W.Va. Clean State Program

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.

- Energy Policy Act of 1992 (EPAct)
- 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

W.Va. Clean State Program

www.energywv.org/cleanstateprogram

Description of Area: State of West Virginia

When was coalition formed? Oct. 19, 1994; re-designated in 1999, 2005, 2012 and 2016

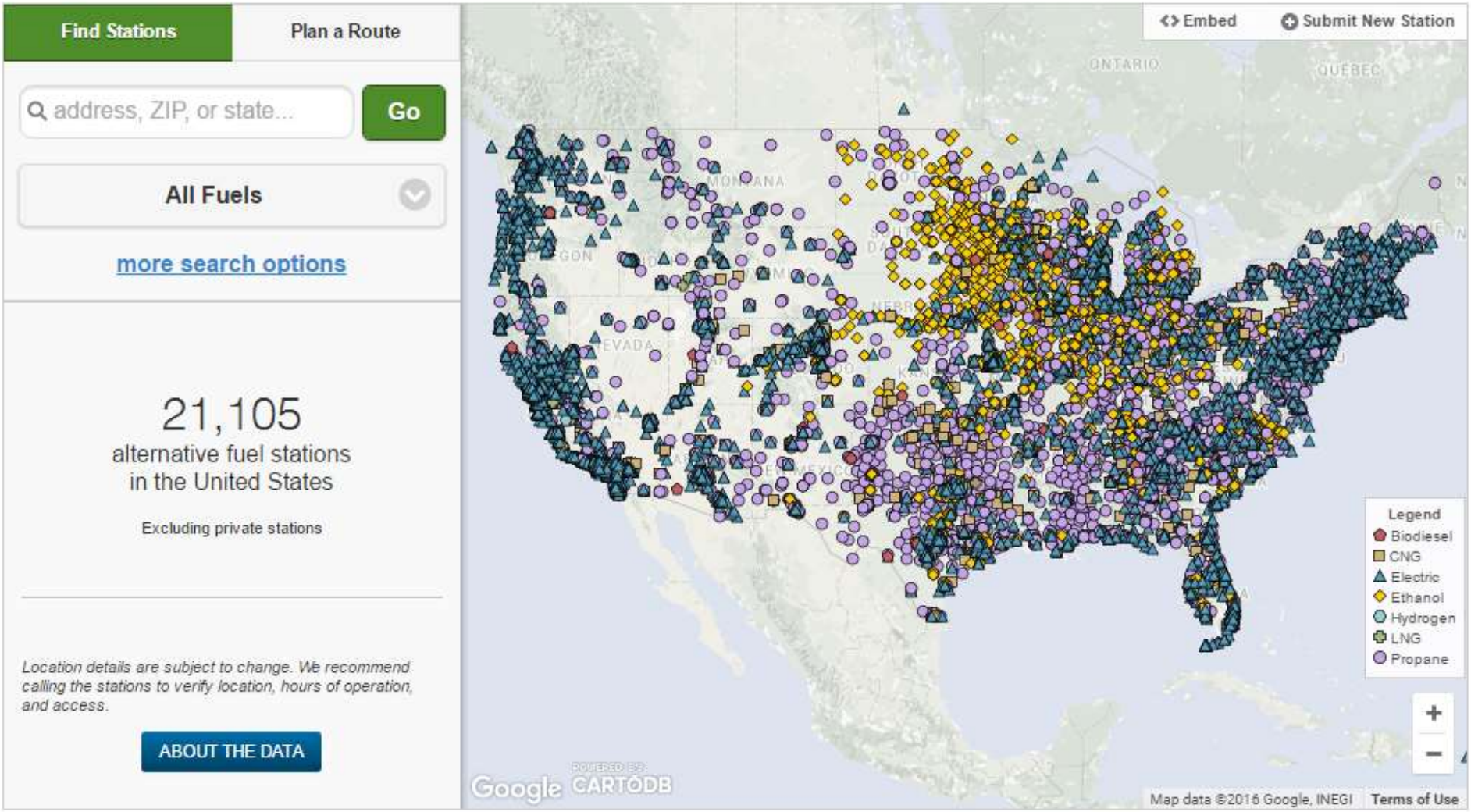
Coalition Structure

- 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)

