

# PNDC Thermal Innovation Facility

**Dr Callum Rae**

Senior R&D Engineer

All-Energy: 10th May 2023

# About PNDC

University of Strathclyde industry-facing innovation centre opened in 2013 and currently celebrating a decade of innovation throughout 2023.

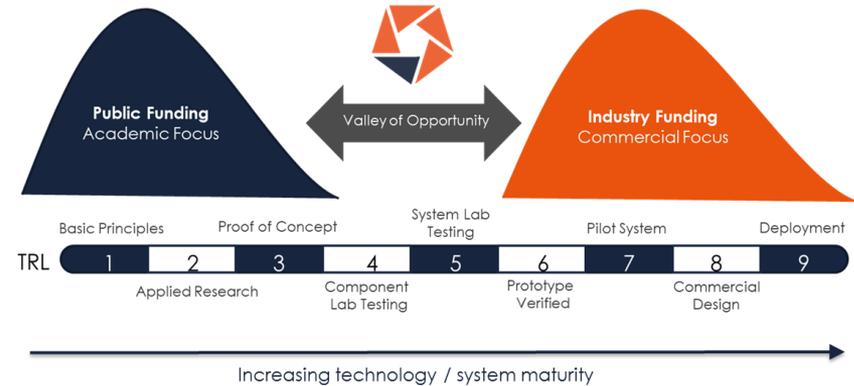
Focussed on accelerating the development and deployment of novel energy, marine and aerospace technologies supporting net zero initiatives.

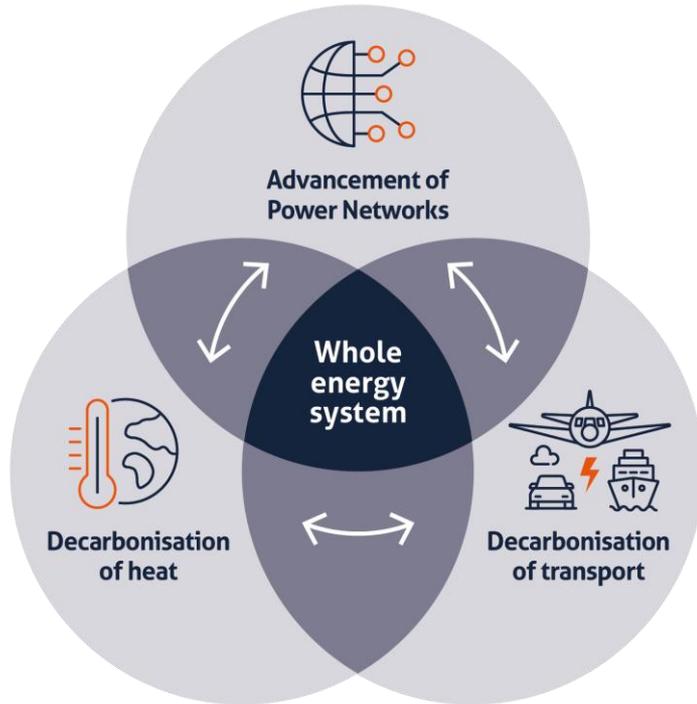
Dedicated expert team (~ 50 staff).

Multiple engagement models:

- Collaborative programmes in partnership with members.
- Open access for supporting all industry.

## →→ Acceleration & de-risking →→





Building on the established track record in innovation activities in power networks, PNDC continues to play an active role in advancement of power networks and expands the innovation program in the following activities:

- ▶ **Decarbonisation of transport** and its interfaces with other energy vectors (particular focus on electrification infrastructure).
- ▶ **Decarbonisation of heat** and its interfaces with other energy vectors (particular focus on electrification of heat).
- ▶ **Whole energy system** activities, which includes the Whole Energy Systems Accelerator (WESA), data collection and analysis, and whole energy system solutions.

## The scale of the challenge is vast:

-  Heat accounts for ~37% of total UK carbon emissions.
-  About 5% of UK homes currently have low carbon heating, with 85% (~24.5 million homes) heated by natural gas.
-  Currently, ~20,000 homes are retrofitted for low carbon heat per year. To meet the UK's 2050 Net Zero target, the required figure is ~20,000 *per week*.

