**Objective and Significance:** This project developed a quantitative dataset to estimate and analyze ground transportation fuel use and CO₂ emissions for passenger and freight vehicles on Oahu.

**Background:** The convergence of electrified transportation and renewable power in Hawaii offers significant benefits as well as challenges to reduce imported fossil fuels and avoid their emissions from combustion. As petroleum-fueled vehicles are replaced with electric vehicles (EVs) in Hawaii, are they any cleaner and do they use less fossil fuels? Since much of the electricity in Hawaii is still generated from oil and coal, especially on Oahu, there is public concern and uncertainties surrounding the actual fossil fuel use and resulting emissions from powering EVs.

Gasoline-powered passenger vehicles comprise the largest share of all vehicles on Oahu and together emit the most CO₂ emissions, followed by gasoline-powered freight vehicles (see figure below).

![Total Annual Emissions, All Freight and Passenger Vehicles, 2018](image)

For this project the CO₂ emissions were based on combustion of the fuel on board the vehicle or at the power plant. The total fleet (passenger and freight), and per mile comparison includes:

- Vehicle Technologies – Internal Combustion Engine (ICE, both conventional and hybrid), and plug-in EVs.
- Vehicle Classes – Passenger, (average and efficient), and freight (both medium and heavy-duty).

**Project Status/Results:** Comparing passenger vehicles, an average gasoline vehicle (22 MPG) produced more CO₂ emissions than the average EV (32kWh/100miles) powered from the electric grid on the island of Oahu during 2017.

But driving an efficient EV (25kWh/100mi) on Oahu in 2017 produced slightly more CO₂ emissions than a comparable efficient gasoline-powered hybrid vehicle (50 MPG).

In 2018, the Oahu power grid reached a turning point, with enough renewable generation so that an efficient EV produced less CO₂ emissions than an efficient gasoline-powered hybrid.

In 2018, an efficient EV on Oahu was comparable in CO₂ emissions to a 50.4 MPG gasoline hybrid, whereas in 2017 the efficient EV was comparable to a 49.2 MPG gasoline hybrid.

Since the power source for EVs in Hawaii is becoming cleaner, older EVs are becoming cleaner as well, (unlike gasoline vehicles). As Hawaii’s utilities continue to add more wind and solar generation to achieve the Renewable Portfolio Standards in the future, EVs powered on the islands will generate less and less CO₂ emissions, and consume less fossil fuels (unlike gasoline vehicles.)

Results of this study are currently being prepared for publication. Additionally, an interactive strawman model was created to assess fossil fuel use and emissions on Oahu as increasing renewables are added to the power grid, and as EV adoption continues (replacing gasoline vehicles). This tool provides a quantitative modeling capability to estimate the impacts of vehicle and fuel options based on current technologies and fuel sources.

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