

Decarbonising Transport

An Opportunity to Innovate

Hydrogen for Aviation



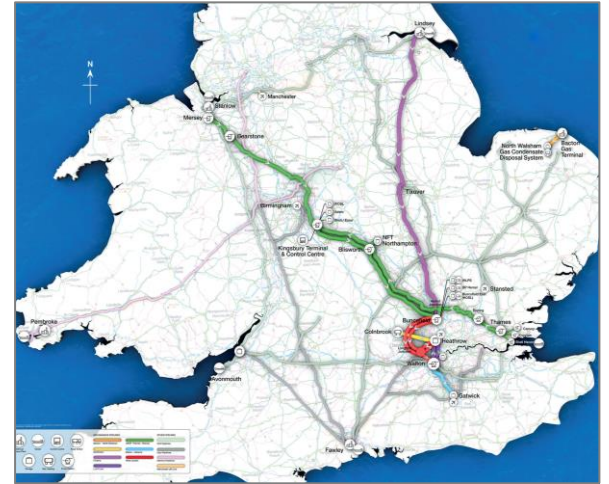
Hydrogen South West



- Group of 10 leading organisations covering aerospace, shipping, hi-tech engineering and public utilities.
- Set up in 2022
- Partnership was set up to work together to create a collaborative infrastructure ecosystem that will bring the benefits of Hydrogen to the South West of England.

Energy & Aviation Today

- Aviation accounts for 2.5% of Global CO2 Emissions.
- Current Aircraft are fuelled by Jet fuel which is a refined kerosene-based fuel.
- Ground operations are currently diesel and electric.
- Electric aircraft have significant challenges.
 - Heavy
 - Short Range
 - Unviable short turnaround times
- Airports are currently supplied by tanker & fuel pipelines around the UK.

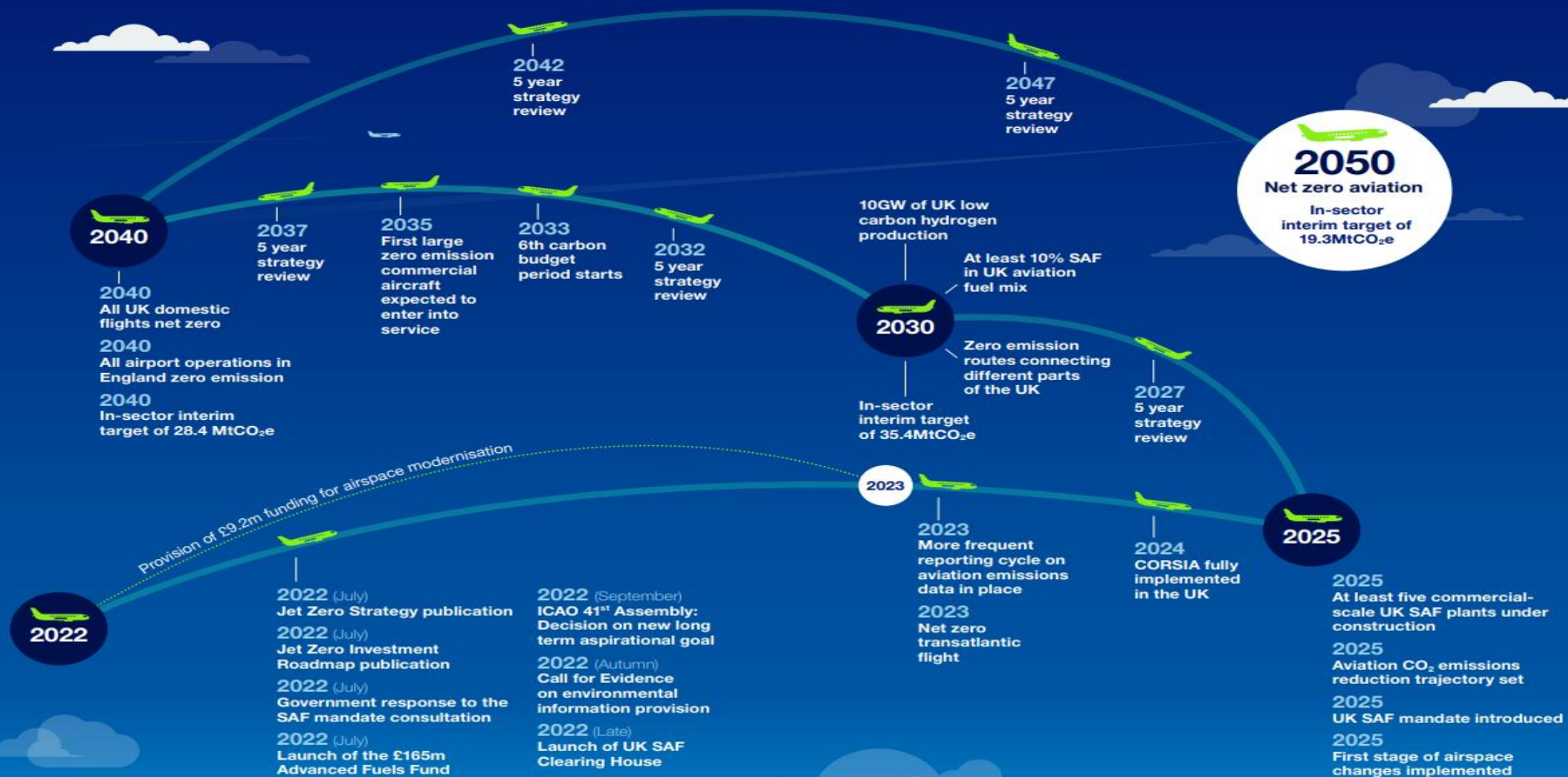


Hydrogen For Aviation

We commissioned Arup to build an evidence base of the potential role for hydrogen in aviation across our network.