*More, better, faster...*

## Key innovation challenges:



Cost & performance uncertainty



Technological diversity



Systems integration complexity

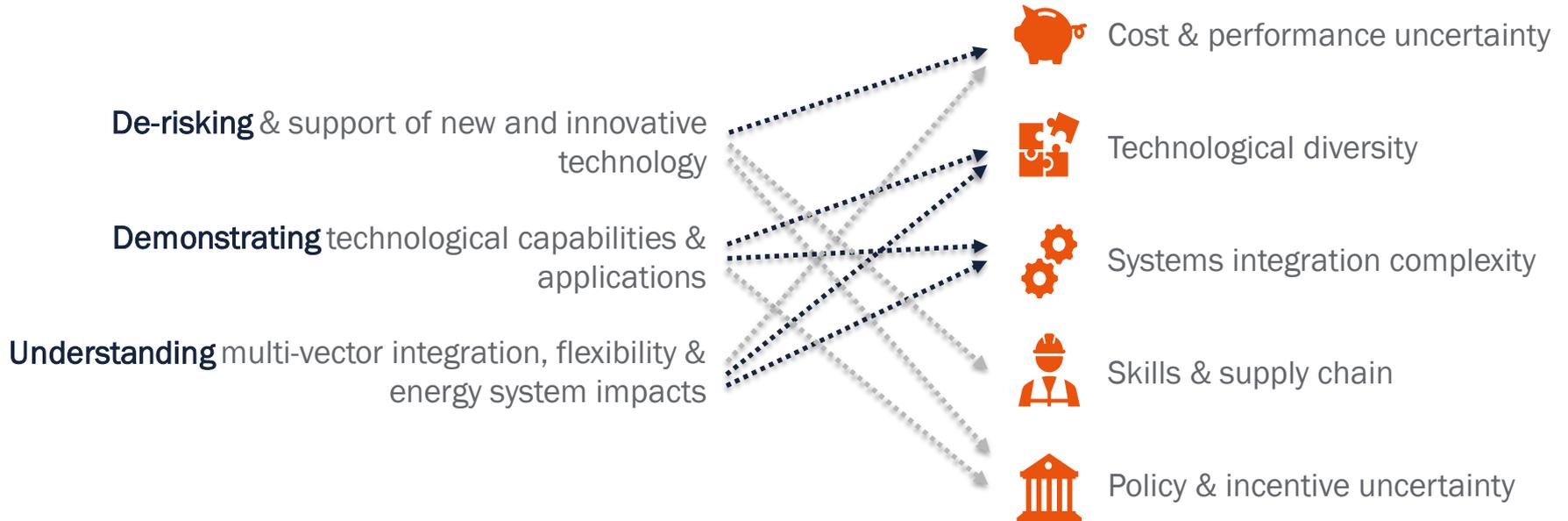


Skills & supply chain



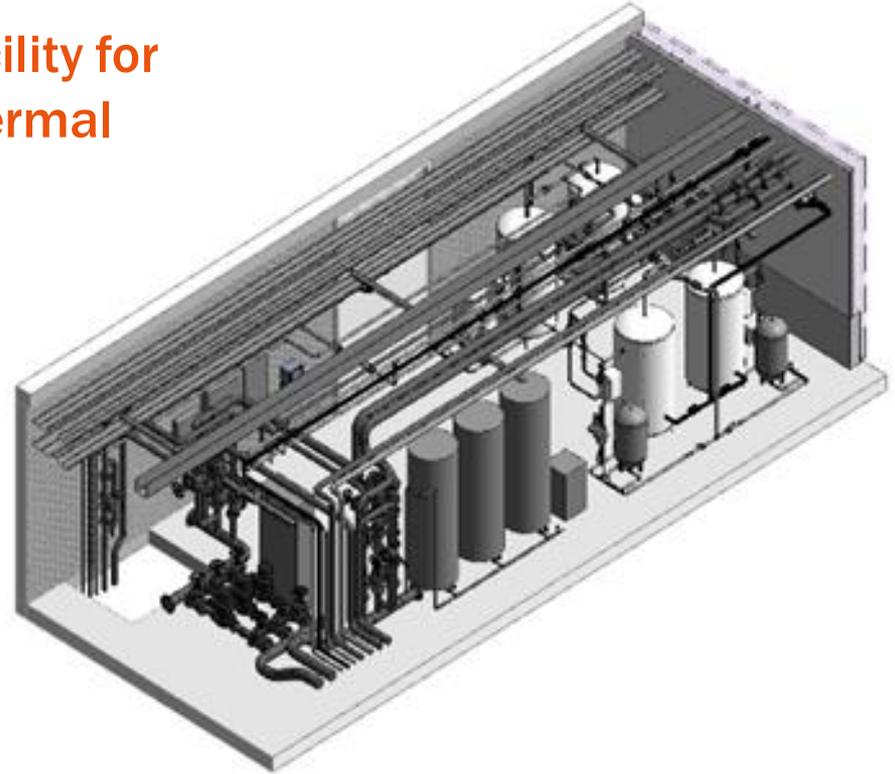
Policy & incentive uncertainty

# How can PNDC address innovation challenges?



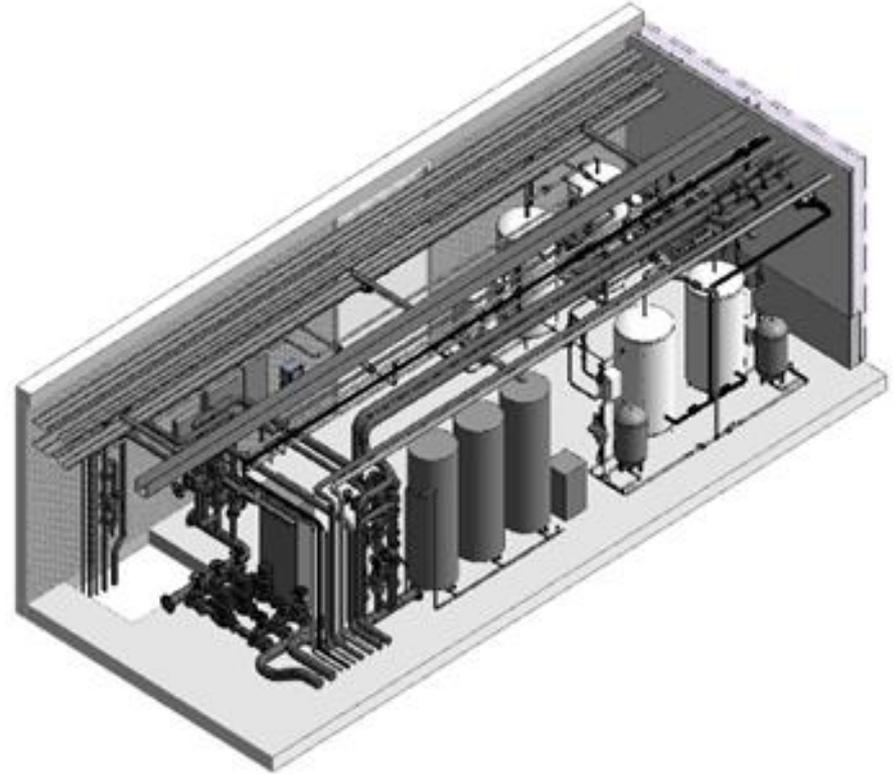
