

100% Clean Ground Transportation Frequently Asked Questions

Why is a 100% Clean Transportation Necessary?

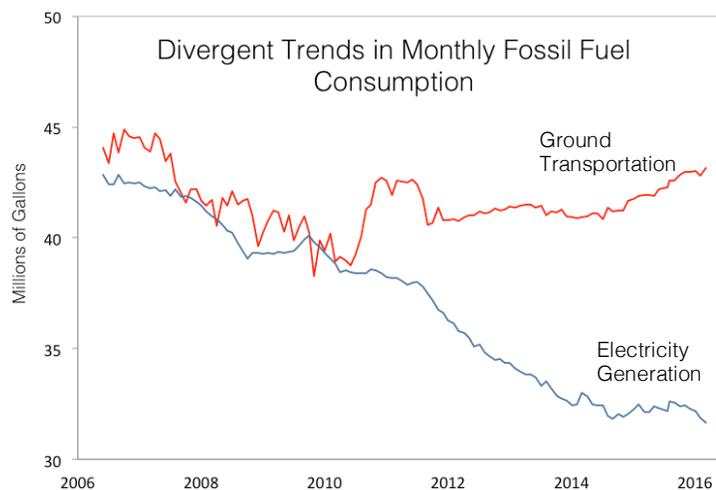
Hawai'i's policy leaders have long stressed the importance transitioning the state's energy system to clean energy. This transition has been driven by economics, and also by concern for our shared environment. As described by Governor George Ariyoshi:

“Stewardship . . . mean living with the constant reminder that our actions occur in context of other people over generations.”

Ground transportation accounts for around one-third of the state's fossil fuel consumption and greenhouse gas emissions. A resilient economy and a healthy environment require that we consider these impacts.

This is especially important in an age where 194 countries—essentially every country on earth—have agreed that it is imperative that we rapidly reduce greenhouse gas emissions.³

The state has long utilized planning targets as a way to set a course for reducing fossil fuel consumption in the electricity sector.⁴ This transformation is on track to reach the goal of 100% renewable energy by 2045. In contrast, fossil fuel consumption for ground transportation is essentially unchanged from a decade ago.



Closing this gap will require many efforts by many entities, both today and in the future. The importance of HB 1580 is that it can align those efforts around a common vision, set by the state's leaders.

What are the Economic Benefits?

The transition to clean transportation creates many opportunities for cost savings. Some of these opportunities come in the form of more efficient multi-modal transportation (e.g. saving money with more walking, biking, and public transit). Other opportunities arise from fuel-cost savings.

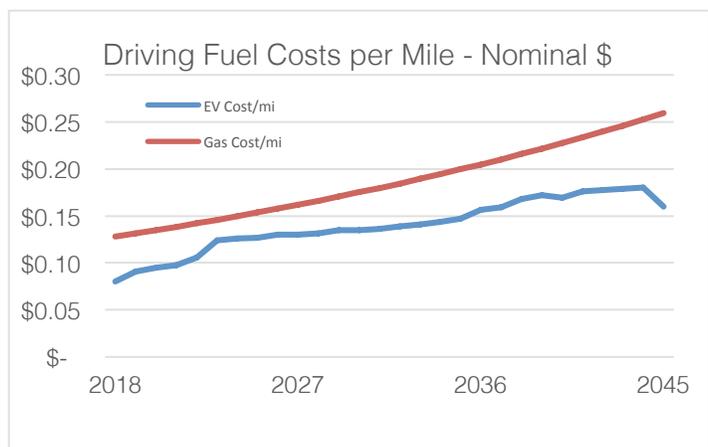
³ See Paris Agreement, U.N. Framework Convention on Climate Change (2016).

⁴ See H.R.S. § 269-91.

For example, the transition to clean energy is sure to include more electric passenger vehicles, buses, and fleet vehicles (“EVs”).⁵ This electrification trend provides a double benefit. First, the cost of powering an EV is generally less than powering an equivalent gasoline vehicle. So consumers can save money—today—by switching to an EV. Second, a growing fleet of EVs can help to balance renewable energy on the electric grid. This can lower the cost of electricity for everyone.

University of Hawai‘i Engineering Professor, Matthias Fripp, has created a quantitative model of the state’s transition to renewable energy. He has calculated that a 100% renewable transportation system, with smart EV charging to match renewable electricity generation, can be expected to **save utility consumers approximately \$150 million per year in fuel and electricity costs.**⁶

Blue Planet Foundation has evaluated recent projections for electricity rates in Hawai‘i, comparing them to a World Bank estimate of the long-term trend for increasing oil prices, under a variety of transportation scenarios. This comparison indicates that we can expect electricity to remain the cheaper fuel option through 2045, and that the potential aggregate benefit in fuel savings is on the order of several billion dollars.



