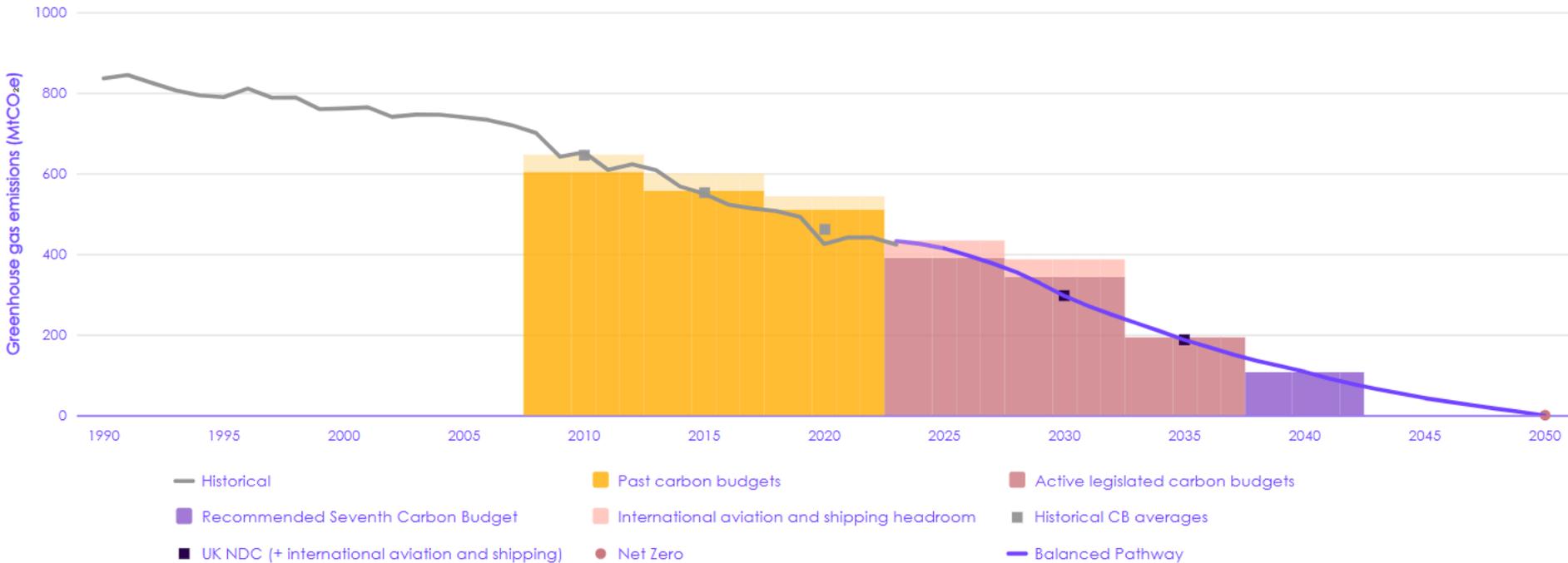


100% renewable energy system - what's the challenge?

