# BENEFITS OF EQUIPMENT ELECTRIFICATION

## PHILADELPHIA INTERNATIONAL AIRPORT

PHL PNE PHILADELPHIA AIRPORT SYSTEM

VIBRANT PORTS HEALTHY PORTS

dvrpc | EPA

**OCTOBER 24, 2017**

# OUTLINE

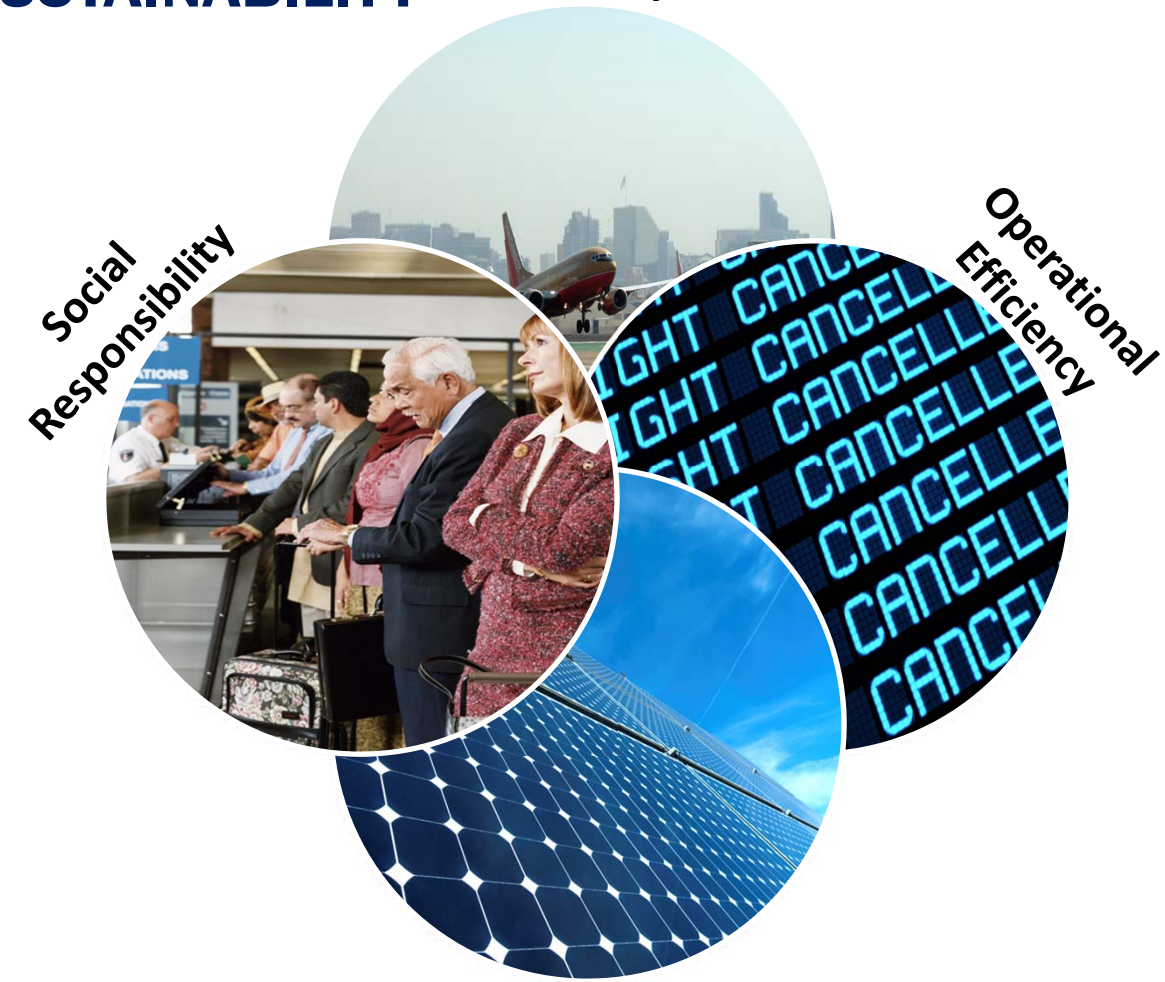
## BENEFITS OF EQUIPMENT ELECTRIFICATION

- PHL Overview
- Ground Support Equipment (GSE) Overview
- Economic Benefits
- Environmental Benefits

# PHL OVERVIEW

| | | | | |
|---|---|---|---|---|
| 2,400 acres | 4 runways | 3.2 million sf terminal space | 30.1 million passengers (2016) | 394,000 operations (2016) |

