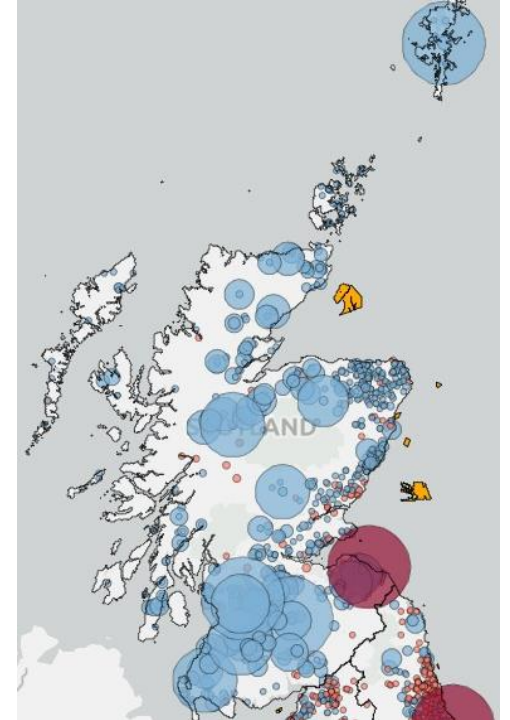


Scotland

Brief overview of the region energy supply mix and demand

Highly decarbonised power sector	Fossil-dependent energy demand
----------------------------------	--------------------------------

- Current **generation capacity** is **20 GW** (10.3GW onshore wind, 4.3GW offshore wind, 1.2GW nuclear, 1.7GW fossil-fuel), projected to **45 GW by 2030**; Vast offshore potential.
- In 2014 electricity generation ~52TWh, electricity demand ~22TWh; Key **net-exporter** to GB system;
- Gas consumption was ~42TWh (>50% is heat, 80% of households connected to gas network); Low uptake of EVs and heat pumps;
- **Storage**: 0.74GW pumped hydro and 0.98GW batteries
- **H2 projects**: 9 (HAR1+HAR2); 5 GW by 2030 and 25 GW by 2045
- Rural & island communities, low population density



Challenges

- Large **connection queues** of RES projects (24GW onshore, 39GW offshore wind)
- Major **grid constraints & low local demand** leading to significant **curtailment** (86% of UK curtailment, 37% of wind curtailed in 2025); Curtailment costs ~£1.5bn in 2025
- Extensive **grid upgrades** facing **delays**
- **Energy-intensive industries embedded in local communities**, High levels of **Fuel Poverty**

Opportunities

- Green hydrogen could help manage thermal constraints of electricity transmission system, **reduce curtailment** and provide wider GB system benefits
- Production of green hydrogen could **reduce the need for grid upgrades** and associated investments
- Strategic alignment of hydrogen facilities with RES production and hydrogen off-takers (energy-intensive industry or gas blending)

Stakeholders

- SGN, SPEN (DNO, DSO, Transmission), SSE (DNO, Transmission, Datavita, Logistics UK, SMAS, AGS, Scottish Water, NHS Scotland, Glasgow City Region)

Research Questions

1. Assess the potential for green hydrogen production from curtailed RES energy including technical and economic case
2. Identify the optimal placement of green hydrogen production to reduce curtailment and reduce the need for grid reinforcement

HI-ACT research plan

- Energy system model to assess constraints modelling (volume, hours, costs) in Scotland
- Identification of scenarios for potential hydrogen production (year, evolution of RES supply, network reinforcement, demand)
- Techno-economic analysis of hydrogen production plants and calculation of LCOH achieved
- Feasibility of hydrogen off-takers (industry and gas blending)
- Suitable location of hydrogen production facilities by development of mapping tool