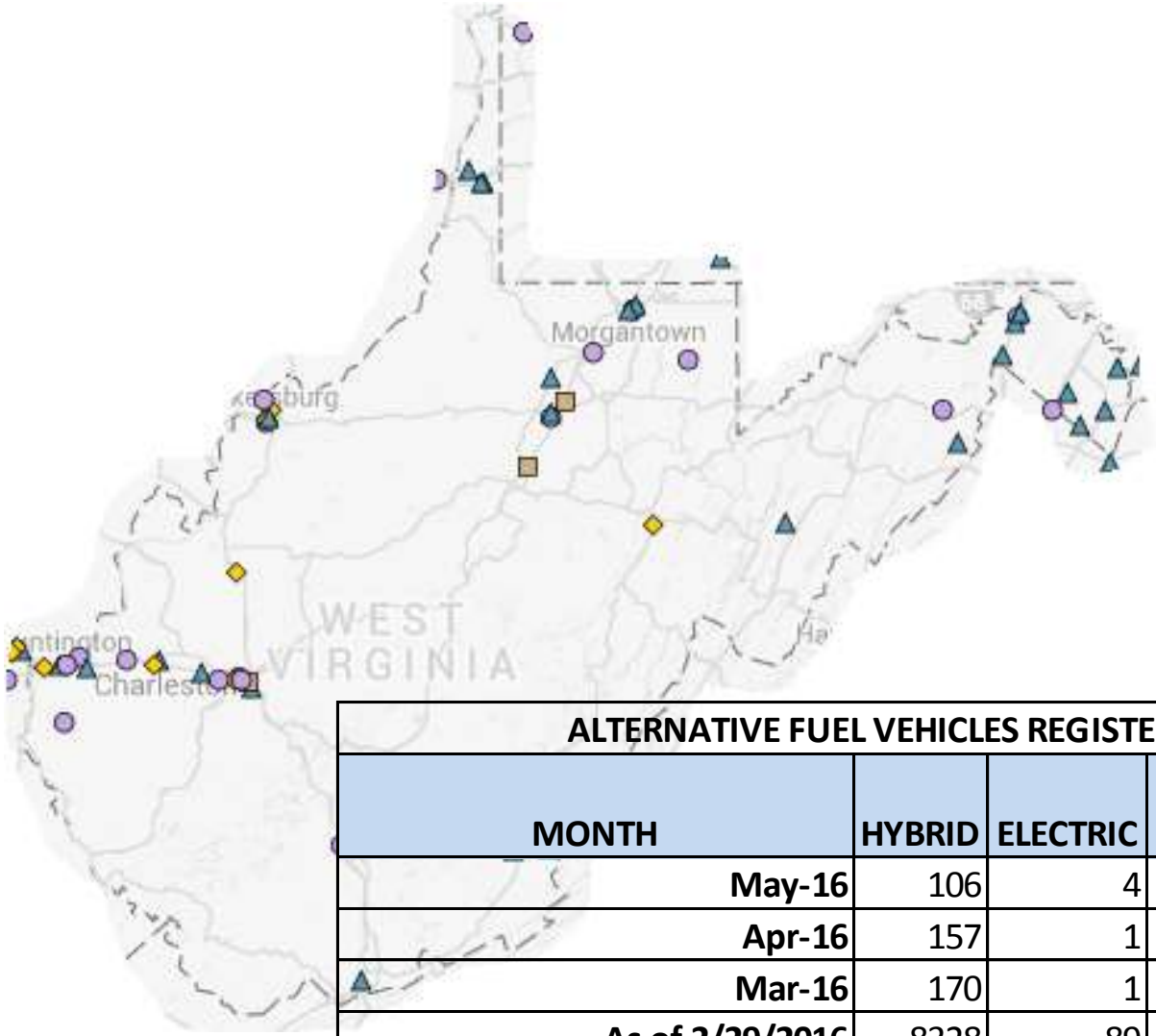
21,105 public alternative fuel stations in U.S.

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.



Alternative fuel vehicles and stations in WV



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

ALTERNATIVE FUEL VEHICLES REGISTERED IN WEST VIRGINIA							
MONTH	HYBRID	ELECTRIC	PHEV	FLEX FUEL	CNG	ETHANOL ONLY	LPG
May-16	106	4	7	1810	2	2	0
Apr-16	157	1	3	3139	3	2	0
Mar-16	170	1	7	3001	1	3	0
As of 2/29/2016	8328	89	243	138678	81	215	8