# AIRPORT SUSTAINABILITY



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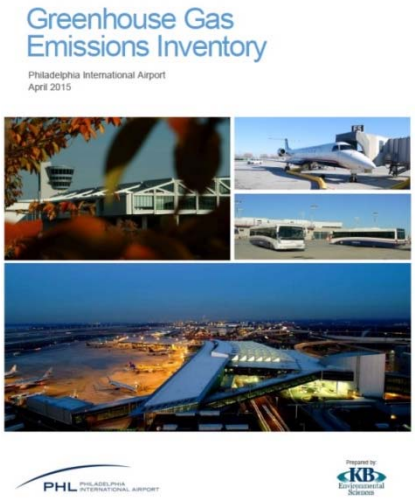
# Air Quality Initiatives at PHL

- Greenhouse gas emissions inventories
- Construction equipment tracking
- CNG Station (public use)
- EV Charging Stations
- Bicycle Facilities





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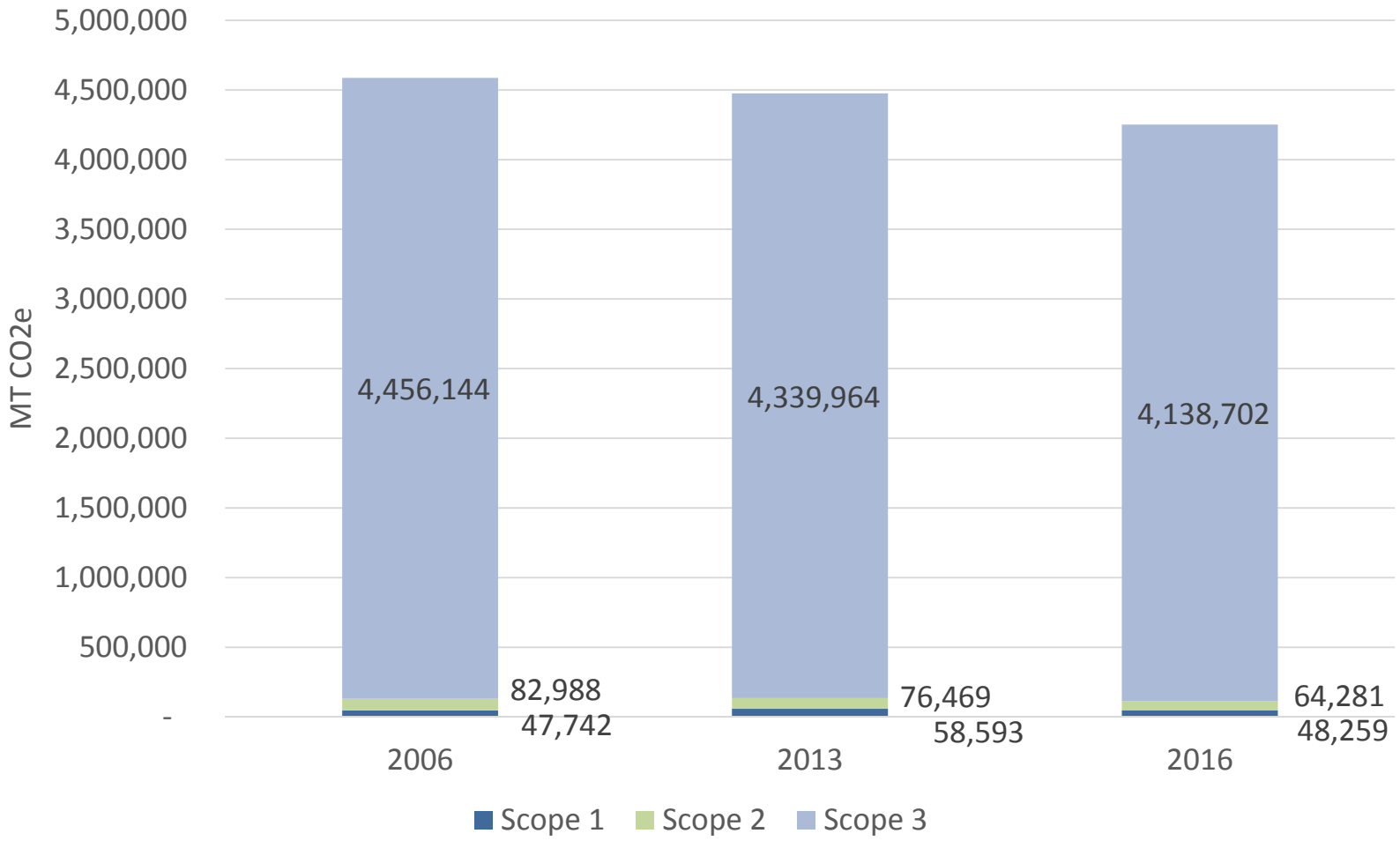
# GREENHOUSE GAS EMISSIONS



