

Sustainable Flight Line Operations



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UW Faculty Mentors: Dr Patricia Buchanan, Dr Prashanth Rajivan, Dr Timothy V Larson, and Timothy Gould.

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Goal Statement

The goal of this project was to reduce greenhouse gas (GHG) emissions from the ground support equipment (GSE) in the 737 Max Flight Line



Fig. 1: 737 Max flight line at Boeing field

Motivation: Boeing Sustainability Report



Fig. 2: reach net-zero emissions by 2050

Fleet Considered:

21 TRUCK
 20 VANS
 10 FORKLIFTS
 5 TRACTORS

Assumptions

- Only accounting for operations within Boeing Field
- Not considering GHGs emitted during vehicle manufacturing
- No previous supporting infrastructure for fueling & maintenance

Infrastructure Mapping



Fig. 3: GSE parking at the 737 Max flight line

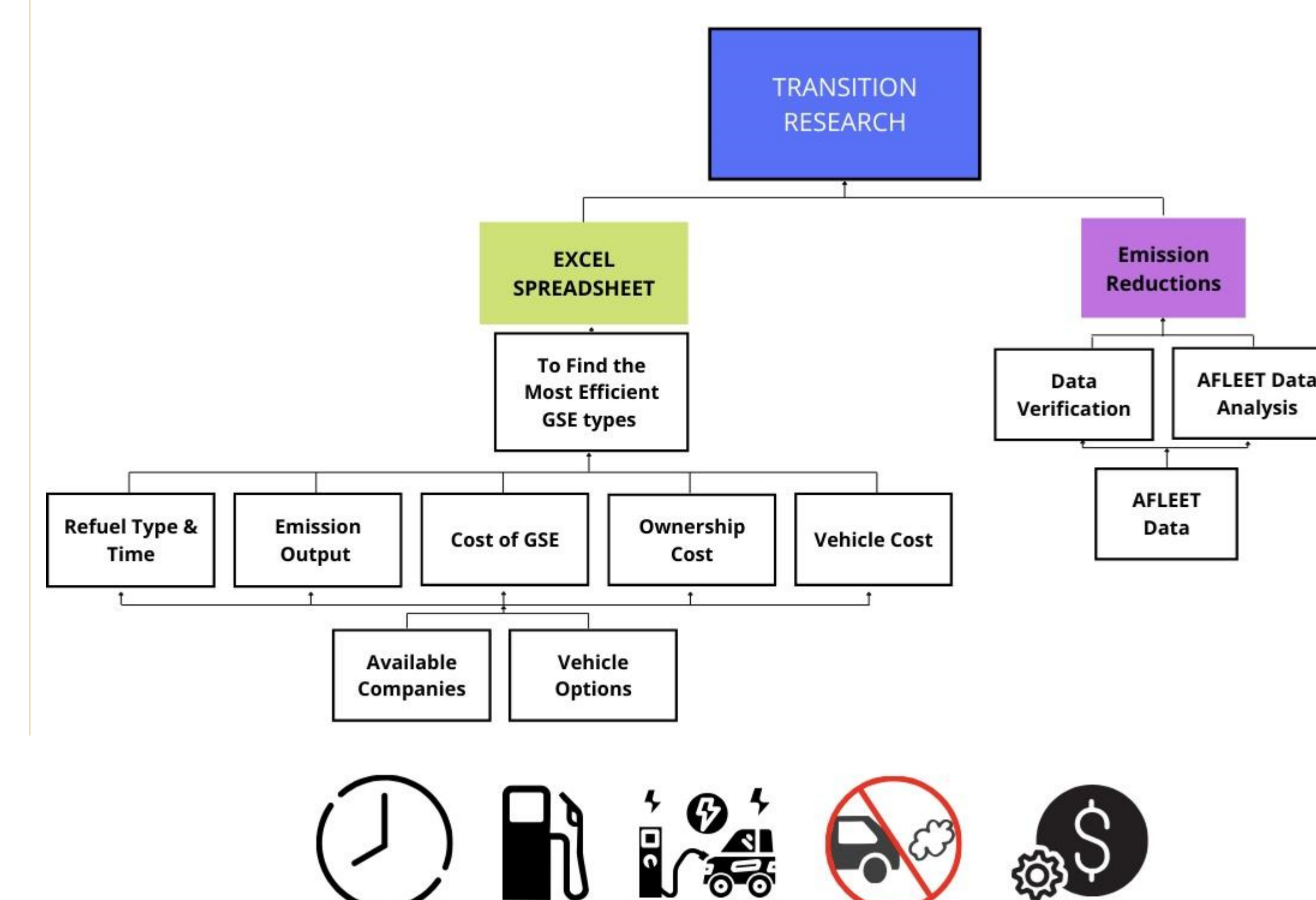
Methodology

Alternatives Researched

Gas
 Electric
 Hydrogen

Considerations

Safety
 Technology maturity
 Emission
 Cost



Emissions Reduction

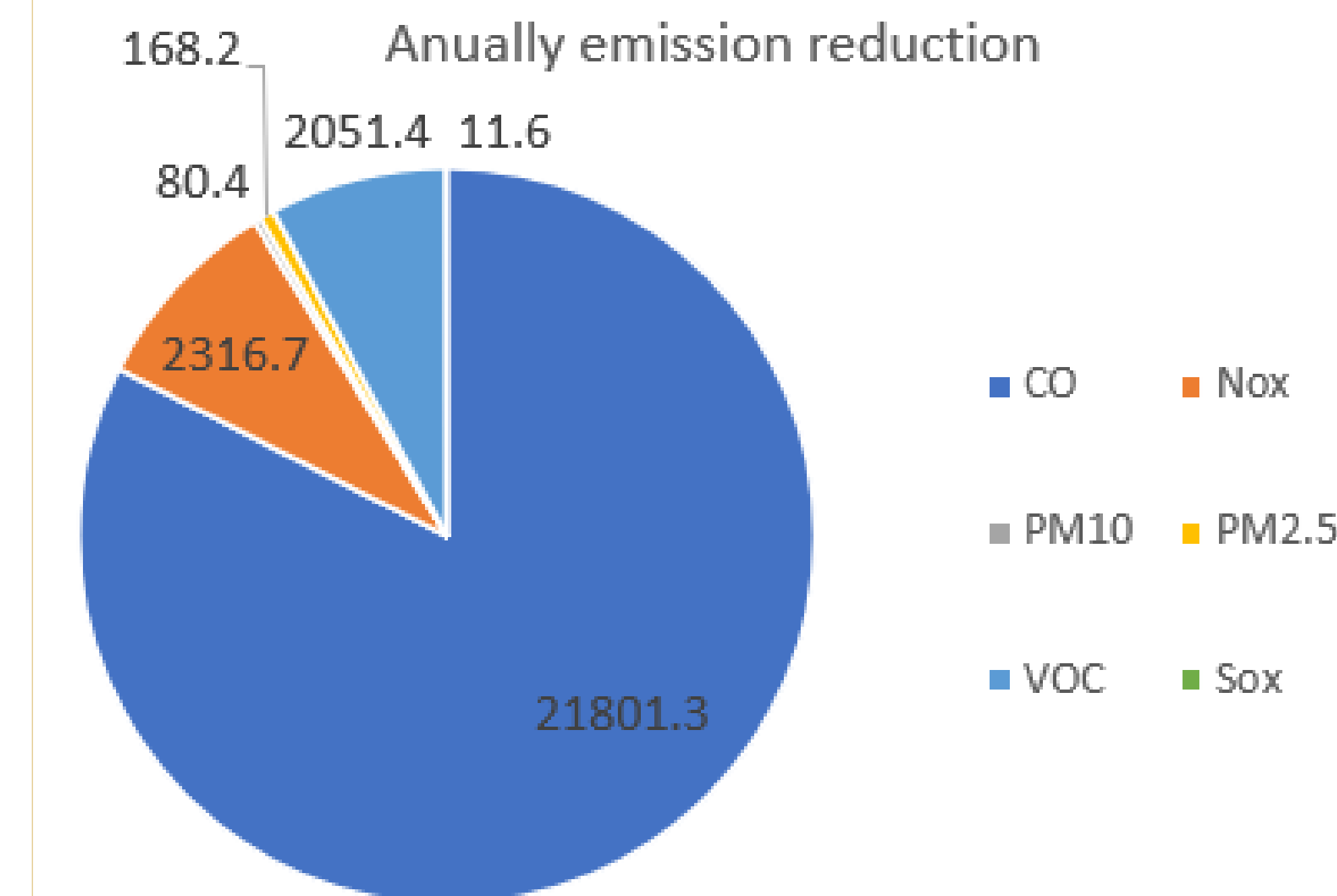


Fig. 4: Estimate of annual emission reduction (lbs)

Carbon sequestered by

164 tree seedlings grown for 10 years
 -or-
 12.9 acres of U.S. forests in one year

Data Validation



Fig. 5: Measurements of GHG on UW Campus

Cost estimate

3 million USD

Prior to incentives from public agencies

Annual Payback \$ 383149

Payback Period 10.5 yrs

Simio Vehicle Charging Simulation

With the simulation, we tested parameters such as:

- Number of chargers needed
- Charger utilization
- Electricity cost

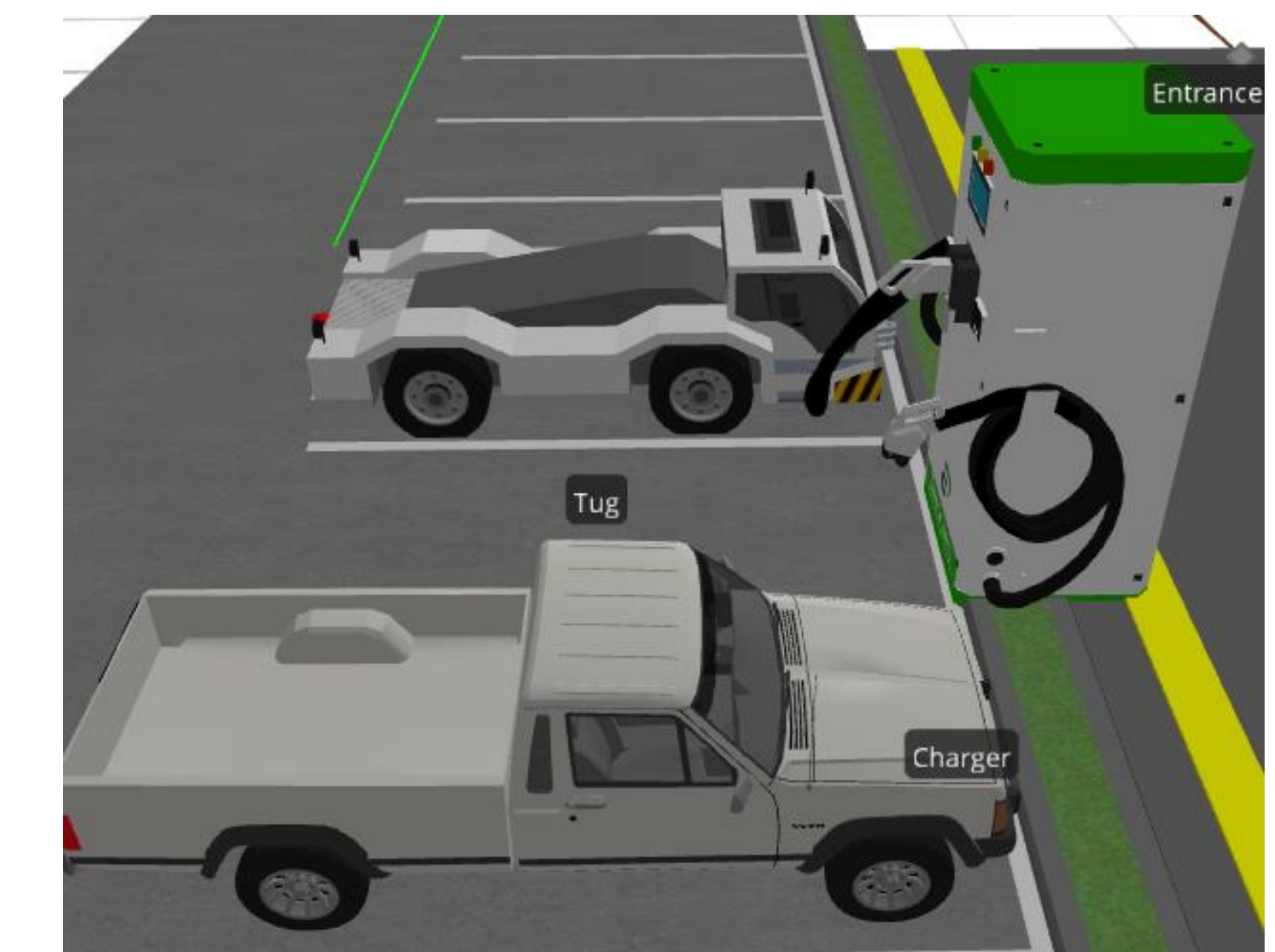


Fig. 6: Vehicles charging in simulation

Deliverables Summary

- Summary of greenhouse gas emissions savings
- Phase out plan
- Non comprehensive guide of safety regulations & standards
- Costs
 - Payback period
 - Maintenance and electricity cost
 - Cost of vehicles and infrastructure
 - Potential savings
- Quantity of chargers needed to install

Future Work

Due to time and resource constraints, there are items that we were unable to address but we consider key for future project success:

- Test the readiness of the flightline's electric infrastructure to support the chargers. If found lacking, upgrades need to be identified
- Collect emissions data from the 737 Max Flight Line for comparison.
- Further investigation regarding relevant regulations and standards applicable