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# **RELATIVE COSTS OF DRIVING ELECTRIC AND GASOLINE VEHICLES IN THE INDIVIDUAL U.S. STATES**

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RELATIVE COSTS OF DRIVING ELECTRIC AND GASOLINE VEHICLES  
IN THE INDIVIDUAL U.S. STATES

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16. Abstract  <p>This study was designed to examine the variation across the individual U.S. states in the relative fuel cost of driving battery electric vehicles (BEVs) and gasoline vehicles. Also of interest was the state-by-state variation in the fuel economy that gasoline vehicles would have to exceed to make driving them less expensive than driving BEVs.</p> <p>The following are the main findings:</p> <ol style="list-style-type: none"> <li>(1) The current average annual cost of driving a typical new gasoline vehicle in the United States is \$1,117, with a maximum of \$1,509 in Hawaii and a minimum of \$993 in Alabama.</li> <li>(2) The current average annual cost of driving a typical new BEV in the United States is \$485, with a maximum of \$1,106 in Hawaii and a minimum of \$367 in Louisiana.</li> <li>(3) The ratio of the current average costs of driving a typical gasoline vehicle and a typical BEV in the United States is 2.3, with a maximum of 3.6 in Washington and a minimum of 1.4 in Hawaii.</li> <li>(4) The required fuel economy that gasoline vehicles would need to exceed for driving them to be less expensive than driving BEVs is 57.6 mpg in the United States, with a maximum of 90.0 mpg in Washington and a minimum of 34.1 mpg in Hawaii.</li> </ol>					
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## **Introduction**

It is generally acknowledged that, in the United States, driving battery electric vehicles (BEVs) tends to be less expensive than driving gasoline-powered vehicles (e.g., INL, 2017). However, the variation in the price of gasoline across the individual states does not completely parallel the variation in the price of electricity. Therefore, this study was designed to examine the variation across the individual states in the relative fuel cost of driving BEVs and gasoline vehicles. Also of interest was the state-by-state variation in the fuel economy that gasoline vehicles would have to exceed to make driving them less expensive than driving BEVs.

## Method

### Approach

The analysis calculated the following measures for each state:

- Annual fuel cost of driving a typical gasoline vehicle
- Annual fuel cost of driving a typical BEV
- Ratio of the above two costs
- Fuel economy that gasoline vehicles would have to exceed to make them less expensive to drive than BEVs

### Underlying data

The following data were used in the calculations:

#### *State data*

- Average price of regular gasoline on December 23, 2017 (AAA, 2017)
- Average price of electricity for residential customers in October 2017 (EIA, 2017)

#### *National data*

- Average (sales-weighted) fuel economy<sup>1</sup> of all light-duty vehicles purchased in December 2017 (25.0 mpg;<sup>2</sup> Sivak and Schoettle, 2018)
- Average (not sales-weighted) electricity consumption for all BEVs listed in the 2017 EPA Fuel Economy Guide<sup>3</sup> (33.0 kWh/100 miles; EPA, 2017)
- Average annual distance driven per light-duty vehicle in 2015<sup>4</sup> (11,443 miles; NHTSA, 2017)

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<sup>1</sup> EPA combined fuel economy (city and highway).

<sup>2</sup> This average includes BEVs as well, but currently BEVs constitute less than 1% of all vehicles sold (EV Obsession, 2017). Therefore, using this measure for gasoline vehicles is a reasonable approximation. (This average also includes diesel vehicles.)

<sup>3</sup> The 2018 edition of the Fuel Economy Guide is currently incomplete. It contains data for only a limited number of vehicle models.

<sup>4</sup> The latest year for which data are available.

## Results

### Cost of driving gasoline vehicles

The average price of regular gasoline in the United States on December 23, 2017 was \$2.441/gallon (AAA, 2017). The price was highest in Hawaii (\$3.297) and lowest in Alabama (\$2.169). The ratio between these two extremes was 1.52.

The annual state-by-state fuel costs of driving a typical gasoline vehicle are listed in the second column of Table 1. The highest cost was in Hawaii (\$1,509), followed by Alaska (\$1,434), California (\$1,407), Washington (\$1,338), and Oregon (\$1,274). The lowest cost was in Alabama (\$993), followed by Texas (\$994), Mississippi (\$998), Arkansas (\$999), and South Carolina (\$1,003). The average cost for the United States overall was \$1,117.

### Cost of driving BEVs

The average price of residential electricity in the United States in October 2017 was \$0.1284/kWh (EIA, 2017). The price was highest in Hawaii (\$0.2929) and lowest in Louisiana (\$0.0972).<sup>5</sup> The ratio between the two extremes was 3.01.

The annual state-by-state costs of driving a BEV are listed in the third column of Table 1. The highest cost was in Hawaii (\$1,106), followed by Alaska (\$833), Connecticut (\$804), New Hampshire (\$751), and Rhode Island (\$737). The lowest cost was in Louisiana (\$367), followed by Washington (\$372), Arkansas (\$382), Idaho (\$390), and Tennessee (\$398). The average cost for the United States overall was \$485.

### Ratio of the costs of driving gasoline vehicles and BEVs

The ratios of the costs of driving a gasoline vehicle and a BEV are shown in the fourth column of Table 1. The ratio was lowest in Hawaii (1.364), followed by New Hampshire (1.479), Connecticut (1.500), Rhode Island (1.565), and Massachusetts (1.579). The ratio was highest in Washington (3.602), followed by Oregon (3.075), Idaho (2.999), Louisiana (2.770), and Utah (2.765). The ratio for the United States overall was 2.304.