Doug Parr

GREENPEACE

Figure 1
The recommended Seventh Carbon Budget



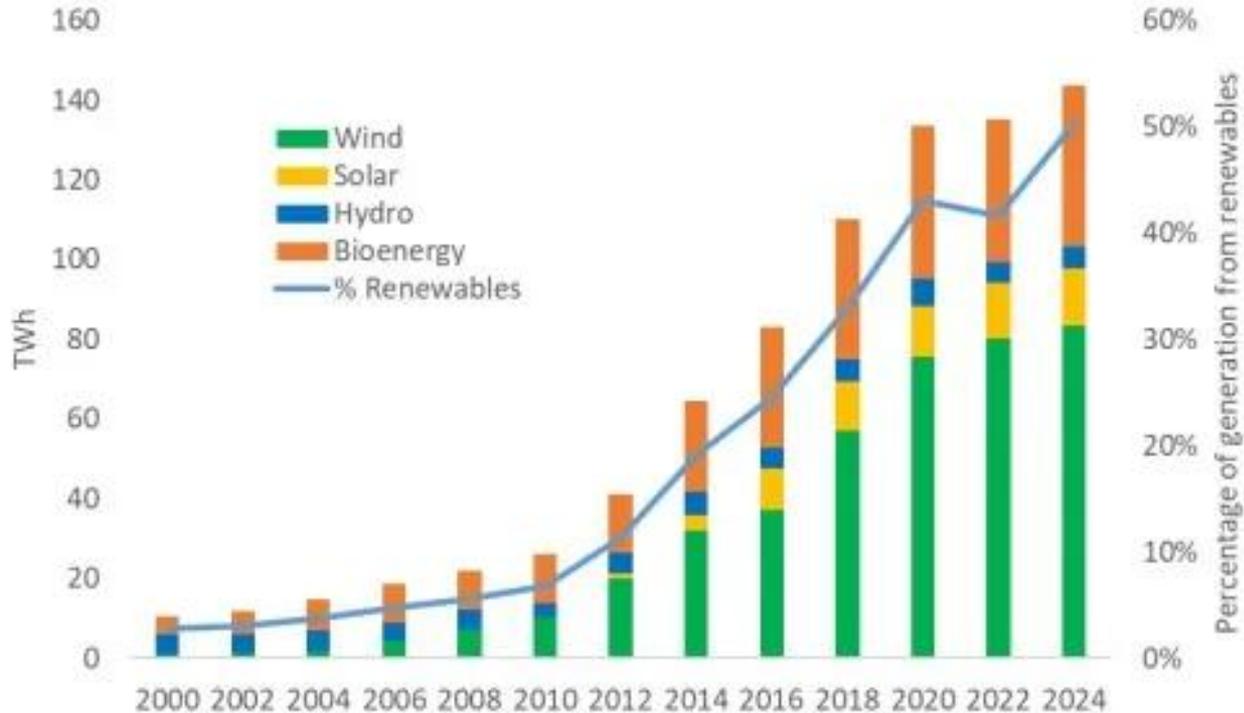
Description: The Balanced Pathway meets the UK's existing future emissions targets and sets the recommended level for the UK's next target: the Seventh Carbon Budget.

Source: Department for Energy Security and Net Zero (DESNZ) (2024) Provisional UK greenhouse gas emissions national statistics 2023; DESNZ (2024) Final UK greenhouse gas emissions national statistics: 1990 to 2022; Climate Change Committee (CCC) analysis.

Notes: See Chapter 3. 'CB' refers to the UK's carbon budget. 'CB1' refers to the First Carbon Budget; subsequent numbers refer to subsequent carbon budgets. 'UK NDC' refers to the UK's Nationally Determined Contributions.

HOW ARE WE DOING?