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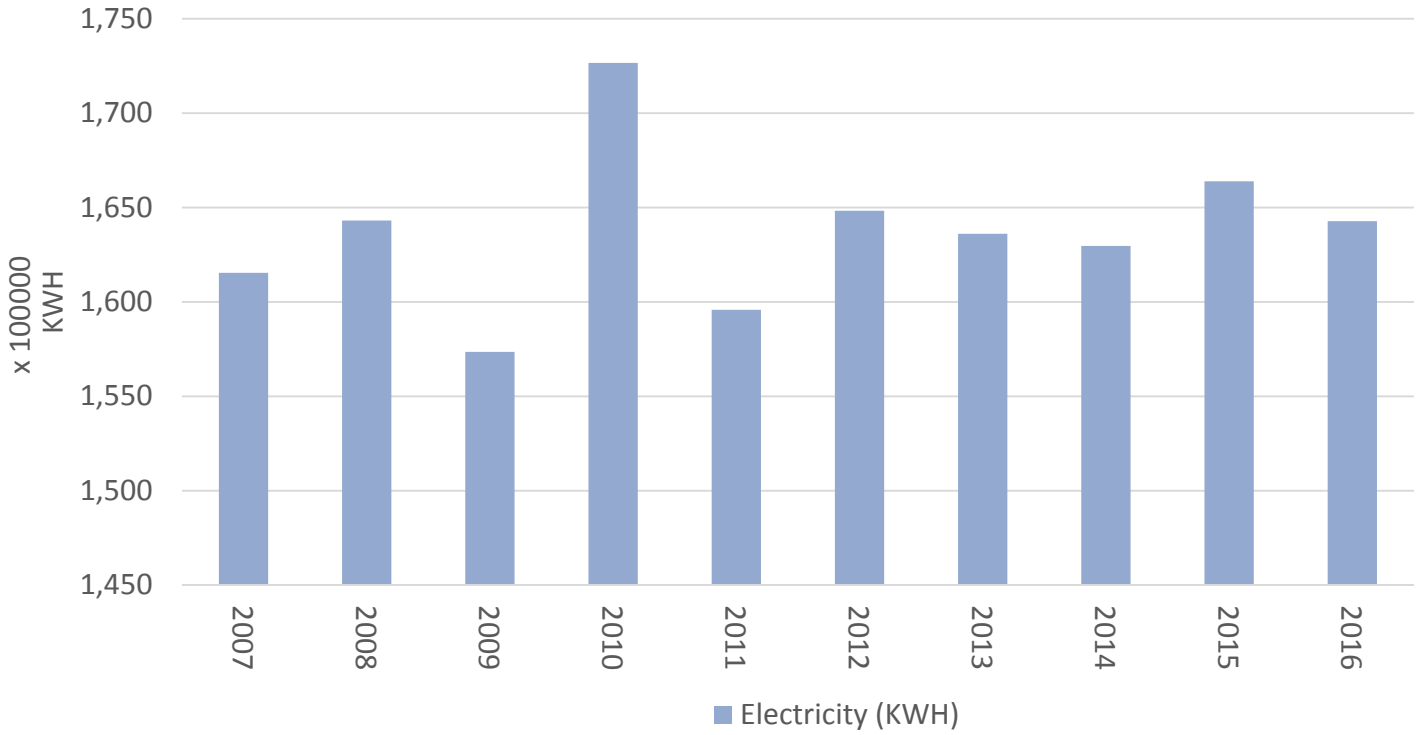
# PHL UTILITIES

- Annual Electric Consumption



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# What is Ground Support Equipment?

- Provide ground power and air conditioning to an aircraft
- Move an aircraft (e.g., out of a gate, to/from maintenance)
- Service an aircraft between flights (e.g., replenishing supplies, deicing, etc.)
- Load/unload passengers
- Load and unload baggage and cargo
- Service the airport's ramps, runways, and other areas (e.g., snow removal and lawn maintenance equipment).