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

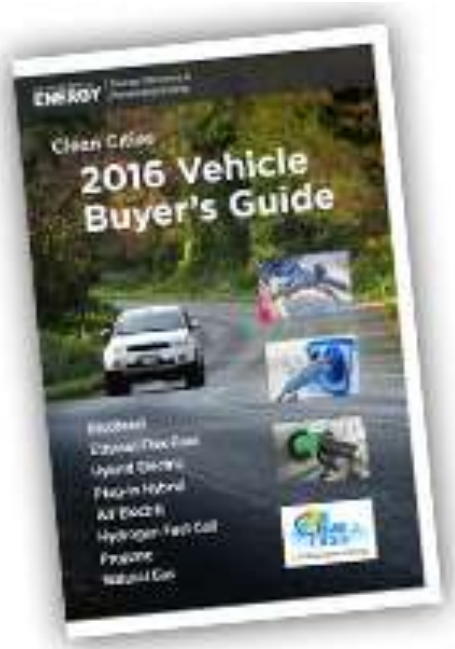
All-Electric Vehicle (EV)

- Powered by an electric motor
- Uses EVSE to charge the battery

Images: NREL Image Gallery #24508, #18563, #24516

Clean Cities 2016 Vehicle Buyer's Guide

www.energywv.org/cleanstateprogram



Clean Cities 2016 Vehicle Buyer's Guide

Download the 2016 Clean Cities Vehicle Buyer's Guide here.

Basics: Benefits and Considerations

Benefits

- Increased energy security
- Improved fuel economy
- Lower fuel costs
- Low or zero tailpipe emissions

Considerations

- Higher initial vehicle cost
- Limited infrastructure availability
- Battery life
- Reduced all-electric range

Image: NREL Image Gallery #28974

Infrastructure: Electric Vehicle Supply Equipment (EVSE)

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

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

EV work in WV

Shepherd University

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

Acknowledgment: This material is based upon work supported by the U.S. Department of Energy Clean Cities Program under Award Number DE-EE0001696.

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.

Clean Cities U.S. Department of Energy

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National Alternative Fuels Training Consortium
A Program of
West Virginia University

