Smith Newton Vehicle Performance Evaluation - 4th Quarter 2012

The Fleet Test and Evaluation Team at the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) is evaluating and documenting the performance of electric and plug-in hybrid electric drive systems in medium-duty trucks across the nation. U.S. companies participating in this evaluation project received funding from the American Recovery and Reinvestment Act to cover part of the cost of purchasing these vehicles. Through this project, Smith Electric Vehicles is building and deploying 500 all-electric medium-duty trucks that will be deployed by a variety of companies in diverse climates across the country.

Number of vehicles: 199  Number of vehicle days driven: 3,720
Reporting period: 10/1/2012 to 12/31/2012  Number of operating cities: 38

Project Vehicle Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curb Weight</td>
<td>9,700-10,200 pounds</td>
</tr>
<tr>
<td>Electric Top Speed</td>
<td>50 mph</td>
</tr>
<tr>
<td>Overall Length</td>
<td>268-368 inches</td>
</tr>
<tr>
<td>Battery Capacity</td>
<td>80 or 120 kWh</td>
</tr>
<tr>
<td>Overall Width</td>
<td>87 inches</td>
</tr>
<tr>
<td>Battery Voltage</td>
<td>~ 350 V</td>
</tr>
<tr>
<td>Overall Height</td>
<td>94-99 inches</td>
</tr>
<tr>
<td>Charging Standards</td>
<td>SAE J1772</td>
</tr>
<tr>
<td>Peak Motor Power</td>
<td>134 kW</td>
</tr>
<tr>
<td>Transmission</td>
<td>Single Speed Reduction Gear</td>
</tr>
<tr>
<td>Motor Location</td>
<td>Front, Behind Cab</td>
</tr>
<tr>
<td>Advertised Range</td>
<td>Up to 150 miles</td>
</tr>
<tr>
<td>Seating</td>
<td>3</td>
</tr>
<tr>
<td>Payload</td>
<td>12,324-16,200 pounds</td>
</tr>
<tr>
<td>Wheelbase</td>
<td>153-220 in.</td>
</tr>
</tbody>
</table>

Trip Data

<table>
<thead>
<tr>
<th>Fuel Economy (mpge)</th>
<th>Combined</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Diesel Equivalent Fuel Economy</td>
<td>23.2</td>
<td>0.0 - 1.0</td>
<td>1.0 - 1.1</td>
<td>1.1 - 1.2</td>
</tr>
<tr>
<td>Overall AC Energy</td>
<td>1,296.3 Wh/mi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall DC Electrical Energy Charged</td>
<td>1,166.7 Wh/mi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall DC Electrical Energy Discharged</td>
<td>1,122.5 Wh/mi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driving DC Electrical Energy Consumption</td>
<td>1,087.3 Wh/mi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Number of Charges</td>
<td>14,193.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Charge Energy Delivered</td>
<td>400,057.5 kWh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Distance Traveled</td>
<td>342,910.9 miles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>Highway Distance</td>
<td>294,699.0</td>
<td>48,210.0 miles</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>Highway Distance</td>
<td>85.9</td>
<td>14.1 %</td>
<td></td>
</tr>
</tbody>
</table>

Route Information

| Distance Traveled Per Day | 92.2 miles |
| Median Driving Aggressiveness | 1.0 [0-10] |
| Average Number of Stops Per Day | 52.0 | 1.2 |
| Average Brake (Regen) Events | 6.3 per mile |
| Average Maximum Acceleration | 0.4 g |
| Average Daily Maximum Driving Speed | 47.5 mph |
| Average Daily Driving Speed | 10.5 mph |

Daily Driving kWh/mile Distribution

Diesel Equivalent Fuel Economy

- Oct
- Nov
- Dec
- Combined
Effect of Daily Driving Aggressiveness on Fuel Economy

