Stargate
within EU Green Deal

Project Fact Sheet

Electrification 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	Electrification of ground handling equipment
Partners involved	DHL
Implementing airport / site	Brussels Airport
Period tested	2023-2026
Project lead / contact	DHL

02 OBJECTIVE

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

Replace diesel-powered ground support equipment with electric alternatives while maintaining safe, reliable cargo operations and tight aircraft turnaround times.

The demonstration aimed to reduce carbon dioxide emissions, energy use, noise and maintenance costs, while proving that fleet electrification and charging infrastructure can work in a high-intensity airport environment.

Success criteria

- Integrate electric equipment without disruption
- Reduce emissions/energy
- Increase electric fleet share
- Maintain safety and reliability
- Establish scalable charging, monitoring and grid-capacity arrangements

03 APPROACH (HOW WE TESTED)

Test set-up & method

DHL used a phased rollout in live cargo operations. Phase 1 introduced electric vans, two belt loaders, 11 tow tugs and two nose lifters with initial chargers.

Phase 2 added nine high loaders, selected for their high diesel use. Distributed charging was installed across two apron areas using a hybrid ownership model between DHL and Brussels Airport.



Data & measurement

Monitoring covered CO_2, energy, fuel/electricity shift, electric fleet share, reliability and safety. Phase 1 cut CO_2 nearly 18% and energy 7.6% compared with the specific assets in the GSE fleet before electrification; phase 2 high loaders cut CO_2 over 56% and energy 33% compared with the pre-electrification high-loader fleet.

Risks & mitigations

Risks included operational disruption, charger availability, grid-capacity constraints, investment needs, energy management and data gaps for high-loader consumption. Mitigation used phased deployment, distributed charging, hybrid infrastructure ownership, telematics and continuous monitoring.

Limitations

Results reflect DHL at Brussels Airport and may vary with equipment, duty cycles, climate, power source and grid capacity.

Some high-loader data gaps remain. Electrification shifts emissions from diesel to electricity, so renewable power matters.

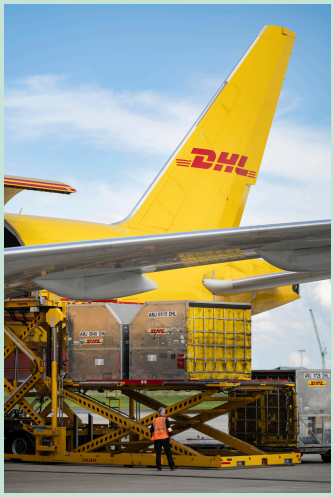
04 RESULTS & IMPACT

Key results

DHL demonstrated that electric ground support equipment can meet the demands of a live, high-intensity cargo hub. The rollout included electric vans, two belt loaders, 11 tow tugs, two nose lifters and nine high loaders, supported by charging across two apron areas.

Phase 1 reduced CO_2 emissions by nearly 18% and energy use by 7.6% compared with the specific assets in the GSE fleet before electrification

Phase 2 high loaders achieved over 56% CO_2 reduction and 33% lower energy use compared with the pre-electrification high-loader fleet.







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

The strongest per-unit impact came from high loaders because conventional models consume substantial diesel.

Replication requires fleet and duty-cycle analysis, early grid planning, distributed charging, reliable telematics and coordination between the airport and operator.

Full electrification is feasible long term when these conditions are met.

06 NEXT STEPS / RECOMMENDATION

Recommendation

Scale through planned fleet replacement: prioritise high-impact equipment while aligning charging capacity, grid access, renewable electricity and performance monitoring.

Next steps

1) Electrify in phases, prioritising high-fuel-use equipment.

2) Plan chargers and grid capacity with future fleet growth.

3) Use hybrid infrastructure ownership to balance cost and flexibility.

4) Add telematics and close data gaps.

5) Align replacements with the long-term electrification roadmap.