Methodology

Should the UK confine hydrogen to industrial clusters or develop national pipelines?

January 2026

green alliance…

This methodology explains the analysis considering potential situations where hydrogen is produced and transported to an industrial customer in Stoke-on-Trent. It supports our briefing 'Should the UK confine hydrogen to industrial clusters or develop national pipelines?'.

The aim is to understand the costs associated with co-location vs transport in future hydrogen use, although the impact of the cost of green hydrogen production remains by far the biggest cost.

We consider four situations:

1. Blue hydrogen (produced using gas power with carbon capture and storage (CCS))is produced at Stanlow and transported via a new pipeline to Stoke-on-Trent.
2. Green hydrogen (produced using renewable energy) is produced at the site itself, using electricity bought via a purchase price agreement (PPA), and transmitted through the existing transmission and distribution grid.
3. Green hydrogen is produced in Aberdeen using otherwise curtailed electricity, before the hydrogen is transported via a new pipeline to Stoke-on-Trent.
4. Green hydrogen is produced onsite in Stoke-on-Trent using otherwise curtailed electricity brought from Aberdeen using new transmission infrastructure.

Production

We calculated the levelised cost of producing blue hydrogen using figures from the International Energy Agency (IEA) for blue hydrogen's levelised cost in north west Europe. This is originally in £/kg H_2 (2.91 to 3.3), so we convert to £74 to 84 per MWh using a higher heating value (HHV) of 39.41.

For green hydrogen, we calculated the levelised cost of production using the European Hydrogen Observatory's Levelised cost of hydrogen calculator. This broadly used the default settings, with the following exceptions:

- We set the cost of CAPEX to 1,204.5. This was sourced from: A Giamperi et al, 2024, *Techno-economic assessment of offshore wind-to-hydrogen scenarios: a UK case study*, table 2. We took the highest CAPEX value for the 2025 scenarios as it was more in line with other sources.
- Operating hours were set within the range of 3,504 – 4,380. These were based on load factors of 40 – 50 per cent. This was broadly based on the default value from the calculator, with variation stemming from considering other sources.
- Grid fees, taxes and subsidies were set to zero and where necessary were added in separately.
- Electricity prices were set in two ways:
    - For situation two, we used the Allocation Round 6 (AR6) offshore wind strike price, adjusted using Consumer Price Index (CPI) inflation to October 2025 prices: 58.87 x 1.452 = 85.47.
    - For situations three and four we calculated the 'price' of curtailed wind electricity as the curtailment cost per MWh. This used total wind curtailment divided by total cost of curtailment for 2025, giving a price of £38.84/MWh. We add and subtract ten per cent to reflect the uncertainty in the figure.
- This gave us a levelised cost of hydrogen production in £/kg. This was converted once again to £/MWh using the HHV of 39.41. Finally, we added electricity transmission costs using policy levies (£4-10/MWh), Balancing system use of system (£15.69/MWh) and demand Transmission network use of system (£12,796/day, converted to £7.10/MWh by multiplying by 365 [days in a year] and divided by annual production in MWh).

Transport

For hydrogen transport by pipeline (situations one and three) we used a cost per km of £1.53 million/kilometre.[1] We calculated a distance of 52km as the crow flies between Chester and Stoke-on-Trent (Chester is selected as HyNet already has plans for pipelines to reach Chester from Stanlow). From Aberdeen, we calculated a distance of 523km from Aberdeen to Stirling to Stoke-on-Trent. As the pipeline will not be a direct straight line, we added 10-25 per cent to each of these figures. These were then multiplied by the cost per km and divided by the annual hydrogen production to obtain a figure for CAPEX cost per MWh. We also calculated OPEX costs by multiplying £0.17/kg[2] H_2 by the HHV to obtain the cost per MWh.

Situation two had no transport costs as it uses existing infrastructure and the electricity transmission costs are covered in the cost of hydrogen production.

Situation four used a cost of electricity transmission infrastructure of £2.2 – 4.2 million per km. The distance is the same as calculated for situation three. As with situation two, there is no operational cost associated with the transmission infrastructure.

Leakage

We took the range for potential leakage in hydrogen production and transport from the extremes reported by: D Trapani et al, 2025, 'Hydrogen leakages across the supply chain: current estimates and future scenarios', *International journal of hydrogen energy*.

For electricity, we added transmission losses from NESO. Production leaks were applied only to production, and transmission losses were applied only to transmission.

Outputs

	Situation 1	Situation 2	Situation 3	Situation 4
Base production cost	73.9	184.7	114.9	114.9
Production uncertainty	11.1	38.5	42.9	42.9
High production cost	85.0	223.1	157.8	157.8
Base transport cost	7.0	0.0	26.6	24.4
Transport uncertainty	0.8	0.0	9.7	38.8
High transport cost	7.8	0.0	36.2	63.2
Base total cost	80.9	184.7	141.4	139.2
Total uncertainty	11.9	38.5	52.5	81.7
High total cost	92.8	223.1	194.0	220.9

Taking the highest and lowest values of each situation, for both transport and production, we obtain low and high estimates, as well as the uncertainty for each situation and its parts. We obtain total costs and uncertainties through summing.

Note: values may not sum due to rounding.

For more information, contact:
George James, policy analyst, Green Alliance
gjames@green-alliance.org.uk

Endnotes

[1] Frazer Nash, 2022, 'Hydrogen transportation and storage infrastructure', assets.publishing.service.gov.uk/media/63973bfde90e077c2e1ce834/Hydrogen_infrastructure_requirements_up_to_2035_-_report.pdf pp 48

[2] Ibid, pp 47