



Fleet Electrification: Options For Communities In Vermont

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Agenda

- **Getting Started**
- **Vehicles Available**
- **Infrastructure**
- **Other electric vehicles**
- **Incentives**
- **Additional Resources**

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



Getting Started: Questions to Ask

- How long does implementation take?
- What are my driving range needs?
- What are the vehicle options?
- What's the cost of vehicle replacement?
- How do I right size my fleet?
- How can I start small?
- What level of charging will I need?
- What incentives are available?
- What support can my local Clean Cities coalition provide?
- What about training and safety?



Helpful Resource:

The *AFDC Laws and Incentives Search* provides information about available state and federal incentives for PEVs and EVSE.

Vehicles: Vehicle Availability



Light-Duty

- HEVs, PHEVs, and EVs widely available
- New models rolling out nationwide



Medium-Duty

- Variety of HEVs, PHEVs, and EVs available
- New models becoming available
- Certified conversions an option



Heavy-Duty

- Several HEV makes and models available
- Light hauling, delivery, and off-road service

Slide Credit:
CARB

Heavy-duty Electric Market Growing - 2016

2B-3

4-5

6-7

8

Commercial



Demonstrations



*Excludes transit buses, not all models shown

Slide Credit:
CARB

Heavy-duty Electric Market Growing - Today

	2B-3	4-5	6-7	8	
Commercial Today	Zentoro van Lightning Systems van Mazda van Wally van Marty van AmeriPride van BYD truck Kalmar truck	Lightning Systems van SPGP van Marty van AmeriPride van BYD truck Kalmar truck	Marty van AmeriPride van BYD truck Kalmar truck	BYD truck Kalmar truck	Kalmar truck
Commercial Soon	B van	Mitsubishi truck	Santitas truck Freightliner truck	Freightliner truck	Freightliner truck
Demos	Mercedes van	ISUZU truck	Peterbilt truck	Peterbilt truck	Peterbilt truck

*Excludes transit buses, not all vehicles shown

Electric Shuttles and Vans: A few options



XL Fleet

- PHEV – Ford F-250, upfit
- 50% MPG improvement
- 33% CO2 reduction
- Loss of bed space for battery



Motiv

- E-450 Shuttle Bus
- 85 mile range, 8 hour charge time
- ADA options available



Adomani

- Purpose-built cutaway
- Classes 3 & 4
- Up to 130 miles on single charge

Infrastructure: EVSE

- Right size your EVSE installation.
- Install the lowest level charger that can charge during standard dwell times.
- Consider what type of charging your vehicle can accept and the connector types.
- Charging hardware required network providers that collect usage data & will incur added fees.

- High-Power charging Pros:
 - Faster charging
 - More flexibility for vehicle operations

- High-Power charging Cons:
 - DCFC cost about 8 times more than AC chargers
 - Higher electric bill
 - Potential battery degradation



EVSE Installing Permitting Process

- Step 1: Identify
- Step 2: Assess
- Step 3: Permit
- Step 4: Install
- Step 5: Inspect
- Step 6: Integrate

Other Electric Vehicles



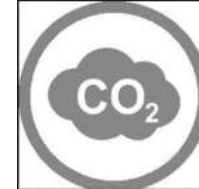
Electric Lawnmowers

- Reduce noise
- Reduce CO2 emissions
- Save money
- Utility Incentives e-mowers



Electric Bicycles

- E-bikes for police
- Save money
- Reduce GHG
- Reduce VMT
- Support local economy
- Last-mile travel to transit
- E-scooters



Helpful Resource: Laws and Incentives

Vermont Laws and Incentives (PEVs & EVSE)

Alternative Fuels Data Center: afdc.energy.gov/

Utility Incentives

- **Lawnmowers**

- Burlington Electric Department (commercial and residential)
- GMP (commercial and residential)
- Vermont Electric Co-op (bill credit for commercial and residential)
- Washington Electric Co-op (commercial and residential)

- **E-Bikes**

- Burlington Electric Department
- GMP
- Washington Electric Co-op

Other Considerations: Maintenance and Safety



- **HEVs and PHEVs have similar maintenance requirements** as conventional vehicles
- **EVs typically require less maintenance** than conventional vehicles:
 - Battery, motor require little to no maintenance
 - Fewer fluids to change
 - Brake wear is reduced due to regenerative braking
 - Fewer moving parts
- Electric drive vehicles **must meet the same safety standards** as conventional vehicles

Other Considerations: Tools



Vehicle Cost Calculator

Compare cost of ownership and emissions for most vehicle models.

mobile



AFLEET Tool

Calculate a fleet's petroleum use, cost of ownership, and air pollutant and GHG emissions.



