

# Electric Vehicles

An electric vehicle (EV) uses electricity in place of gasoline, reducing the need for petroleum-based fuel. Since EVs can use electricity produced from renewable resources available in Hawaii (i.e. sun, wind, hydropower, ocean energy, geothermal energy), the transition from gasoline fueled vehicles to electric vehicles supports Hawaii's energy independence goals.



Based on statewide averages, the amount of fossil fuel used to power an electric vehicle in Hawaii is 31% less than the fossil fuel required to power a similar gasoline-fueled vehicle.<sup>45</sup> This is expected to get even better as renewable energy increases in Hawaii.

Electricity is most commonly delivered to an electric vehicle's batteries at night, through a home vehicle charger. Electric vehicles can also use publically available charging stations.

## Registered Electric Vehicles (EVs) and Publically Available Charging Stations in Hawaii, September 2013

| County                 | Electric Vehicles | Level 2 <sup>46</sup> Charging Stations | Ports <sup>47</sup> | Level 3 <sup>48</sup> Charging Stations |
|------------------------|-------------------|---|---------------------|---|
| Oahu                   | 1427              | 221                                     | 246                 | 4                                       |
| Maui                   | 291               | 32                                      | 39                  | 1                                       |
| Hawaii                 | 95                | 29                                      | 46                  | 0                                       |
| Kauai                  | 56                | 32                                      | 37                  | 1                                       |
| <b>State of Hawaii</b> | <b>1869</b>       | <b>314</b>                              | <b>368</b>          | <b>6</b>                                |

- Public charging, including fast charging, is needed as a convenience for EV drivers and to reduce range anxiety.
- The cost for a government or commercial property owner to install a Level 2 charging station is typically approximately \$6,000-\$8,000 per station.<sup>49</sup>

EVs have a greater initial purchase price<sup>50</sup> than comparable gasoline-fueled vehicles. Most experts, including Hawaii's auto dealers, believe that widespread acceptance of EVs will grow as a full battery charge provides greater driving range and the cost of EVs more closely matches the cost of conventional internal combustion engine (ICE) vehicles.

## Hawaii EV Dealers by County

| County                 | Nissan Leaf | GM/Chevy Volt | Mitsubishi iMiEV | Toyota plug-in Prius | Ford Focus EV |
|------------------------|-------------|---------------|------------------|----------------------|---------------|
| Oahu                   | 3           | 3             | 1                | 3                    | 3             |
| Maui                   | 1           | 1             | 0                | 1                    | 1             |
| Hawaii                 | 0           | 1             | 0                | 2                    | 0             |
| Kauai                  | 1           | 1             | 0                | 1                    | 1             |
| <b>State of Hawaii</b> | <b>5</b>    | <b>6</b>      | <b>1</b>         | <b>7</b>             | <b>5</b>      |

Fuel cost comparisons show approximate savings between internal combustion engine and electric vehicles. The example below shows that fuel costs are lower for the Nissan Leaf than for a comparable gasoline fueled vehicle.

## Fuel Cost Comparison

| Vehicle                          | 2012 Nissan Versa | 2012 Honda Civic | 2012 Nissan Leaf <sup>51</sup> |
|----------------------------------|-------------------|------------------|--------------------------------|
| Fuel Type                        | Gasoline          | Gasoline         | Electricity                    |
| Miles Per Gallon (mpg)           | 27mpg Combined    | 32mpg Combined   | 99 Combined mpge               |
| Fuel Costs                       | \$ 4.10/gallon    | \$ 4.10/gallon   | Electricity: \$ 0.345/kWh      |
| Fuel Cost per Mile               | \$ 0.1519 / mile  | \$ 0.1282 / mile | \$ 0.1173 / mile               |
| Fuel Cost per Year <sup>52</sup> | \$ 1,370 / year   | \$ 1,156 / year  | \$ 1,058 / year                |

Hawaii's electric vehicle policies and incentives include:

- Free parking is provided in State and County Government lots, facilities, and at parking meters (Act 168 of 2012, formerly Act 290 of 1997).
- Vehicles with Electric Vehicle license plates are allowed access to High Occupancy Vehicle lanes (Act 168 of 2012).
- Parking lots with at least one hundred public parking spaces are required to have at least one parking space, equipped with an EV charging system, reserved exclusively for EVs (Act 089 of 2012, formerly Act 156 of 2009).
- Multi-family residential dwellings or townhouses cannot prohibit owners from installing EV chargers in their assigned parking spaces (Act 186 of 2010).

|   |  |   |                                |
|---|--|---|--------------------------------|
| Electric Vehicle Land Speed Record  | <b>303</b> miles per hour              | Electric Vehicle Distance Record on a Single Charge                                       | <b>423</b> miles <sup>53</sup> |
| Average distance driven by US driver in one day (easily accomplished by current EV technology). | <b>35</b> miles per day                | Best temperature range to operate lithium ion batteries (most common EV batteries today). | <b>68° - 95°</b> Fahrenheit    |
| EPA rating for 2013 Ford Fusion Energi plug in hybrid   | <b>108</b> mpg city, <b>92</b> mpg hwy | Hawaii national rank for public EV charging stations per capita.                          | <b>1</b>                       |

## End Notes / References

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- 3 Current price data, July 2013: [http://www.eia.gov/electricity/monthly/epm\\_table\\_grapher.cfm?t=epmt\\_5\\_6\\_a](http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a)
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42 From work by Anthony Ostrowski, Oceanic Institute.

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45 State of Hawaii, *Driving EVs Forward: A Case Study of the Market Introduction and Deployment of the EV in Hawaii*, 2012. [http://energy.hawaii.gov/wp-content/uploads/2011/10/ReportMauiElectricVehicleAlliance\\_12\\_20\\_12.pdf](http://energy.hawaii.gov/wp-content/uploads/2011/10/ReportMauiElectricVehicleAlliance_12_20_12.pdf)

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47 A "charger" can have one or more ports. The number of "ports" determines how many vehicles each charger can service at a time. One "port" can service one vehicle.

48 Level 3, also known as "fast charging," can provide an 80% charge for some vehicles in under 30 minutes, depending on vehicle and charger specifications. Not all vehicles can use fast charging.

49 Based on data collected by the State Energy Office, a relatively simple project in Hawaii can range from \$4,000 to \$25,000; however, prices vary considerably.

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Electric vehicles are practical too: 42 percent of US households could use a battery-electric or plug-in electric vehicle. Doing so would save drivers billions in fuel costs and greatly reduce the amount of global warming pollution we emit. In fact, widespread adoption of electric cars and trucks could save 1.5 million barrels of oil a day by 2035. Electric vehicles and plug-in hybrid electric vehicles stand at a crossroads in terms of becoming viable, mass market options for the UK to radically reduce CO2. Executive Summary. emissions from transport. Technical development is proceeding, driven by an industry that sees their potential as the future of personal transport. However, their success will rely on a number of infrastructural improvements and early agreement on standards and protocols.