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

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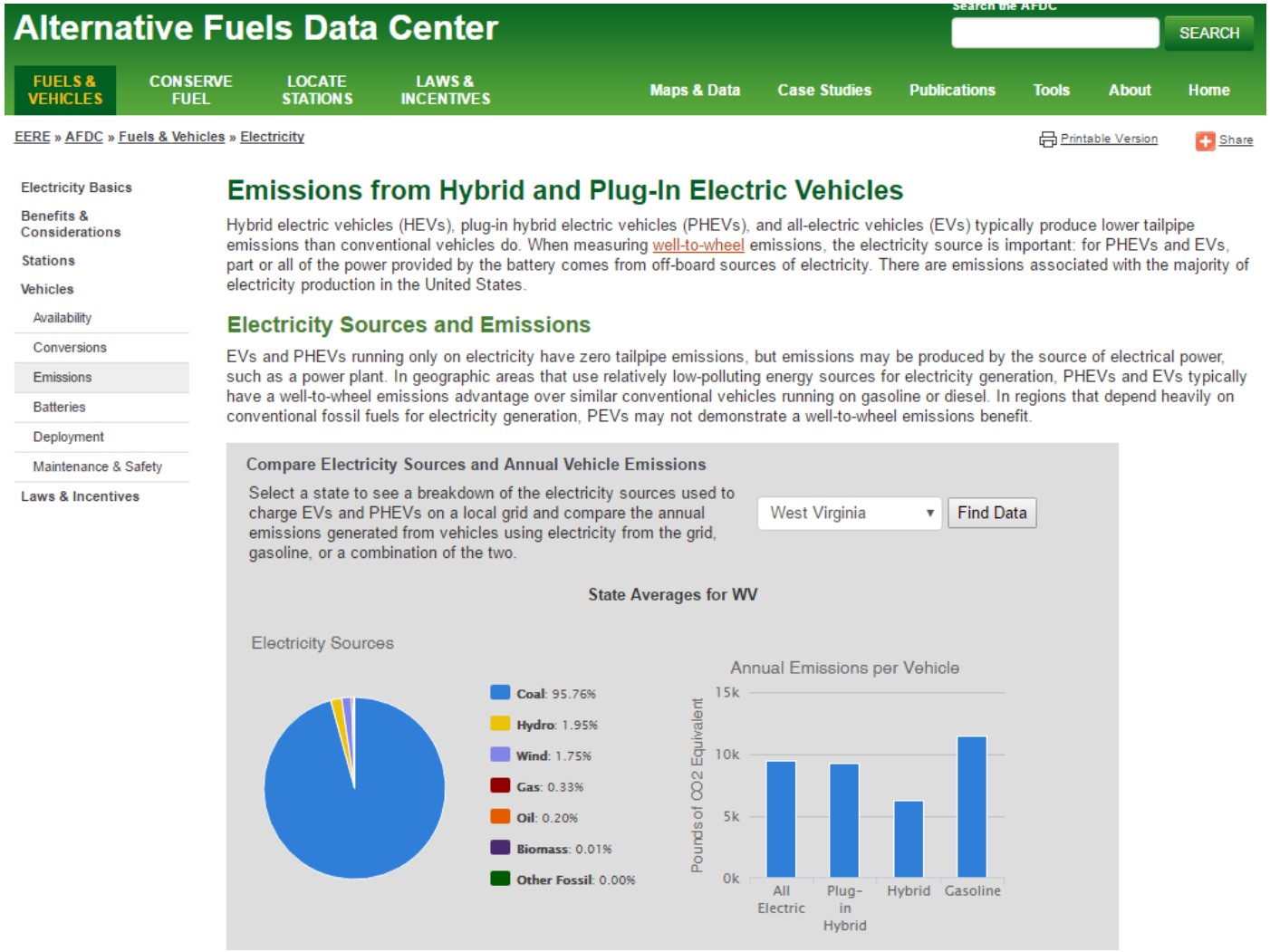
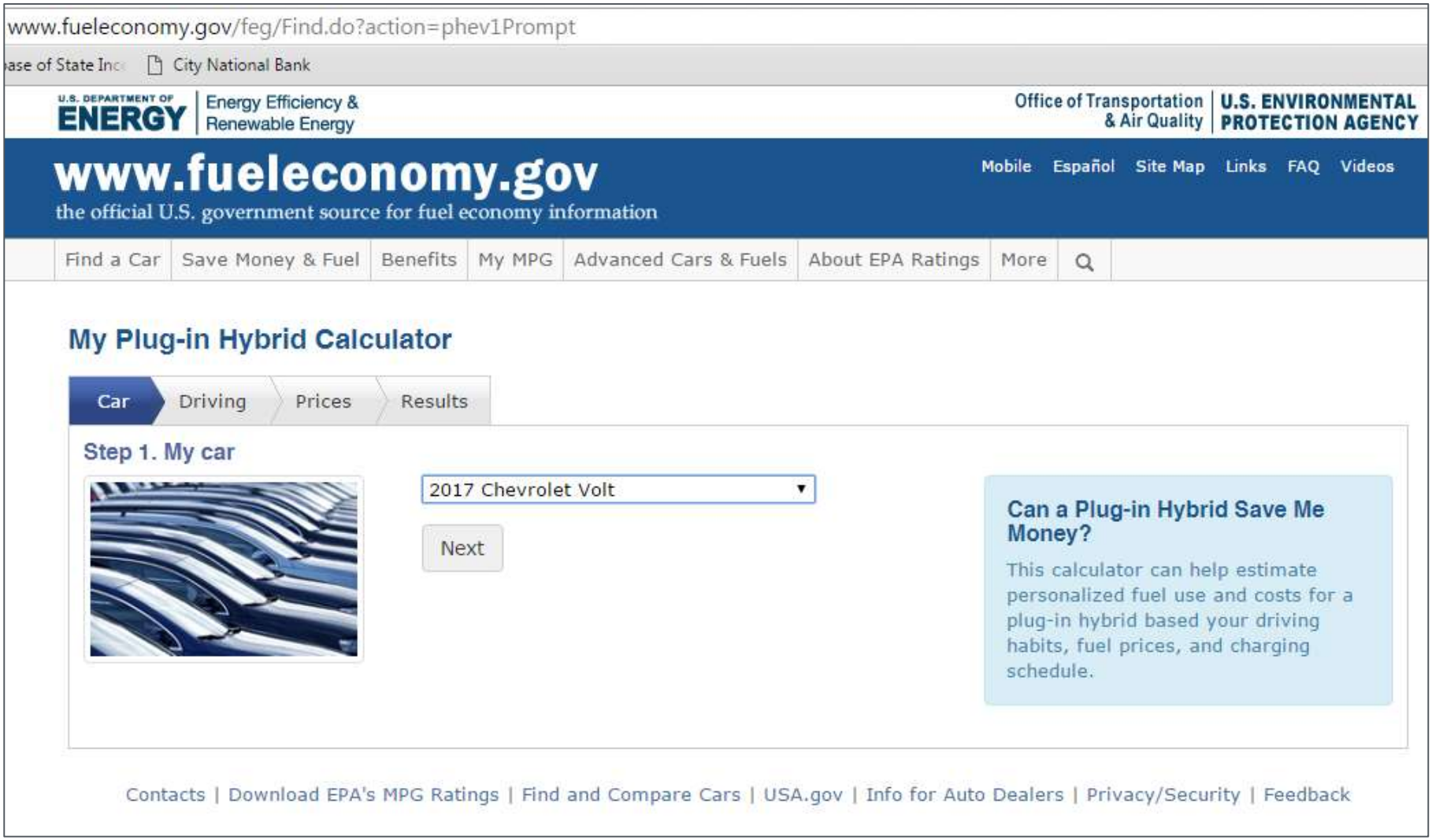
Emissions from Hybrid and Plug-In Electric Vehicles

