NREL
NATIONAL RENEWABLE ENERGY LABORATORY

# Electric Ground Support Equipment at Airports

Airport ground support equipment (GSE) is used to service airplanes between flights. Services include refueling, towing airplanes or luggage/freight carts, loading luggage/freight, transporting passengers, loading potable water, removing sewage, loading food, de-icing airplanes, and fire-fighting.

Deploying new electric GSE (eGSE) technologies is a promising opportunity in part because the purchasers are generally large, technologically sophisticated airlines, contractors, or airports with centralized procurement and maintenance departments. Airlines could particularly benefit from fuel diversification since they are highly exposed to petroleum price volatility. GSE can be particularly well-suited for electrification because it benefits from low-end torque and has frequent start/stops, idle time, and short required ranges. Some auxiliary loads that can be more efficiently met by electric power sources (rather than an idling diesel motor vehicle) include hydraulic lifts (for all equipment accessing high airplanes), refrigeration (catering), and pumps (for fuel, potable water, and sewage). Operators favor eGSE because of multiple features including an "inching device" that allows them to stand behind luggage tugs and inch it into the hitch of the luggage trailer. Furthermore, electric chargers can be safely located in more locations throughout an airport than diesel refueling stations, which reduces GSE traffic and non-productive travel.


Seattle-Tacoma International Airport (Sea-Tac) has approximately 250 pieces of electric ground support equipment, about half of which are luggage tugs like the one pictured here. Photo from Western Washington Clean Cities, NREL 34961


Electric LEKTRO pushback tractor pushing a United Airlines aircraft. Photo from Port of Seattle.

Six of the most common pieces of GSE already have electric options available, as shown in Table 1. A majority of eGSE uses AeroVironment PosiCharge stations for charging. Diesel to electric conversions have also been done successfully.[1]

Airports have been using eGSE since the first major project was implemented by American Airlines at El Paso International Airport in 2001.[2] According to a 2013 survey of Ground Support Worldwide readers, 10% of the existing GSE was electric.[3] Many eGSE deployments were funded through the Federal Aviation Administration's Voluntary Airport Low Emissions Program and Inherently Low-Emission Airport Vehicle Program. In May 2016, the National Renewable Energy Laboratory tallied at least 22 U.S. airports with significant eGSE projects. The largest projects were at Sea-Tac, Philadelphia, and Dallas Fort Worth, where between 230 and 430 eGSE were being used at each airport. Delta Airlines reported that it had converted 15% (or 15,000 pieces) of its GSE fleet to eGSE as of early 2016.[4]

Table 1. Available eGSE and Manufacturers

| Electric Equipment | Manufacturers |
|---|---|
| Pushbacks | Charlatte, TLD, Lektro, Jetporter, TUG Technologies, Eagle |
| Belt Loaders | Charlatte, TLD, Hercules |
| Container Loaders | TLD, JBT Corporation |
| Luggage tugs | Charlatte, Harlan, TUG Technologies Corporation and Eagle |
| Lavatory Truck | Charlatte |
| Water Truck | Charlatte |

[1] *http://www.aviationpros.com/press_release/10943131/delta-cte-work-together-to-reduce-gse-carbon-emissions-at-atl*
[2] *www.automotive-fleet.com/news/story/2001/03/american-airlines-switches-to-electric-gse-fleet.aspx*
[3] *www.aviationpros.com/article/10889496/electric-ground-support-equipment-buying-trends-report*
[4] *http://news.delta.com/airline-s-other-fleet-science-behind-ground-equipment*

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

National Renewable Energy Laboratory
15013 Denver West Parkway
Golden, CO 80401
303-275-3000 • www.nrel.gov

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

NREL/FS-5400-70359 • December 2017
NREL prints on paper that contains recycled content.