Delivering a high power electric transport ecosystem : from grid to vehicle (and back again)

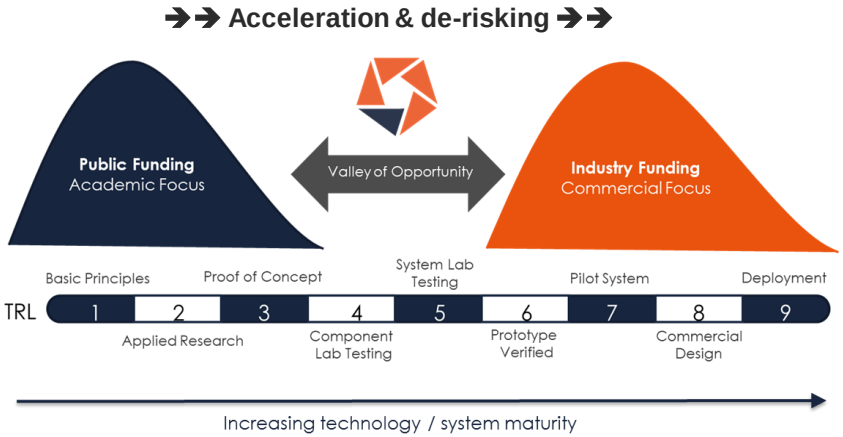
Daniel Cutting

Head of DER-IC – Scotland

10th May 2023

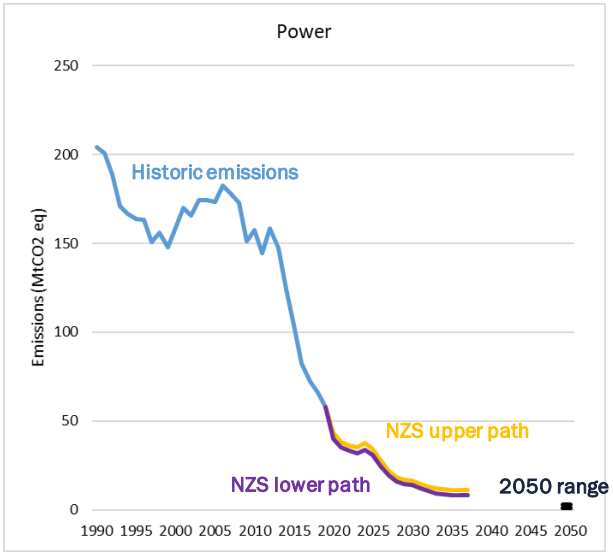
PNDC Overview

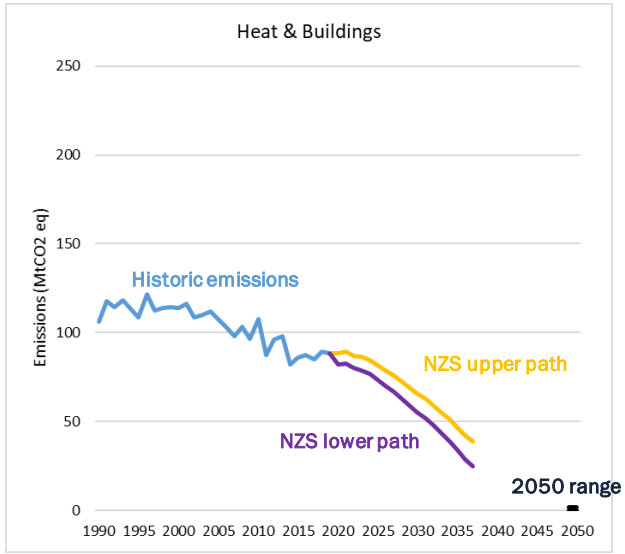
- University of Strathclyde industry-facing innovation centre opened in 2013 and currently celebrating a **decade of innovation** throughout 2023
- Focussed on accelerating the development and deployment of novel energy, marine and aerospace technologies supporting net zero initiatives
- Multiple engagement 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