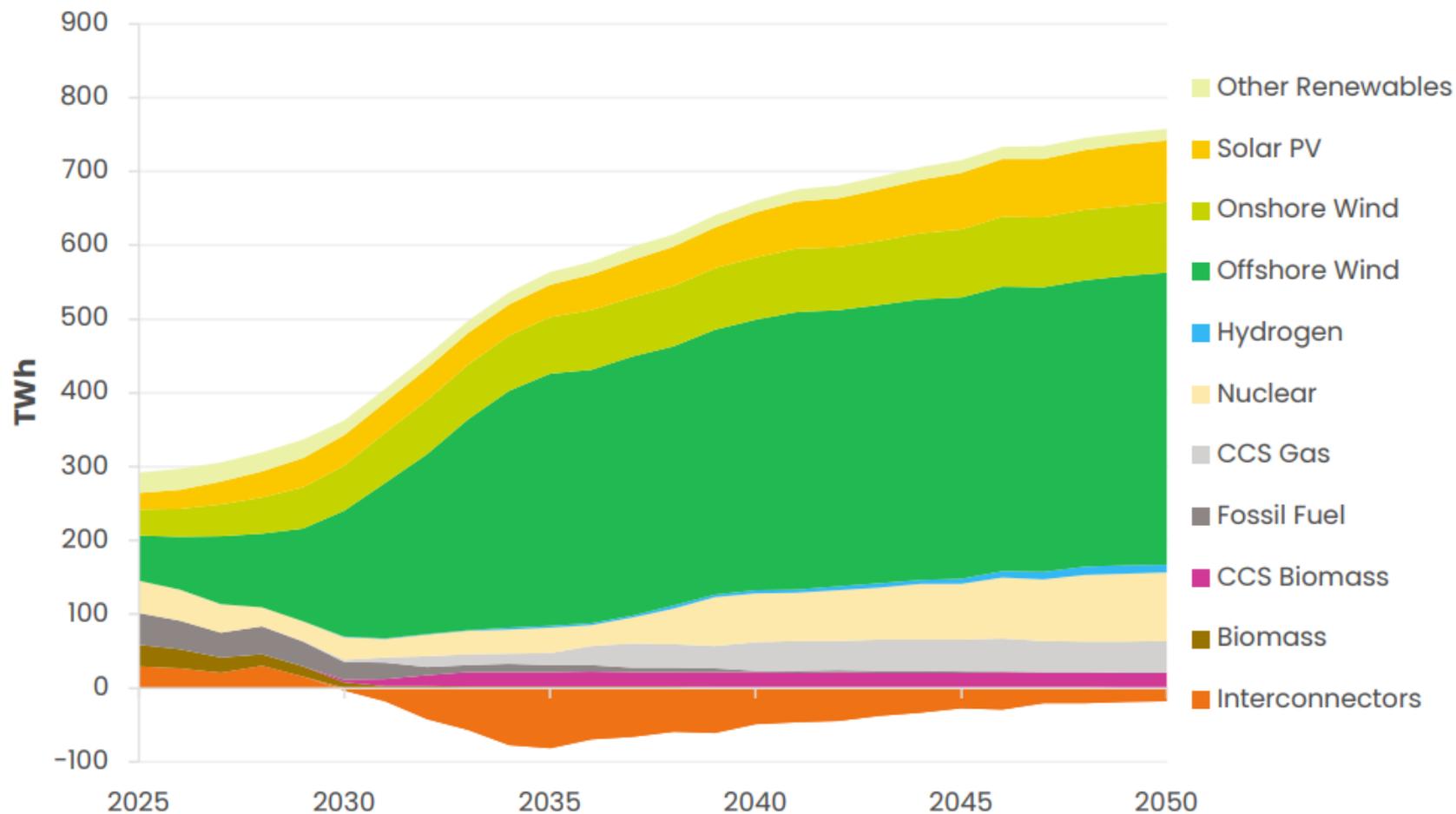
Volume and percentage of electricity generated from renewable sources, 2000 – 2024



Electrification remains key

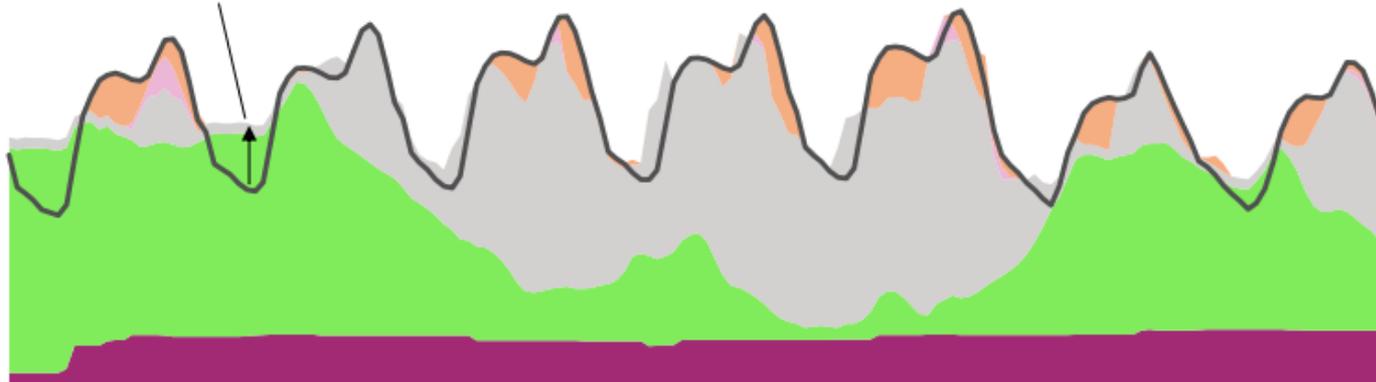
- Renewables generate zero carbon electricity
- Electrification means this clean electricity can be used in transport, heating, industry
- The challenge is to marry up more RE with those uses when & where required
- Low cost storage is opening up electrification as a better option compared to e.g. hydrogen