Daily Driving Distance

Time of Day When Driving
## Plug-in Charging

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Fleet Charging Frequency</td>
<td>4,731.0 charge events per month</td>
</tr>
<tr>
<td>Average Fleet Charge Energy per Month</td>
<td>133,352.5 kWh/month</td>
</tr>
<tr>
<td>Average Vehicle Charging Frequency</td>
<td>3.8 per day each</td>
</tr>
<tr>
<td>Average Vehicle Charge Energy per Day</td>
<td>107.5 kWh/day</td>
</tr>
<tr>
<td>Average Energy Delivered per Charge</td>
<td>28.2 kWh</td>
</tr>
<tr>
<td>Average Duration of Charge Event</td>
<td>7.9 hr</td>
</tr>
<tr>
<td>Average Distance Between Charges</td>
<td>24.2 miles</td>
</tr>
</tbody>
</table>

### Time of Day When Charging

- **Energy**
  - 06:00 AM: 0%
  - 07:00 AM: 1%
  - 08:00 AM: 2%
  - 09:00 AM: 3%
  - 10:00 AM: 4%
  - 11:00 AM: 5%
  - 12:00 PM: 6%
  - 01:00 PM: 7%
  - 02:00 PM: 8%
  - 03:00 PM: 9%
  - 04:00 PM: 10%
  - 05:00 PM: 11%
  - 06:00 PM: 12%
  - 07:00 PM: 13%
  - 08:00 PM: 14%
  - 09:00 PM: 15%
  - 10:00 PM: 16%
  - 11:00 PM: 17%
  - 12:00 AM: 18%

- **Cumulative**
  - 06:00 AM: 0%
  - 07:00 AM: 1%
  - 08:00 AM: 2%
  - 09:00 AM: 3%
  - 10:00 AM: 4%
  - 11:00 AM: 5%
  - 12:00 PM: 6%
  - 01:00 PM: 7%
  - 02:00 PM: 8%
  - 03:00 PM: 9%
  - 04:00 PM: 10%
  - 05:00 PM: 11%
  - 06:00 PM: 12%
  - 07:00 PM: 13%
  - 08:00 PM: 14%
  - 09:00 PM: 15%
  - 10:00 PM: 16%
  - 11:00 PM: 17%
  - 12:00 AM: 18%

### Time of Day When Plugging In

- **Energy**
  - 06:00 AM: 0%
  - 07:00 AM: 1%
  - 08:00 AM: 2%
  - 09:00 AM: 3%
  - 10:00 AM: 4%
  - 11:00 AM: 5%
  - 12:00 PM: 6%
  - 01:00 PM: 7%
  - 02:00 PM: 8%
  - 03:00 PM: 9%
  - 04:00 PM: 10%
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  - 04:00 PM: 10%
  - 05:00 PM: 11%
  - 06:00 PM: 12%
  - 07:00 PM: 13%
  - 08:00 PM: 14%
  - 09:00 PM: 15%
  - 10:00 PM: 16%
  - 11:00 PM: 17%
  - 12:00 AM: 18%
1. Vehicle specifications provided by Smith Electric Vehicles.

2. Actual electric range will vary based on drive cycle and vehicle configuration.

3. Miles per gallon diesel equivalent (mpge) is calculated based on a 128,450 BTU/gallon energy density provided by U.S. Department of Energy’s Alternative Fuels Data Center. Using this information diesel fuel mpge equates to 37.6 kWh.

4. Assumed charger efficiency of 90%.

5. Total in-motion energy consumption averaged per mile. These figures cover multiple vehicle configurations, in multiple cities, with multiple environments, topologies and load profiles. These numbers are averages of a diverse fleet of vehicles and can not be used to predict the efficiency of any particular Smith vehicle.

6. City and highway distance classification is distinguished by a 35-mph trip speed limit. Trips classified as "highway" achieved a maximum driving speed in excess of 35 mph while trips classified as "city" do not.


8. Average pack estimated range calculated based on battery energy storage capacity (80 or 120 kWh) and average overall DC electrical energy consumption. Data is being collected for both 80 and 120 kWh battery capacity vehicle configurations. Previous data collected from 120 kWh configurations are unusable.

9. Current charge time information is calculated based on time spent while energy is being delivered to battery.

10. All recharges occurring with less than 0.5 mile traveled were excluded from the chart for visual clarity.