Stargate within EU Green Deal

Project Fact Sheet

Hydrogen fueling & GSE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement GA101037053

01 BASIC PROJECT INFORMATION

Project name	Hydrogen fueling & GSE
Partners involved	VIL, Brussels Airport Company, MULAG, DHL, Waterstofnet
Implementing airport / site	Brussels Airport
Period tested	2024
Project lead / contact	VIL

02 OBJECTIVE

What are we trying to solve or tackle with this project?

Assess whether hydrogen can decarbonise ground support equipment where battery-electric options may be less suitable.

The project tested a mobile hydrogen refuelling station and hydrogen-powered cargo tractor in real airside operations, focusing on safety, operational fit and user acceptance.

Success criteria

Demonstrate safe airside hydrogen refuelling, operate a hydrogen tractor in daily cargo operaions, asses CO_2 impacts, and identify conditions for future scale-up (TCO tool)

03 APPROACH (HOW WE TESTED)

Test set-up & method

A mobile hydrogen refuelling station was installed airside and used to refuel a hydrogen-powered baggage/cargo tractor during cargo operations.

The test assessed vehicle performance, refuelling process, safety procedures, operational constraints, operator feedback. The total-cost implications resulted in a usable TCO model.



KPI's

- Saved fossil fuel (L) - Baseline: 6L per hour
- CO_2 reduction - Baseline: 46kg per hour
- Operator acceptance, operational feasibility and safety perception.

Risks & mitigations

- Limited hydrogen GSE maturity and availability
- Low power of the tested tractor
- Slow refuelling
- Regulation & permitting
- Airside safety requirements
- High hydrogen and infrastructure costs
- Weak TCO without scale and high utilisation

Limitations

Only one hydrogen tractor/use case was demonstrated, not a full fleet. CO_2 values came from a TCO tool, not a measurement campaign. The mobile station was suitable for a pilot but caused slower refuelling and operational detours.

04 RESULTS & IMPACT

The following key findings can be highlighted:

- Hydrogen GSE can be operated safely in an airside cargo environment.
- A hydrogen refuelling station can be deployed safely in an airside environment.
- User acceptance increases as the technology matures.

A mobile hydrogen refuelling station was used to refuel a hydrogen-powered cargo tractor during daily operations. Compared to a diesel/HVO tractor baseline consumption of 6 L/h, the hydrogen tractor consumed no fossil fuel and required approximately 0.6 kg of hydrogen per hour. A fleet-scale scenario showed a reduction in CO_2 emissions from 46 kg/h to 26 kg/h.

Operators appreciated the lower noise levels, the absence of exhaust fumes, and the vehicle's user-friendly operation.

However, large-scale deployment remains constrained by limited vehicle power, slow refuelling using temporary infrastructure, limited market availability, and a high total cost of ownership (TCO).





05 RATINGS (QUICK ASSESSMENT)

Deployment Approach

How standardised is the solution: can it be deployed off the shelf, or does it require extensive customization?

Off The Shelf — Custom-Built

Investment Magnitude

From low-cost deployment to major investment.

Low Investment (less than €10k) — High Investment (more than €15mio)

OPEX ☐ ■ CAPEX

Sector Readiness

From non-existing or emerging standards, regulations, and certification pathways to fully established industry practices.

Emerging Framework — Established Framework

Innovation Maturity

How does the solution score in terms of maturity, from low TRL experimental/pilot-stage to high TRL market-ready.

Experimental — Market-Ready

Operational Impact

Does the innovation deliver targeted improvements or rather drastically transform processes and/or operations.

Incremental Improvement — Transformational Change

Notes

Hydrogen is most relevant for high-energy, intensively used GSE where battery-electric options are constrained. Airports should plan refuelling at ecosystem level, combine multiple users/applications and avoid isolated low-utilisation infrastructure.

06 NEXT STEPS / RECOMMENDATION

Recommendation

- Recognize TaxiBot as a promising sustainable taxiing solution, demonstrating significant reductions of emissions.
- Consider TaxiBot for airports with favourable conditions, such as longer taxi distances, high traffic volumes, or strong decarbonisation targets.
- Continue to support industry efforts on certification and operational standardisation to unlock broader deployment opportunities.

Next steps

- Monitor developments in TaxiBot technology and aircraft certification.
- Reassess deployment opportunities as operational and regulatory conditions evolve.
- Share lessons learned with industry stakeholders and airport partners.
- Benchmark TaxiBot against other sustainable taxiing solutions.