13. Wind and solar provide more than 75% of annual generation by 2050 in Holistic Transition.

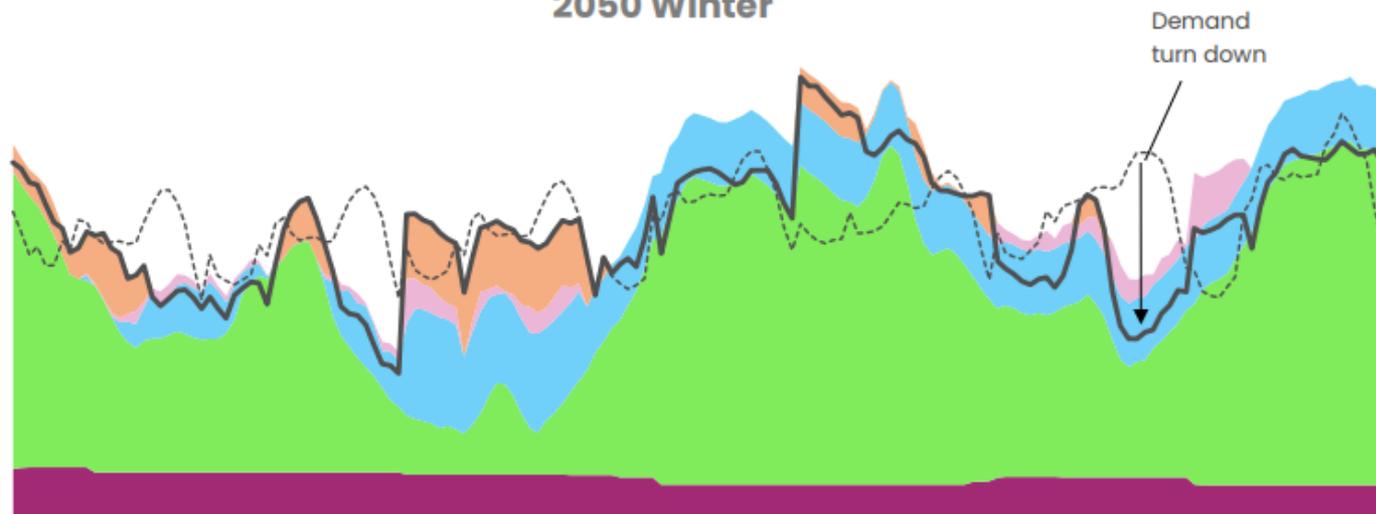


Generation for charging
storage or exports

2024 Winter



2050 Winter



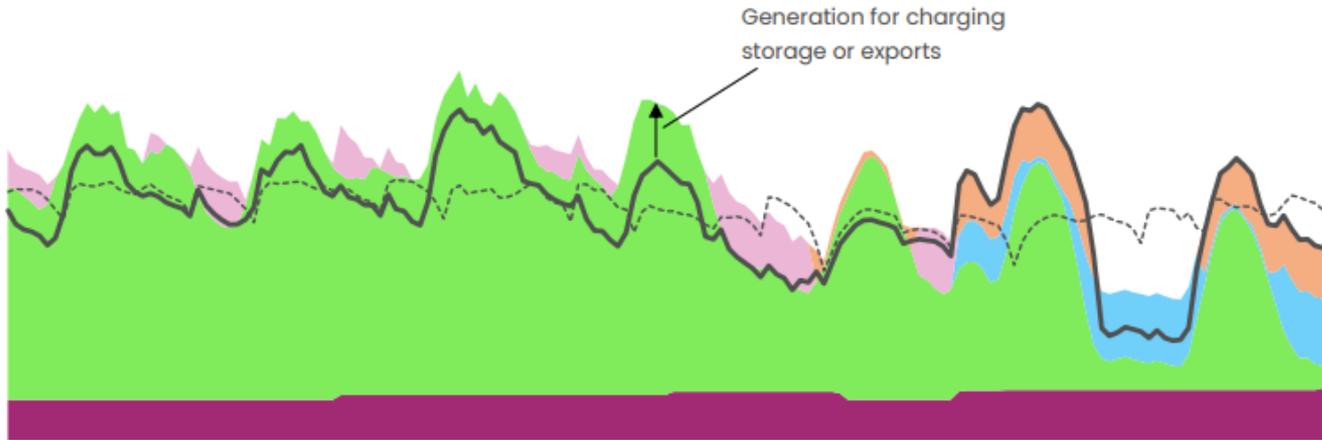
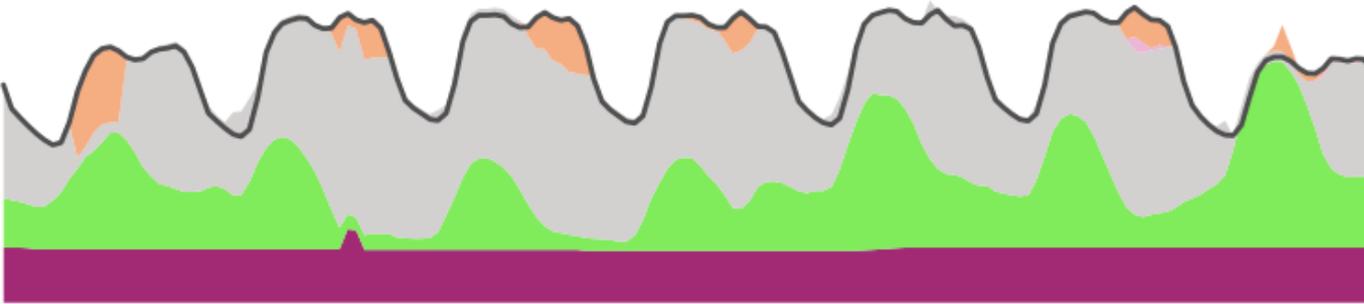
Lots more weather
dependent
renewables in 2050
means:

- Demand response changes need up and down
- “Low Carbon dispatchable” power (blue)
- Storage discharging (pink)