# Types of GSE

- AC/Heaters
- Air Start Units
- Aircraft Tractors/Tugs
- Belt Loaders
- Baggage Tugs
- Buses
- Cars/Pickups/Vans/SUVs
- Carts
- Cargo Loaders
- Catering Trucks
- Deicing Trucks
- Forklifts
- Fuel Trucks
- Ground Power Units
- Hydrant Carts
- Lavatory Carts
- Light Carts
- Lifts
- Maintenance Trucks
- Passenger Stairs


# ELECTRIC GSE AT PHL

- 232 charging ports
- Electric belt loaders
- Electric Baggage tractors
- Fork Lifts
- Police golf carts
- Hybrid Vehicles
- 400 Hz power & Preconditioned Air units at each gate
- Portable Ground Power Units
- Passenger buses (high efficiency diesel)

*Note: There are 141 pieces of equipment at PHL that is tracked as part of grant reporting process. Airlines may add eGSE to their fleet that are not part of DOA's reporting parameters.






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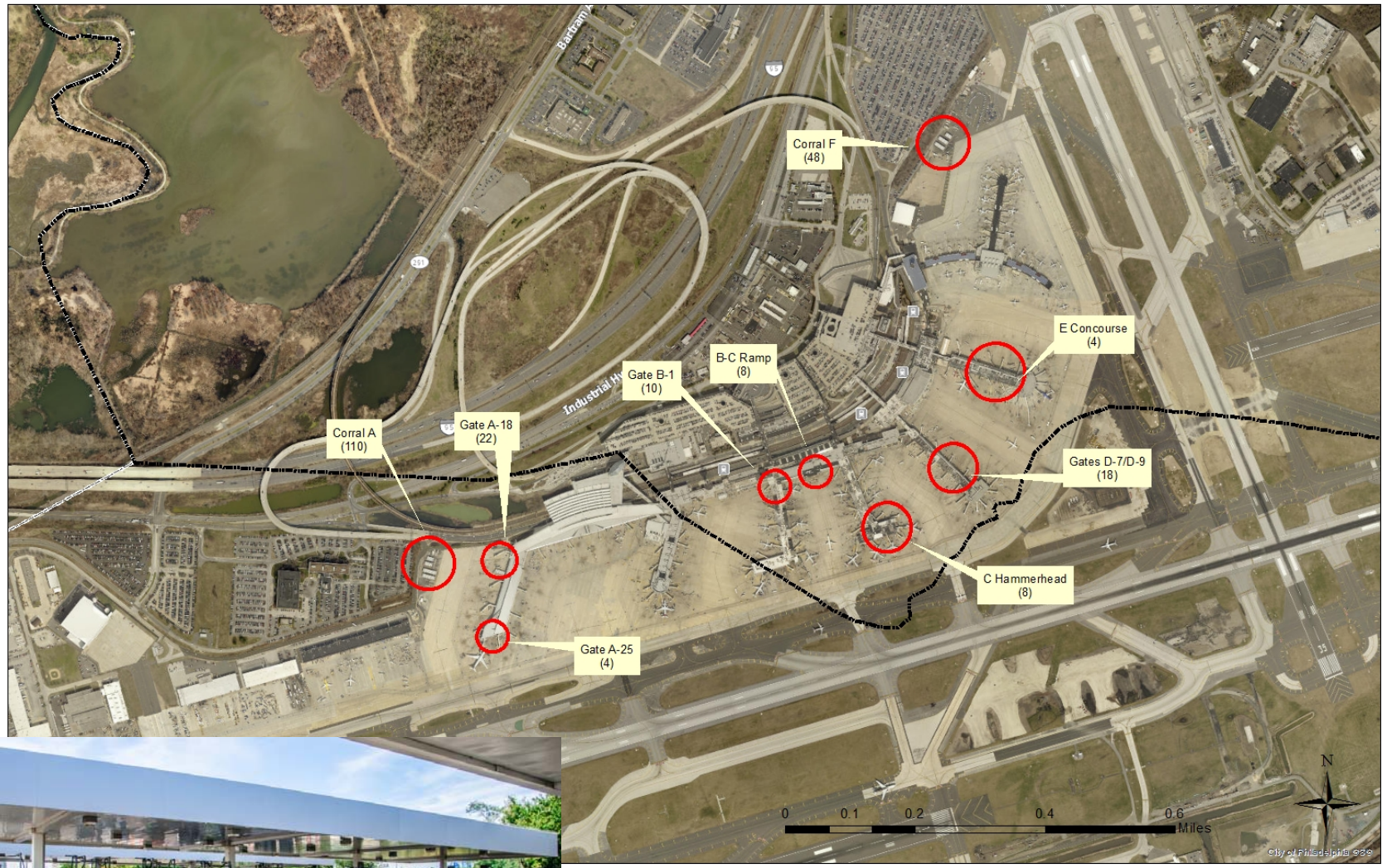
# CHARGING STATION LOCATIONS