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<sup>5</sup> The correlation between the state prices in electricity and gasoline proved to be only moderate ( $r = 0.59$ ).

Table 1

Annual fuel costs of driving a typical gasoline vehicle and a typical BEV, ratio of the costs, and fuel economy that gasoline vehicles would need to exceed to make driving them less expensive than driving BEVs. (The states are listed in increasing order of the cost ratio and the required fuel economy.)

State	Gasoline cost (\$)	Electricity cost (\$)	Cost ratio	Required fuel economy (mpg)
Hawaii	1,509	1,106	1.364	34.1
New Hampshire	1,111	751	1.479	37.0
Connecticut	1,207	804	1.500	37.5
Rhode Island	1,154	737	1.565	39.1
Massachusetts	1,154	731	1.579	39.5
Vermont	1,148	678	1.694	42.3
New York	1,200	708	1.694	42.4
Alaska	1,434	833	1.720	43.0
Maine	1,135	612	1.855	46.4
Wisconsin	1,108	570	1.945	48.6
Delaware	1,053	540	1.950	48.8
Kansas	1,022	503	2.031	50.8
Maryland	1,109	544	2.039	51.0
New Jersey	1,141	555	2.055	51.4
Alabama	993	481	2.065	51.6
Michigan	1,196	574	2.084	52.1
South Carolina	1,003	481	2.087	52.2
Minnesota	1,088	511	2.129	53.2
Arizona	1,064	485	2.193	54.8
New Mexico	1,083	491	2.205	55.1
Pennsylvania	1,234	555	2.224	55.6
Virginia	1,023	454	2.253	56.3
Ohio	1,103	475	2.321	58.0
Texas	994	424	2.341	58.5
Florida	1,078	458	2.355	58.9
Mississippi	998	423	2.360	59.0
Iowa	1,084	456	2.376	59.4
South Dakota	1,120	469	2.387	59.7
Georgia	1,040	431	2.413	60.3



Table 1 (continued)

State	Gasoline cost (\$)	Electricity cost (\$)	Cost ratio	Required fuel economy (mpg)
North Carolina	1,066	441	2.414	60.3
District of Columbia	1,229	508	2.422	60.6
California	1,407	580	2.425	60.6
Illinois	1,182	486	2.431	60.8
Oklahoma	1,012	416	2.433	60.8
Colorado	1,115	454	2.454	61.4
Missouri	1,004	407	2.464	61.6
Nevada	1,212	484	2.506	62.6
Indiana	1,185	468	2.530	63.2
Wyoming	1,115	438	2.544	63.6
West Virginia	1,157	452	2.562	64.1
Tennessee	1,020	398	2.565	64.1
Kentucky	1,077	413	2.606	65.1
Arkansas	999	382	2.617	65.4
Nebraska	1,089	413	2.635	65.9
North Dakota	1,117	418	2.672	66.8
Montana	1,186	431	2.750	68.8
Utah	1,107	400	2.765	69.1
Louisiana	1,017	367	2.770	69.2
Idaho	1,171	390	2.999	75.0
Oregon	1,274	414	3.075	76.9
Washington	1,338	372	3.602	90.0
<i>U.S.A.</i>	<i>1,117</i>	<i>485</i>	<i>2.304</i>	<i>57.6</i>

### Required fuel economy of gasoline vehicles

The fifth column in Table 1 lists the fuel economy that gasoline vehicles would need to exceed to make driving them less expensive than driving BEVs. The required fuel economy was lowest in Hawaii (34.1 mpg), followed by New Hampshire (37.0 mpg), Connecticut (37.5 mpg), Rhode Island (39.1 mpg), and Massachusetts (39.5 mpg). The required fuel economy was highest in Washington (90.0 mpg), followed by Oregon (76.9 mpg), Idaho (75.0 mpg), Louisiana (69.2 mpg), and Utah (69.1 mpg). For the United States overall, the required fuel economy was 57.6 mpg.

## Key findings

- (1) The current average annual cost of driving a typical new gasoline vehicle in the United States is \$1,117, with a maximum of \$1,509 in Hawaii and a minimum of \$993 in Alabama.
- (2) The current average annual cost of driving a typical new BEV in the United States is \$485, with a maximum of \$1,106 in Hawaii and a minimum of \$367 in Louisiana.
- (3) The ratio of the current average costs of driving a typical gasoline vehicle and a typical BEV in the United States is 2.3, with a maximum of 3.6 in Washington and a minimum of 1.4 in Hawaii.
- (4) The required fuel economy that gasoline vehicles would need to exceed for driving them to be less expensive than driving BEVs is 57.6 mpg in the United States,<sup>6</sup> with a maximum of 90.0 mpg in Washington and a minimum of 34.1 mpg in Hawaii.<sup>7</sup>

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<sup>6</sup> By comparison, the average fuel economy of new vehicles sold in December 2017 was 25.0 mpg (Sivak and Schoettle, 2018).

<sup>7</sup> The EPA Fuel Economy Guide for model year 2017 vehicles (EPA, 2017) lists seven all-gasoline vehicles that have better fuel economy than 34.1 mpg. Therefore, driving any of those seven gasoline vehicles in Hawaii is currently less expensive than driving a typical BEV.

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