- Energy demand forecast
- Scenario development
 - Jet Zero strategy
 - Aircraft development timeline
 - 4 Airports Modelled
- Scenario options
 1. Business as usual
 2. Kerosene and SAF only
 3. Optimistic hydrogen
 4. Conservative hydrogen
- Hydrogen and SAF demand
- Supporting infrastructure





Hydrogen For Aviation

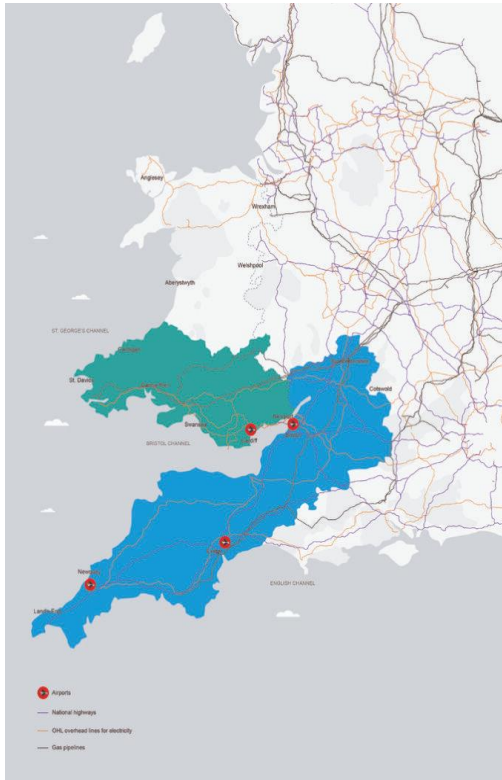
How will the role of hydrogen emerge in multiple parts of the supply chain from manufacturing through to operations ?

- Ground operations
 - Tugs, Busses, Generators, fire trucks, maintenance vehicles etc.
- Sustainable Aviation Fuel – Short term & Medium-term opportunity.
 - Aircraft can already run on SAF with minimal changes to the aircraft.
 - Saf's main GHG saving is through the production of the fuel depending on what feedstock is used.
- Hydrogen – Long term opportunity
 - Hydrogen fuel cells.
 - Liquid hydrogen.

Projects Already in motion

- Live projects to construct SAF plants as part of Jet Zero commitment.
 - LanzaTech Project Dragon site in Port Talbot will be a potential future demand for WWU HyLine project.
 - Fulcrum building a plant near Stanlow.
- Bristol Airport have commitment to decarbonise ground operation vehicles as part of airport masterplan.
- Cardiff Airport look to become carbon neutral by 2040.
- Airbus are working on their Zeroe concepts that will look to bring a hydrogen powered commercial aircraft by 2035.
 - 4 concepts being looked at with different Fuel cell & Liquid Hydrogen technologies.
- ZeroAvia
 - Flight tests of hydrogen electric fuel cell engine already ongoing.
 - Partnered with Absolut Hydrogen to develop liquid hydrogen refuelling Infrastructure.
- Rolls Royce looking at developing engine technologies.

Role of the Networks



- Work undertaken to quantify the potential hydrogen demand from each of the potential pathways. Bristol's demand could be around 100k tonnes by 2050.
- Unlikely that early pre-2030 projects will require a small element of the gas network given initially low demand (ground operations and short-haul) and retention of network for methane.
- Post-2035 presents an opportunity for the gas networks to play a role, in line with rapid growth from clusters and GW-scale hydrogen production from industrial clusters.
- There is a natural opportunity to connect airports into industrial clusters and local hydrogen production projects.
- Conversion of existing kerosene pipelines is a key challenge as airports will require kerosene and hydrogen in the medium term whilst carriers don't wholly convert to hydrogen.

Summary

- Opportunities will be case-by-case and depend on the availability of hydrogen, ambitions of airports and carriers – potential for disruptive technology and organisations (ZeroAvia).
- Uncertainty around whether production of hydrogen at airports will be viable, highly dependent on availability of electricity grid connections & hazardous zoning distances for liquid hydrogen.
- Need for further clustering partnerships like Hydrogen South West to keep close to all elements of the supply chain as there are currently a lot of unknowns.
- Understanding the likelihood of a network role for hydrogen is key for the planning of both gas and electricity grids in the 2030's & when the likely timelines for the switch from tanker to pipeline will be needed.
- This is already being done for industry, so there needs to be the same development between GDN's/DNO's and aviation)

Thank –you



Download The Hydrogen For Aviation Report

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