novel flexible electrified heating systems on the electricity system, using a fleet of 100 prototype systems deployed in homes across the UK

🔧 **Approach:**

- 🔧 Create a WESA scenario that groups 100 dispersed EXTEND systems into a single network environment
- 🔧 Explore ability of flexible heating systems to manage distribution network constraints
- 🔧 Understand consumer experience of Demand Side Response events



Thank you

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