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# PHL GSE Fleets

United – 27%

American - 21%

Piedmont – 20%

SW – under consideration

# Economic Considerations

## Pros

- O&M Savings offset upfront cost of electric GSE
  - Maintenance costs reduced by 30%
  - No parts/labor needed for Oil Changes, Antifreeze, Filters, Exhaust components, Starter motors, etc.
- Fuel $ Savings from eGSE
- Funding Assistance available

## Cons

- Higher upfront costs (10-25%)
- Increased Electricity Costs (but more stable prices)
- Battery replacement costs
- May require expensive infrastructure upgrades

# FUNDING ASSISTANCE

Alternate Fuel Incentive Grants (AFIG)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Diesel Emissions Reductions Act (DERA)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Voluntary Airport Low Emissions (VALE) Program

VALE CLEAN TECHNOLOGY
Voluntary Airport Low Emission Program

# FUNDING ASSISTANCE

- $15.3 M Federal grants (VALE)
  - $7.2M → eGSE Charging Infrastructure (232 Charging ports)
  - $7.0M → PCAir
  - $1.0M → GPU & supporting infrastructure
  - $16,000 → Hybrid vehicles
- $2.8 M State matching grants (AFIG, DERA through PADEP)

# Environmental and Social Considerations

## Pros

- Improved air quality
  - Reduced harmful emissions in enclosed spaces/tunnels
  - Reduced emissions during idling
- Reduced jet fuel or diesel/gas use
- Reduced noise pollution
- Reduced fuel spills

## Cons

- Emissions from electricity source
- Range anxiety
- Recharge time
- Training employees

# Environmental Benefits

## Total Emissions Reduced To Date (tons)

| Project | CO | VOC | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|
| 11 PCAir at Terminal A-East | -89.5 | -6.6 | -63.8 | -9.4 | -8.2 | -8.2 |
| 24 PCAir at Terminal F | -78.6 | -5.8 | -57.3 | -8.6 | -8.1 | -8.1 |
| 15 Charging Stations (AA) | -40.2 | -2.3 | -35.8 | -1.5 | -2.4 | -2.3 |
| 25 Charging Stations (AA) | -118.5 | -6.8 | -105.7 | -4.4 | -7.0 | -7.2 |
| 5 Chargers for 10 eGSE (United Airlines) | -9.8 | -0.6 | -7.4 | -0.4 | -0.6 | -0.6 |
| 5 GPUs at Maintenance Hangar (AA) | -25.8 | -1.4 | -11.8 | -1.1 | -0.8 | -0.8 |
| **TOTALS** | **-362** | **-23** | **-282** | **-25** | **-27** | **-27** |

# Environmental Benefits – CY 2016

**NOx**
**30 TPY**

| Project | CO | VOC | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Avoided Fuel Consumption (gal) | |
|---|---|---|---|---|---|---|---|---|
| 11 PCAir at Terminal A-East | 17.7 | 1.3 | 12.6 | 1.9 | 2.0 | 2.0 | 750,153 | *jet fuel* |
| 24 PCAir at Terminal F | 17.4 | 1.3 | 12.7 | 2.4 | 1.8 | 1.8 | 1,179,018 | *jet fuel* |
| 15 Chargers for 34 GSE (AA) | 8.4 | 0.5 | 7.6 | 0.3 | 0.5 | 0.5 | 120,592 | *diesel* |
| 25 Charging Stations for 97 GSE (AA) | 23.4 | 1.3 | 20.9 | 0.9 | 1.4 | 1.4 | 341,591 | *diesel* |
| 5 Chargers for 10 eGSE (United Airlines) | 2.1 | 0.1 | 1.6 | 0.1 | 0.1 | 0.1 | 49,180 | *diesel* |
| 5 GPUs at Maintenance Hangar (AA) | 9.5 | 0.5 | 4.2 | 0.4 | 0.3 | --- | 299,273 | *jet fuel and diesel* |
| **TOTALS** | 78.5 | 5.0 | 59.5 | 5.9 | 6.1 | 5.8 | | |

# THANK YOU!

## CONTACT INFO:

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