Summer

Summer 2024 vs 2050

- Solar more prominent
- Periods of storage
- DSR still important



LUT University 100% renewable UK

100% Renewable UK

[100% Renewable UK - 100% Renewable UK \(100percentrenewableuk.org\)](https://100percentrenewableuk.org)

**100% RENEWABLE
ENERGY FOR THE
UNITED KINGDOM**

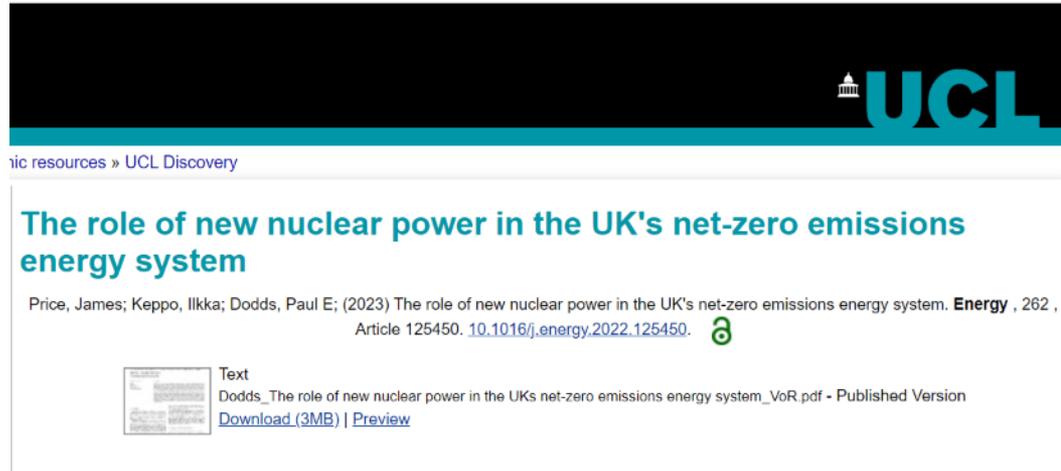
Authors: Philipp Diesing, Dmitrii Bogdanov, Rasul Satymov, Michael Child, Christian Breyer

