

GKN AFROSPACE



















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

- O 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.
- O Electric aircraft have significant challenges.
 - Heavy
 - Short Range
 - Unviable short turnaround times
- O Airports are currently supplied by tanker & fuel pipelines around the UK.

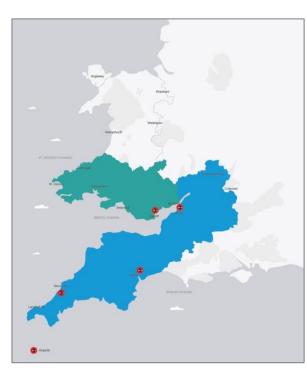




Hydrogen For Aviation

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







Jet Zero Strategy: Delivering net zero aviation by 2050 Executive summary 2042 5 year 2047 strategy 5 year review strategy review Net zero aviation 10GW of UK low In-sector carbon hydrogen 2035 2033 interim target of 2037 2040 production 19.3MtCO₂e First large 6th carbon 5 year 2032 zero emission At least 10% SAF budget strategy 5 year commercial period starts in UK aviation review strategy aircraft fuel mix 2040 review expected to All UK domestic enter into flights net zero 2030 service 2040 Zero emission routes connecting All airport operations in different parts **England zero emission** of the UK 2027 2040 In-sector 5 year In-sector interim interim target Provision of £9.2m funding for airspace modernisation strategy target of 28.4 MtCO₂e of 35.4MtCOe review 2023 2023 2025 More frequent 2024 reporting cycle on **CORSIA fully** aviation emissions implemented 2025 data in place 2022 (July) 2022 (September) in the UK At least five commercial-Jet Zero Strategy publication ICAO 41st Assembly: 2023 scale UK SAF plants under Decision on new long Net zero construction 2022 2022 (July) term aspirational goal transatlantic Jet Zero Investment 2025 flight 2022 (Autumn) Roadmap publication Aviation CO₂ emissions Call for Evidence reduction trajectory set 2022 (July) on environmental Government response to the 2025 information provision SAF mandate consultation **UK SAF** mandate introduced

2025

First stage of airspace

changes implemented

2022 (Late)

Launch of UK SAF

Clearing House

2022 (July)

Launch of the £165m

Advanced Fuels Fund

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

- O 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.
- O Bristol Airport have commitment to decarbonise ground operation vehicles as part of airport masterplan.
- O Cardiff Airport look to become carbon neutral by 2040.
- O 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 quantifies 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

Mark Evans—NetZero Project manager Mark.evans@wwwtilities.co.uk

