

Roadmap for the introduction of hydrogen at medium-sized airports in Europe

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Background/Introduction

The use of alternative fuels in aviation is necessary to reduce the climate impact of aviation and to achieve the sector-specific, Europe-wide and German emission reduction targets.

In addition to sustainable aviation fuels (SAF) such as power-to-liquid/synthetic fuels, hydrogen can play a central role in the decarbonization of aviation.

The introduction of hydrogen in aviation is a complex task, requiring both large infrastructure investments and process adjustments.

Objectives

A roadmap is developed for the use of hydrogen as an alternative fuel for aircraft and ground traffic at Hamburg Airport. The focus is on possible future hydrogen demand as well as infrastructure and process adjustments.

A Roadmap that is:

- exemplary for other German and European medium-sized airports;
- depending on the development over time (2030, 2040, 2050);
- both operationally and economically feasible.

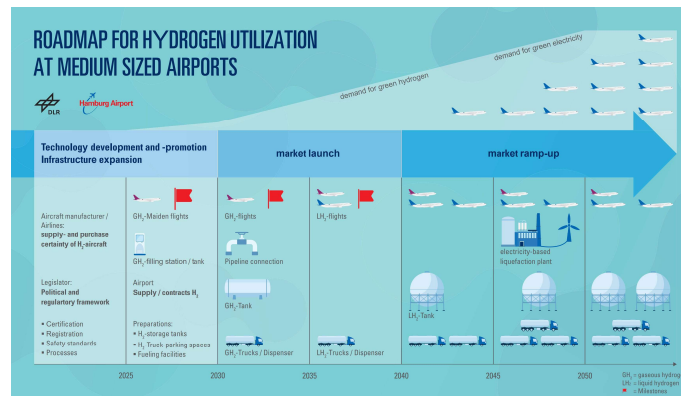
Methodology

1. Simulation model for future hydrogen demand at airports by 2050.

- Module 1: Air Traffic Forecast
- Module 2: Aircraft Retirement Cycles
- Module 3: New (hydrogen) aircraft entering into service

2. Feasibility studies / cost-benefit analyses / expert advice on necessary airport infrastructure adjustments.

Results



Source: DLR and Hamburg Airport (2023)

Conclusions

By 2050, up to 60% of departures from Hamburg could be carried out by hydrogen-powered aircraft. This corresponds to an annual hydrogen demand of 60,000 tons and a CO₂ reduction of over 0.5 million tons in 2050 (~38% CO₂ savings).

Germany-wide, the demand for hydrogen in aviation would correspond to 0.73 million tons in 2050, which would save 6.5 million tons of CO₂ (~20% CO₂ savings).

The introduction of hydrogen in aviation is a multilayered endeavor, requiring both large industry investments and decisive political support.

Limitations/Future work

Explore how the roadmap could be adapted for larger international hubs or smaller regional airports, identifying scalability challenges and solutions. Propose detailed policies, subsidies, and incentive programs to accelerate hydrogen adoption across European airports.

References

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