Making It Happen In WV – Electric Vehicles and Electric Vehicle Supply Equipment

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Clean Cities Mission
To advance the energy, economic, and environmental security of the U.S. by supporting local decisions to reduce petroleum use in transportation.

- Provides a framework for businesses and government agencies to work together
- Clean Cities activities are implemented by a national network of nearly 100 Clean Cities coalitions.
- Major milestone: In 2013, coalitions and stakeholders reduced U.S. petroleum consumption by 1 billion gallons in a single year
- Ahead of schedule on goal: Reduce U.S. petroleum use by 2.5 billion gallons per year
Description of Area: State of West Virginia


Coalition Structure

- Host agency is W.Va. Division of Energy, the state energy office
- Activities set by WVDOE director
- 60 stakeholders
- Coalition funded through U.S. Department of Energy
- In 2015, stakeholders reduced 536,827 gasoline gallon equivalents through electric vehicle use, reducing idling, and the use of alternative fuels (biodiesel, CNG and propane)

www.energywv.org/cleanstateprogram
21,105 public alternative fuel stations in U.S.

Alternative Fueling Station Locator
Find alternative fueling stations near an address or ZIP code or along a route in the United States. Enter a state to see a station count.

21,105 alternative fuel stations in the United States
Excluding private stations

Location details are subject to change. We recommend calling the stations to verify location, hours of operation, and access.

ABOUT THE DATA
### Alternative Fuel Vehicles Registered in West Virginia

<table>
<thead>
<tr>
<th>MONTH</th>
<th>HYBRID</th>
<th>ELECTRIC</th>
<th>PHEV</th>
<th>FLEX FUEL</th>
<th>CNG</th>
<th>ETHANOL ONLY</th>
<th>LPG</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-16</td>
<td>106</td>
<td>4</td>
<td>7</td>
<td>1810</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Apr-16</td>
<td>157</td>
<td>1</td>
<td>3</td>
<td>3139</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Mar-16</td>
<td>170</td>
<td>1</td>
<td>7</td>
<td>3001</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td><strong>As of 2/29/2016</strong></td>
<td><strong>8328</strong></td>
<td><strong>89</strong></td>
<td><strong>243</strong></td>
<td><strong>138678</strong></td>
<td><strong>81</strong></td>
<td><strong>215</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>

- 3 CNG
- 7 E85
- 26 Electric
- 16 Propane

As of 2/29/2016

**Alternative Fuel Vehicles and stations in WV**
Basics: Electric Drive Vehicles

**Hybrid Electric Vehicle (HEV)**
- Powered by an engine and electric motor
- Does not use electric vehicle supply equipment (EVSE) to charge the battery

**Plug-In Hybrid Electric Vehicle (PHEV)**
- Powered by an electric motor and engine
- Uses EVSE to charge the battery

**All-Electric Vehicle (EV)**
- Powered by an electric motor
- Uses EVSE to charge the battery

Images: NREL Image Gallery #24508, #18563, #24516
www.energywv.org/cleanstateprogram
# Basics: Benefits and Considerations

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increased energy security</td>
<td>• Higher initial vehicle cost</td>
</tr>
<tr>
<td>• Improved fuel economy</td>
<td>• Limited infrastructure availability</td>
</tr>
<tr>
<td>• Lower fuel costs</td>
<td>• Battery life</td>
</tr>
<tr>
<td>• Low or zero tailpipe emissions</td>
<td>• Reduced all-electric range</td>
</tr>
</tbody>
</table>

*Image: NREL Image Gallery #28974*
## Infrastructure: Electric Vehicle Supply Equipment (EVSE)