LUT University, Yliopistonkatu 34, 53850 Lappeenranta, Finland

- Dominated by offshore wind but also lots of inter-annual energy storage
- Saves well over £100 billion by 2050 compared to UK Govt strategy
- Storing as methane in conventional natural gas storage facilities most cost-effective (conversion from green H2 and captured CO2)

https://100percentrenewableuk.org/wp-content/uploads/REPORT_21_12_2022.pdf

University College London using highRES model



The screenshot shows the UCL Discovery interface. At the top right is the UCL logo. Below it, the breadcrumb trail reads "Home » UCL Discovery". The main heading is "The role of new nuclear power in the UK's net-zero emissions energy system". Below the heading, the citation information is displayed: "Price, James; Keppo, Ilkka; Dodds, Paul E; (2023) The role of new nuclear power in the UK's net-zero emissions energy system. **Energy** , 262 , Article 125450. [10.1016/j.energy.2022.125450](https://doi.org/10.1016/j.energy.2022.125450). ". Below the citation, there is a small thumbnail image of the PDF document. To the right of the thumbnail, the text reads: "Text Dodds_The role of new nuclear power in the UKs net-zero emissions energy system_VoR.pdf - Published Version [Download \(3MB\)](#) | [Preview](#)".

- “We show that a nearly 100% variable renewable system with very little fossil fuels, no new build nuclear and facilitated by long-term storage is the most cost-effective system design. This suggests that the current favourable UK Government policy towards nuclear is becoming increasingly difficult to justify.”

https://discovery.ucl.ac.uk/id/eprint/10156347/1/Dodds_The%20role%20of%20new%20nuclear%20power%20in%20the%20UKs%20net-zero%20emissions%20energy%20system_VoR.pdf

Energy Systems Catapult for Good Energy



- “A key finding from this research is the strong potential to build out a very high renewable, low nuclear, zero fossil fuel system and remain cost competitive.”

<https://www.goodenergy.co.uk/business/renewable-nation-pathways-to-a-zero-carbon-britain/>

The Big Things to roll out ****now**** for 100% RE

- Renewables delivery esp offshore wind
- Smarten, Extend Grid and add storage
- Electrify vehicle transport
- Heat pumps in residential and commercial build