Is 100% Clean Transportation by 2045 Possible?

Much like in the electricity sector, many factors will influence the pace of the state’s transition to clean energy. While some of those factors remain unknown (as is expected for a 30-year planning horizon), several important factors are apparent today:

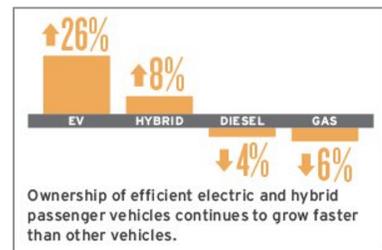
1. The Rise of Battery Electric and Fuel Cell Vehicles

While familiar clean transportation options (like biofuels, walking, biking, public transit, etc.), and emerging technologies (like hydrogen) will undoubtedly play an important role, we expect the emergence of electric vehicles (EVs) to quickly and radically shift the state’s transportation energy landscape.

⁵ For example, auto executives recently polled by KPMG identified EVs as the top trend in the car market between now and 2025.

⁶ See M. Fripp, *Effect of Electric Vehicles on Design, Operation and Cost of a 100% Renewable Power System* (Apr. 2016).

In Hawai'i, the growth rate of EV sales has far outpaced other fuel options. On a more global scale, important factors such as the cost of producing batteries for electric cars has fallen dramatically, from around \$1,000 per kWh to less than \$200. As we enter the second generation of modern EVs, a steadily increasing variety of models are coming onto the market with lower prices, larger batteries, and longer driving ranges. Nearly every major auto manufacturer is investing heavily in battery electric and/or hydrogen fuel cell electric vehicles, and views zero emission vehicles as the long-term solutions for transportation fuels.



Hawai'i is particularly well-suited for the this acceleration of EV adoption because electric batteries perform well in our year-round warm climate. Our island geography often restricts the distances we need to drive, making range anxiety less of an issue compared to other locations. Hawai'i is already in the top three states by proportion of registered vehicles that are electric, and we have the second highest ratio of electric charging stations to population of any state.

2. Transportation will Become More Multi-modal, Networked, Autonomous

The future of transportation in Hawai'i is likely to include more efficient land use that reduces travel demand and travel distances, significant improvements in mass transit, bicycling and pedestrian infrastructure, and new mobility alternatives such as autonomous taxis and other networked 'mobility as service' options. These changes are likely to shift a sizable percentage of Hawai'i's trips from personal automobiles to alternative modes and to significantly reduce transportation energy use.

With sufficiently transformative policies, the small sector of gasoline vehicles can be a small fraction of the total ground transportation sector (around 6%).

3. Biofuels are a Near-Term and Long-Term Option

Hawai'i is home to one of the leading pioneers of biofuel production, Pacific Biodiesel. Today, the state is producing commercial quantities of biofuels using local feedstocks.

In a report commissioned by DBEDT in 2010, the consultant firm Black & Veatch Corporation performed an analysis of the potential for biofuel production in the state of Hawai'i. The report found that the maximum theoretical capacity of biofuel production in the state was equal to the equivalent of 848 million gallons of "green gasoline" or 779 million gallons of "green diesel" per year (see chart below). This is around 2.5 times the total amount of gasoline and diesel used in ground transportation in Hawai'i today.

Table 1-6. Maximum Theoretical Hawai'i Biofuel Production Potential.					
Feedstock	Biofuel 10 ¹² Btus/yr	Ethanol million gal/yr	Green Gasoline equivalent million gal/yr	Green Diesel equivalent million gal/yr	Green Jet Fuel equivalent million gal/yr
Energy Crops	101	1,202	786	722	751
Cellulosic Wastes	8	95	62	57	59
Total:	109	1,297	848	779	810

Source: DBEDT (2010). "The Potential For Biofuels Production in Hawaii"

The report also concluded that "...it should be quite achievable for biofuels produced from in-state resources to displace 20 percent [over 50 million gallons] of the gasoline and diesel fuel needed for vehicle transportation in Hawai'i. This could be accomplished using about 10 percent of available agricultural land for energy crop production to supply the required biomass feedstock."

In short, local biofuels are a viable option for powering significant portions of the transportation sector.