## A dedicated test & demonstration facility for driving innovation in low-carbon thermal technologies and systems.

- ✦ Flexible, scalable and fully integrated with new and existing PNDC and University of Strathclyde capabilities.
- ✦ Located at existing Rolls-Royce facility at Inchinnan, near Glasgow Airport.
- ✦ Due to be operational in 2024.



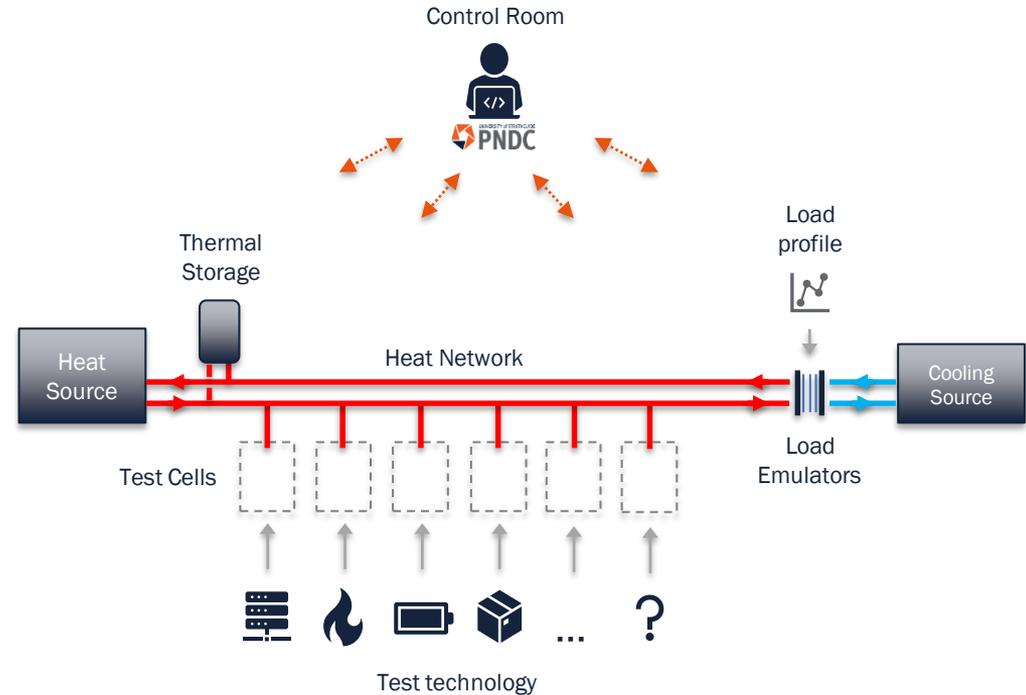
## Features:

- ✦ Maximised flexibility, instrumentation and control.
- ✦ 1MW capacity, with dedicated 750kW heating and cooling sources and thermal storage.
- ✦ Flexible design capable of testing devices from domestic to commercial scale (<10kW to 1MW).
- ✦ Working temperatures of 5-90 °C, and  $\Delta T$  of 5-40 °C.
- ✦ Configurable heating Load Emulators to mimic demands from buildings and processes.
- ✦ Dedicated Hydrogen supply.

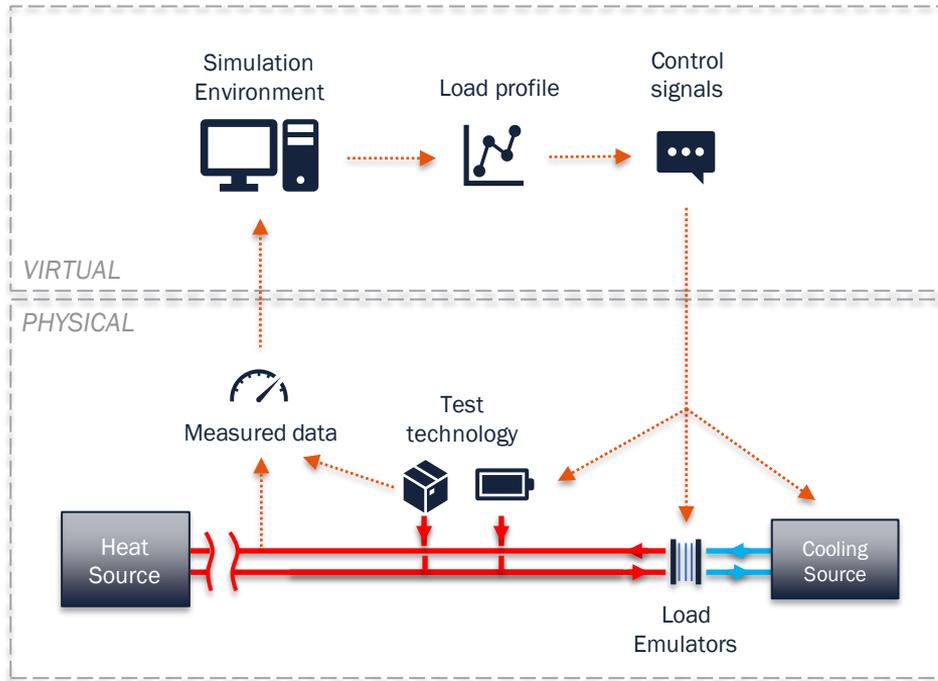


# How it works...

- System consists of parallel heating and cooling networks.
- Equipment being tested is connected to the network via 6 Test Cells.
- Heating demand profiles (actual or simulated) are implemented via Load Emulators.
- Measured data (temperatures, flow rates, pressures...) are fed back to the on-site Control Room, where the entire system is monitored and controlled.
- This allows multiple technologies, control strategies and demand scenarios to be tested.



# Capability Example: Hardware in the Loop



**Test & demonstrate real-time system performance under a range of conditions**

- Frequency < 1min
- Simulation environment generates heating load profiles based on measured data.
  - Changes in load translated into system control signals.
  - Measured physical data imported into simulation environment.

# Collaboration Opportunities

## Examples of potential use cases include:

- ✦ Performance testing and demonstration of novel components and systems (generation, storage, metering, combinations...)
- ✦ Electrified heating for flexibility
- ✦ Heat network/system control strategy testing
- ✦ Demand reduction impact assessment
- ✦ Retrofit sizing and optimisation
- ✦ ...

*Have we missed anything? Let us know...*



Scan me to get in touch



Or come and find us at  
Stand G50

**PNDC** 62 Napier Road, Wardpark,  
Cumbernauld G68 0EF

**e** [pndc@strath.ac.uk](mailto:pndc@strath.ac.uk)

**t** +44 (0) 01236 617 161

**w** [pndc.co.uk](http://pndc.co.uk)

**t** @PNDC\_UK

**in** /company/pndc

**y** @pndcstrathclyde

**ig** @pndcstrathclyde