Chart of the Week:
Fast Charging Electric Vehicle Stations
Some Considerations

Max Pyziur
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Washington, DC

Source: Philip Cheung / NY Times
EV charging infrastructure by number of stations and fast chargers is concentrated in states such as California, Florida, and Washington.
Fast Charging Electric Vehicle (EV) Stations: Some Considerations

• The development and utility of all-electric motor vehicles is predicated on the availability of both conveniently located charging stations and a robust grid.

• EV charging is available in three categories: DC Fast Charging (DCFC) which charges EVs to 80% charge within 30 minutes; Level 2 which requires 5-6 hours; and Level 3 which takes up to 20 hours to achieve the same level.

• According to DOE data, U.S. DCFC EV stations at the end of 2020 numbered almost 5,500 with over 20,000 available connections. The number of U.S. filling stations is about 125 thousand with 4 to 8 pumps per location.

• The majority of DCFCs have 1 to 2 connections; however, the largest one run by Tesla located in Firebaugh, California has 56.

• The EV charging industry lacks standardization; only Teslas can be charged at North American Tesla DCFCs due to the proprietary connectivity. In addition, vehicle connections differ by manufacturer requiring DCFC connections to have multiple types of connectors along with extensive cabling in order to reach a vehicle’s particular electrical interface.

• With 42% of U.S. EVs registered in California, the state dominates U.S. charging infrastructure with number of stations and connections per facility.

• DCFC puts considerable load on electricity grids: fifty EVs charging concurrently is the equivalent load of a major commercial building.

• The expanded version of this slide deck is available at: https://eprinc.org/chart-of-the-week/

• For more information on this chart, please contact Max Pyziur (maxp@eprinc.org).

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Additional Slides
## Estimate of Costs per Miles Driven

<table>
<thead>
<tr>
<th>Miles Driven</th>
<th>Gasoline</th>
<th>Electricity</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Level 1</td>
<td>Level 2</td>
</tr>
<tr>
<td>30</td>
<td>$4.08</td>
<td>$1.16</td>
<td>$2.31</td>
</tr>
<tr>
<td>100</td>
<td>$13.60</td>
<td>$3.86</td>
<td>$7.71</td>
</tr>
<tr>
<td>200</td>
<td>$27.20</td>
<td>$7.71</td>
<td>$15.43</td>
</tr>
</tbody>
</table>

### Assumptions

<table>
<thead>
<tr>
<th>U.S. Light Duty Vehicle Average Miles per gallon (EIA)</th>
<th>U.S. Regular Gasoline Price per gallon (current, EIA)</th>
<th>U.S. EV Efficiency per mile (EPRI, EVgo)</th>
<th>U.S. Average Home Electricity Price per kWh (EIA - 2021)</th>
<th>U.S. Level 2 Electricity Price per kWh (EPRI)</th>
<th>U.S. DC Fast Charging Electricity Price per kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.0</td>
<td>$3.40</td>
<td>3.5</td>
<td>$0.14</td>
<td>$0.27</td>
<td>$0.31</td>
</tr>
</tbody>
</table>

### Charge Time Comparison

<table>
<thead>
<tr>
<th>Typical Location</th>
<th>Rate (kW)</th>
<th>Miles per Charging Time</th>
<th>Typical Total Charging Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>1.4 - 1.9</td>
<td>3-5 miles of range per hour</td>
<td>20 hours</td>
</tr>
<tr>
<td>Level 2</td>
<td>3.3 - 19.2</td>
<td>8-24 miles of range per hour</td>
<td>5-6 hours</td>
</tr>
<tr>
<td>DC Fast Charging</td>
<td>50-350</td>
<td>3-18 miles of range per minute</td>
<td>15-30 minutes</td>
</tr>
</tbody>
</table>

Analysis based on EPRI Data
U.S. Fast Charging EV Stations by Company

- 1,560 Chargepoint (29%)
- 1,159 Tesla (21%)
- 830 EVgo (15%)
- 665 Electrify America (12%)
- 1,232 Others (23%)

Analysis Based on AFDC-DOE Data

U.S. Fast Charging EV Connections by Company

- 11,541 Tesla (58%)
- 2,871 Electrify America (14%)
- 1,615 EVgo (8%)
- 1,561 Chargepoint (8%)
- 2,442 Others (12%)

Analysis Based on AFDC-DOE Data
Number of EV Registrations by State

400,500
All Other States
39%

425,300
California
42%

32,590
New York
3%

50,520
Washington
5%

52,190
Texas
5%

58,160
Florida
6%

Analysis Based on AFDC-DOE Data

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