Renewables and the battery storage



Storage - 7GW as of last Autumn,
GW pipeline

42GW prioritised for 2030

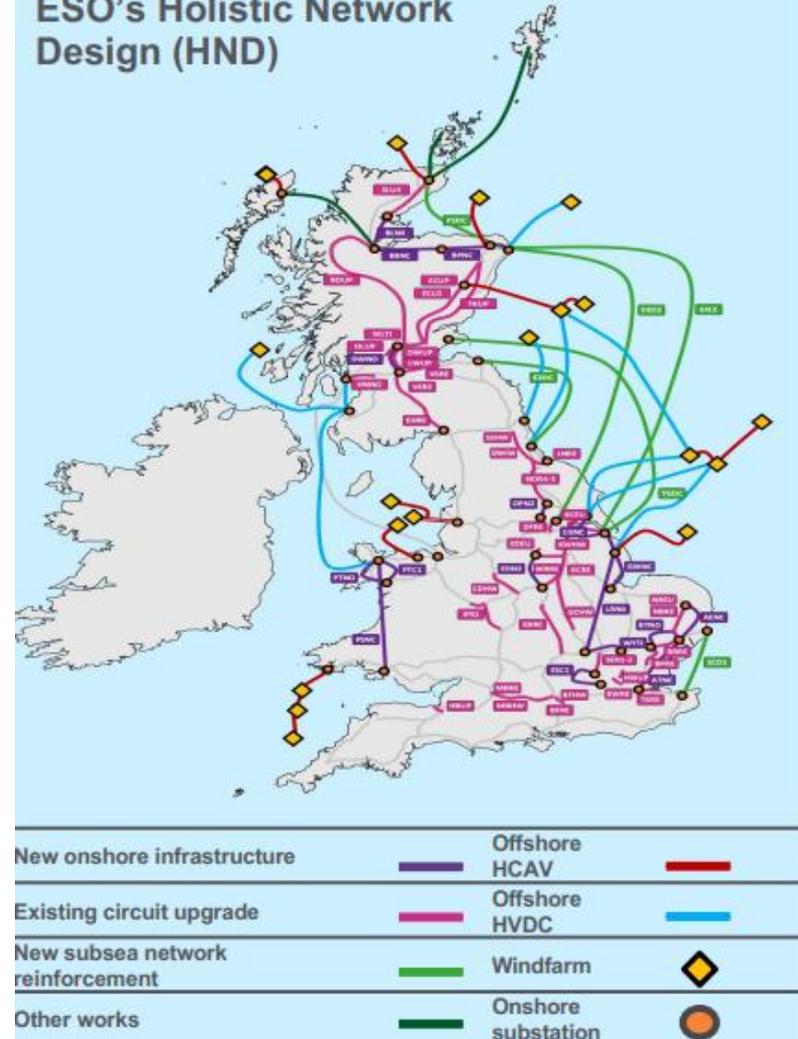
- Offshore wind - 45GW target by 2030 target, 100GW by 2050
- Onshore wind and solar growing too slowly