<table>
<thead>
<tr>
<th>Level</th>
<th>Current Type</th>
<th>Voltage (V)</th>
<th>Charging Time</th>
<th>Primary Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Alternating Current (AC)</td>
<td>120V</td>
<td>2 to 5 miles of range per hour of charging</td>
<td>Residential</td>
</tr>
<tr>
<td>Level 2</td>
<td>AC</td>
<td>240V</td>
<td>10 to 20 miles of range per hour of charging</td>
<td>Residential Commercial</td>
</tr>
<tr>
<td>Level 3 (Pending Industry Consensus)</td>
<td>Undefined</td>
<td>Undefined</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
<tr>
<td>DC Fast</td>
<td>Direct Current (DC)</td>
<td>480V</td>
<td>60 to 80 miles of range per 20 minutes of charging</td>
<td>Commercial</td>
</tr>
<tr>
<td>Wireless</td>
<td>AC</td>
<td>240V</td>
<td>10 to 20 miles of range per hour of charging</td>
<td>Residential Commercial</td>
</tr>
</tbody>
</table>

*Image: NREL Image Gallery #26453*
Uses: Charging at Home and in Public

Charging at Home
• Most charge vehicles overnight at home using a Level 1 outlet or installed Level 2 EVSE
• Installation requires permitting and licensed contractors

Charging in Public
• Increases vehicle range, especially for consumers who live in high-density urban areas
• Ideal public charging locations include:
  • Workplaces or office buildings
  • Shopping centers
  • City parking lots
  • Airports
  • Hotels

Images: NREL Image Gallery #18723 and #18870
The Institute of Environment and Physical Science Sustainability Site is equipped with three new 6.6 kW cloud connected Schneider EVLink electric vehicle (EV) charging units. These level 2 charging units were made possible in part by generous support from Schneider Electric, who donated one of the units, and a grant from the West Virginia Division of Energy.
Electric Drive – Today and Tomorrow

- More technologically refined vehicles
- Recent BEV developments
- Many light-duty HEV options
- Some medium- and heavy-duty EVs are also available
- Medium- and heavy-duty applications may utilize diesel-electric hybrid systems
The Future of Electric Drive

- **Fuel Cell Electric Vehicles**
  - Produces electricity while converting hydrogen and oxygen into water
  - Platinum may be required for some components
  - Hydrogen gas used to power fuel cell
  - Do not require large batteries

*Figure 1: Mercedes-Benz F600 fuel cell prototype. Source: NAFTC.*
Wireless Charging

- Can shorten charging times
- Electricity is sent through charging pad under vehicle
- Automatically charge the batteries when placed within a specified range of charger
- Operates at 240 volts, Level 2
Emissions from Hybrid and Plug-In Electric Vehicles

Hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and all-electric vehicles (EVs) typically produce lower tailpipe emissions than conventional vehicles do. When measuring well-to-wheel emissions, the electricity source is important; for PHEVs and EVs, part or all of the power provided by the battery comes from off-board sources of electricity. There are emissions associated with the majority of electricity production in the United States.

Electricity Sources and Emissions

EVs and PHEVs running only on electricity have zero tailpipe emissions, but emissions may be produced by the source of electrical power, such as a power plant. In geographic areas that use relatively low-polluting energy sources for electricity generation, PHEVs and EVs typically have a well-to-wheel emissions advantage over similar conventional vehicles running on gasoline or diesel. In regions that depend heavily on conventional fossil fuels for electricity generation, PEVs may not demonstrate a well-to-wheel emissions benefit.
My Plug-in Hybrid Calculator

Step 1. My car

2017 Chevrolet Volt

Can a Plug-in Hybrid Save Me Money?
This calculator can help estimate personalized fuel use and costs for a plug-in hybrid based on your driving habits, fuel prices, and charging schedule.
No AFV? Drive smarter!

Welcome to My MPG!
We've created "My MPG" to help you calculate and track your fuel economy and compare it with EPA test ratings. You can also share your MPG with other users.

Benefits of Registering
If you register, you will be able to save your MPG information and view, edit, or update it later. You will also be able to share your MPG with others. Fueleconomy.gov retains no information that could be used to identify any individual with a user name or password.

As a non-registered guest, you still have access to all MPG tools, but you cannot save your data or share your MPG.

We Can Help You...
- Calculate Your MPG
- Maintain a Fuel Purchase Record

Other Useful Tools
- Our Printable Form for Recording Fuel Purchases
- MPG Estimates from Drivers Like You

Tracking Your MPG Just Got Easier
Now you can enter "My MPG" data at the pump from your mobile device at fueleconomy.gov/my.
Thank you

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