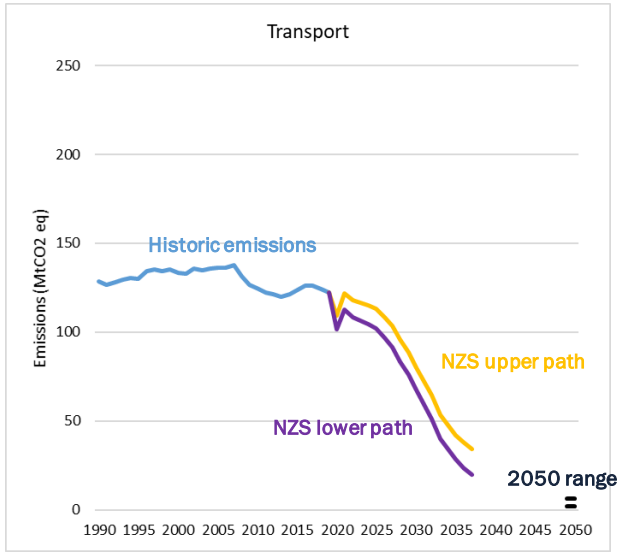


Pathways to net zero*

Major interventions needed to decarbonise heat and transport; increased interaction between sectors required

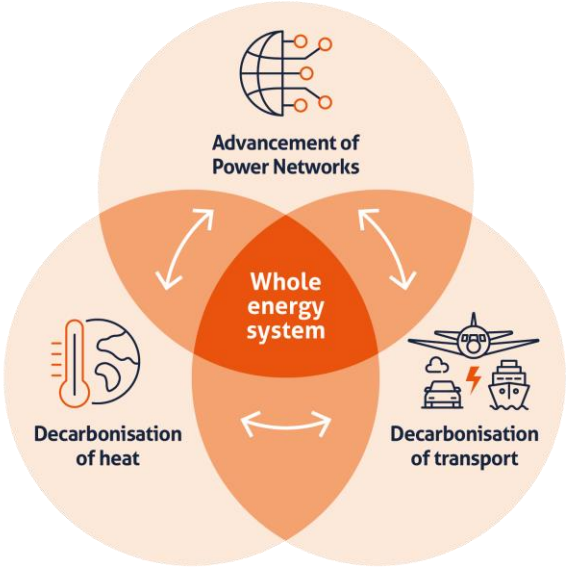






* Data taken from HM Government's Net Zero Strategy, October 2021

PNDC – A Whole Systems Approach



Advancement of Power Networks

- Asset Management
- Digitisation
- Informatics
- Comms & Cyber Security
- Power Hardware in the Loop (PHiL)
- LV and 11kV network validation

Decarbonisation of Heat

- Heat sources, e.g. heat pumps
- Heat storage
- Heat networks
- Cooling systems
- Hydrogen for heat

Decarbonisation of Transport

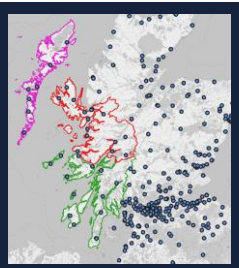
- HGV, marine, aero and rail systems
- Power electronics convertors
- LVAC and LVDC systems
- Drivetrains
- Electrification infrastructure

PNDC Transport Timeline – Key Projects

Ecosystem

- PNDC opens 2013, creating an open access facility for energy systems innovation including assessment of EVs on the UK power system

- **Interreg funded FASTER** project – EV charge point forecasting & site identification for 24 rapid EV charge points (with HITRANS)



- **Driving the Electric Revolution – Industrialisation Centre** DER funded investment in MW-scale Power Electronics, Machines and Drives validation equipment

Scotland Industrialisation Centre

Network Impacts of EVs + Device Testing

Smart Grid + Vehicle Power Systems Focus

Whole Systems Electricity & Transport + Vehicle charging, storage and powertrains

2013 2018 2021 2023

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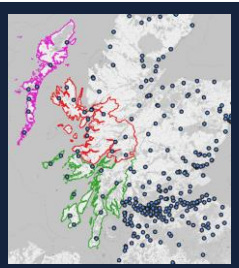

Driving the Electric Revolution – Industrialisation Centre
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Vehicle Systems