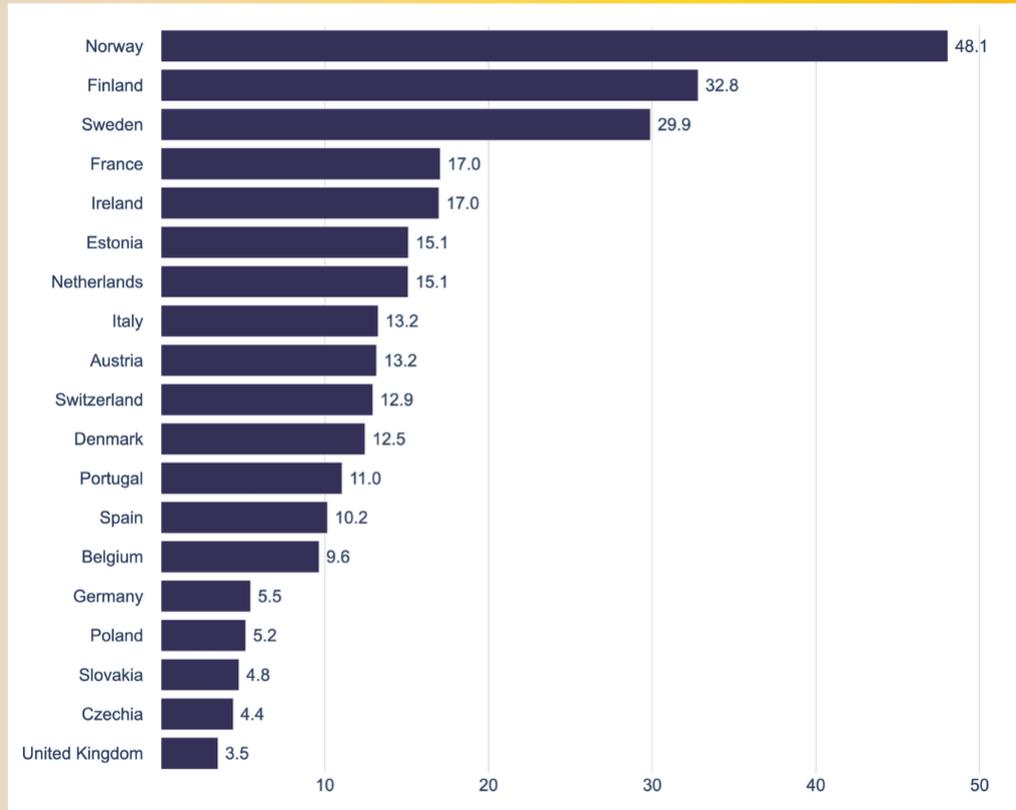


Grid

- Offshore wind current approach to both is out of date, when govt thought it would be a few GW offshore, and not the backbone of the system
- Need to put windfarms where they do least damage to wildlife and plan offshore grid accordingly
- There's a lot to build...

ESO's Holistic Network Design (HND)



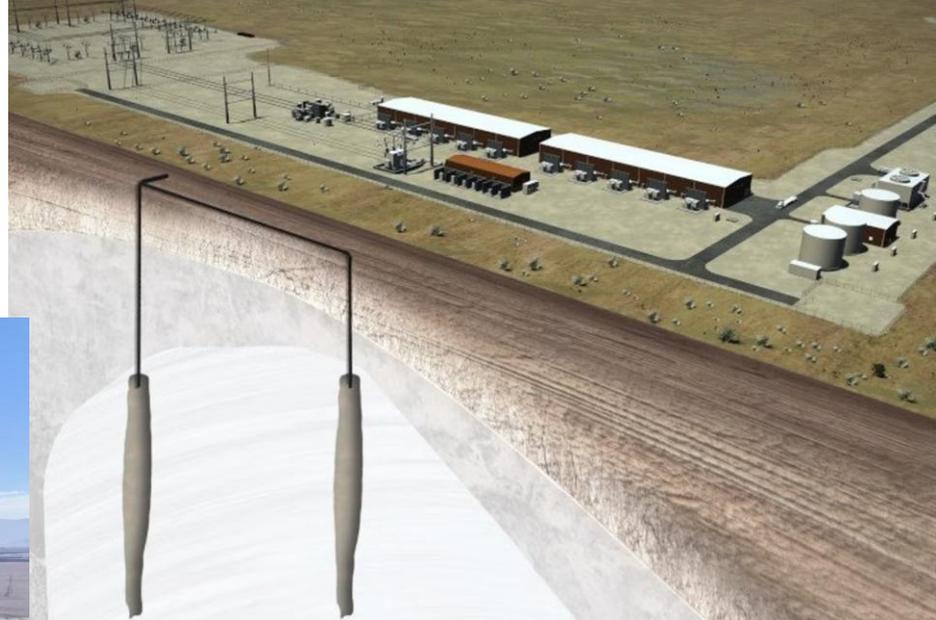


Sales of heat pumps per 1,000 households (2024)

Key challenges - tech development required

- Long Duration Storage
- Heavy goods vehicles
- Industrial heat
- Green Steel
- Aviation

Storage



Heavy Goods Vehicles

Amazon makes record UK order for 160 electric trucks

Wed 05 November 2025

[View all news >](#)

Amazon, the international e-commerce company, has announced that 160 electric heavy goods vehicles are joining its fleet in the biggest ever UK eHGV order. The company is also adding 800 new electric vans across the UK and extending pedestrian and e-bike deliveries.



Green Steel



Industrial Heat



Aviation

- Electric planes?
- Hydrogen Planes?
- “Sustainable Aviation Fuels”?
- E-fuels?
- Removals?

What needs to change?

- 1) Don't treat change as a technical rather than social, political, economic shift
 - Some communities will be hit and need support
 - Community energy a winner
 - Clean energy attractive public frame
 - Fix the disinformation space

What needs to change? (2)

- Coalitions of the willing for transferrable tech e.g. storage, grid balancing
- Policy for integration of technologies in electricity system
- More explicit innovation policy in tricky areas incl costly grid expansion
- Don't put innovation and social costs on energy bills 🙄
- Take gas out of the electricity market

Summary

- 100 Renewables energy system is plausible
- Many of the most outstanding challenges apply to decarbonisation generally
- Even in the most challenging areas there are nascent scalable solutions