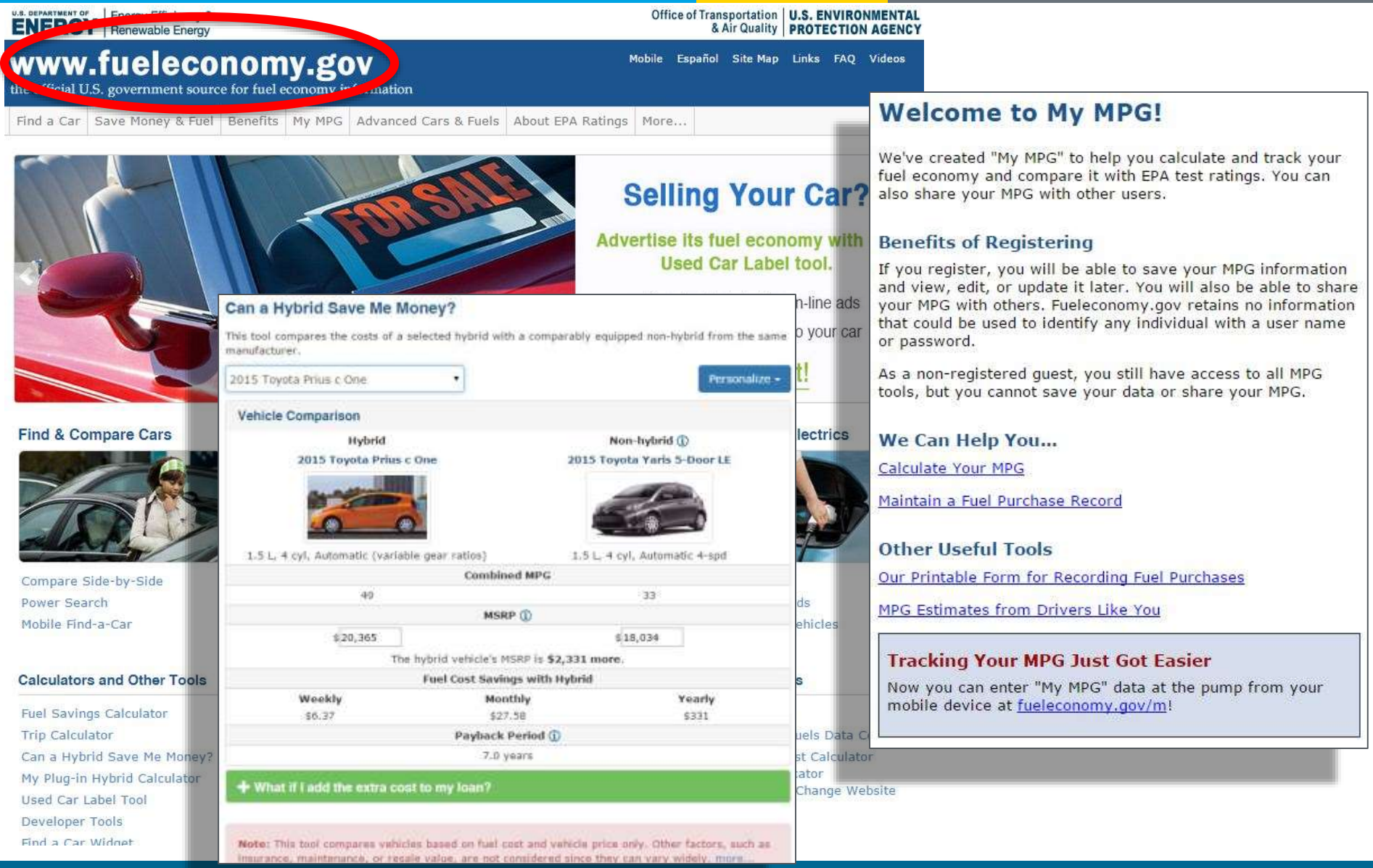
http://www.afdc.energy.gov/vehicles/electric_emissions.php



MY PLUG-IN HYBRID CALCULATOR



No AFV? Drive smarter!



Thank you

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