Alexander Dennis Wireless Bus Charging Pilot

MOD Naval Platform Power Systems Modelling

HV-Systems
Development and validation of Hydrogen electric HGV

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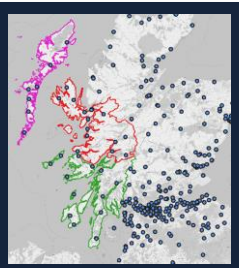

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Enabling Technologies

- **Trojan Energy Pop-up Charge Point** Performance Testing

- **MOD Flywheel testing on simulated naval power system**

- **Fuuse/TPS V2X:** V2G system development & demonstration

Network Impacts of EVs + Device Testing (2013 – 2018)

Smart Grid + Vehicle Power Systems Focus (2018 – 2021)

Whole Systems Electricity & Transport + Vehicle charging, storage and powertrains (2021 – 2023)

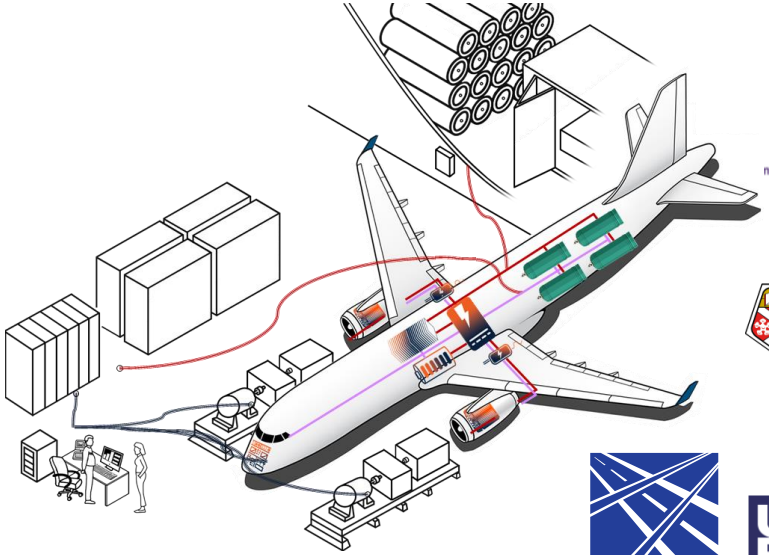
New Whole Transport System Decarbonisation Facility

Vision

A unique manufacturing and test facility for the decarbonised mobility sector, not available elsewhere in UK or Europe. The accelerated growth of a decarbonised transport whole systems and manufacturing hub, promotes Scottish Government colocation principles, enhancing the value proposition to industrial end-users. Builds on existing experience across electrical systems development, testing and manufacturing across University of Strathclyde

Facilities

- Aero/Marine/HGV/Rail Electrical Systems and Propulsion focus
- MW-Scale electrical systems and propulsion testing
- Multi-vector Solution Testing (e.g. battery, fuel cell)
- H2 (storage and use) & Heat Networks (heat exchangers)
- Low carbon mobility capabilities
- c£10M of existing manufacturing and testing equipment
- Office space for > 100 staff
- Potential for Secure Labs for University partners



Partners

NMIS National Manufacturing Institute Scotland

CATAPULT npound Semiconductor Applications

University of Strathclyde PNDC

University of Strathclyde Glasgow

Funders

TRANSPORT SCOTLAND COMHDHAIL ALBA

UK Research and Innovation

Collaboration Opportunities

PNDC supports the development and deployment of whole systems innovation - advancing energy system decarbonisation and creating new opportunities across the supply chain.

We have successfully delivered over 280 innovation projects in collaboration with a wide range of stakeholders, including large industrials, network operators, SMEs, policymakers and academic institutions.

We are currently focussing on the following transport challenges

- V2X technology and deployment
- Power Electronics, Machines and Drives
- Vehicle power system control
- Fleet charging hub development and testing
- High power charging development and testing
- Energy storage systems (batteries, fuel cells, supercapacitors

To learn more about how PNDC accelerates innovation through collaboration, see our latest case studies - https://pndc.co.uk/case-studies/.

UNIVERSITY of STRATHCLYDE
PNDC
A DECADE OF INNOVATION

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pndc.co.uk/publications

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