Hierarchy of hydrogen production pathways for the UK

based on cost optimisation at whole system level to meet net-zero

Baringa
Brighter together

	UK	Process	Advantages	Challenges
1 BECCS Bio-energy + Carbon capture and storage	Most favourable in the UK due to the predicted amount of Carbon Capture and Storage (CCS) and availability of sustainably sourced biomass.	Hydrogen is produced from bio-energy sources (biomass such as plants and timber) coupled with CCS.	Can produce 'negative emissions' which allow some residual emissions to be retained in parts of the economy where it would be extremely expensive to actually reduce emissions to zero.	Scale of production depends on the availability of sustainably sourced biomass.
2 Blue hydrogen Gas fired power generation + Carbon capture and storage	Significant potential for gas with CCS to produce larger volumes of hydrogen compared to BECCS, due to far greater availability of natural gas compared to sustainable biomass resources.	Hydrogen is produced from natural gas, and coupled with CCS.	A cost-effective way to produce bulk hydrogen at scale with very low emissions. In this scenario, CCS plays a material role across the energy system leading to a sharing of costs for a wide-spread CO2 transport-infrastructure and high utilisation of the UK's significant CO2 storage potential.	Higher CO2 capture rates are necessary to minimise residual emissions from hydrogen produced via this route.
3 Green hydrogen Intermittent renewables	Limited potential for the UK because of the overall role electrification plays in driving decarbonisation, ie it is more cost effective to use low carbon electricity directly in decarbonising buildings and light transport.	Hydrogen is produced from electrolysis-routes, particularly intermittent renewables.	Useful in markets with excess renewable energy.	High capital expense of new electrolysis plant – requires large amount of excessive renewables to build business case.