PEV Readiness Scorecard

Assess your community's readiness for the arrival of plug-in electric vehicles.

The screenshot shows the AFDC website's search interface. It includes a navigation menu with categories like 'FUELS & VEHICLES', 'CONSUMER', 'LOCAL STATIONS', and 'LINKS & RESOURCES'. The main content area is titled 'Light-Duty Vehicle Search' and features a search form with dropdown menus for 'Fuel Type' (set to 'Electric (EV)') and 'Manufacturer' (set to 'All'). Below the form, there is a table of search results with columns for 'Year' and 'Count'. The table shows results for years 2010 through 2013. A 'Compare' section is visible at the bottom, listing various vehicle models and their corresponding AFDC IDs.

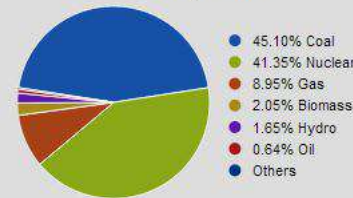
Compare Electricity Sources and Annual Vehicle Emissions

Enter a ZIP code to see a breakdown of the electricity sources used to charge EVs and PHEVs on a local grid and compare the annual emissions generated from vehicles using electricity from the grid, gasoline, or a combination of the two.

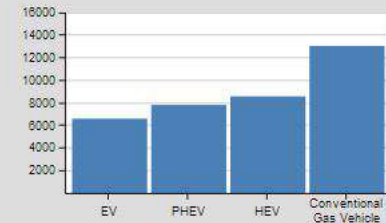
ZIP Code

Virginia - 22031

Electricity Sources

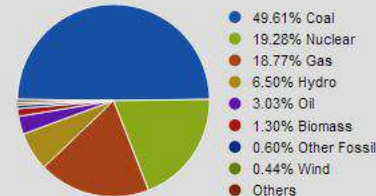


Annual Emissions per Vehicle (lb of CO₂ equivalent)

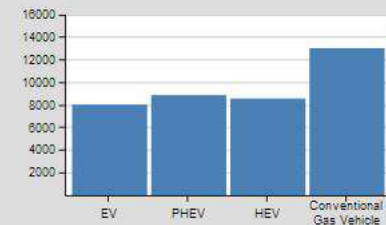


National Averages

Electricity Sources



Annual Emissions per Vehicle (lb of CO₂ equivalent)



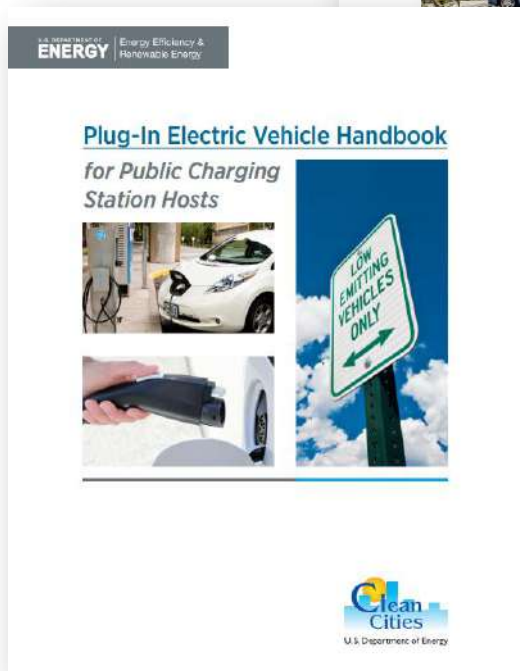
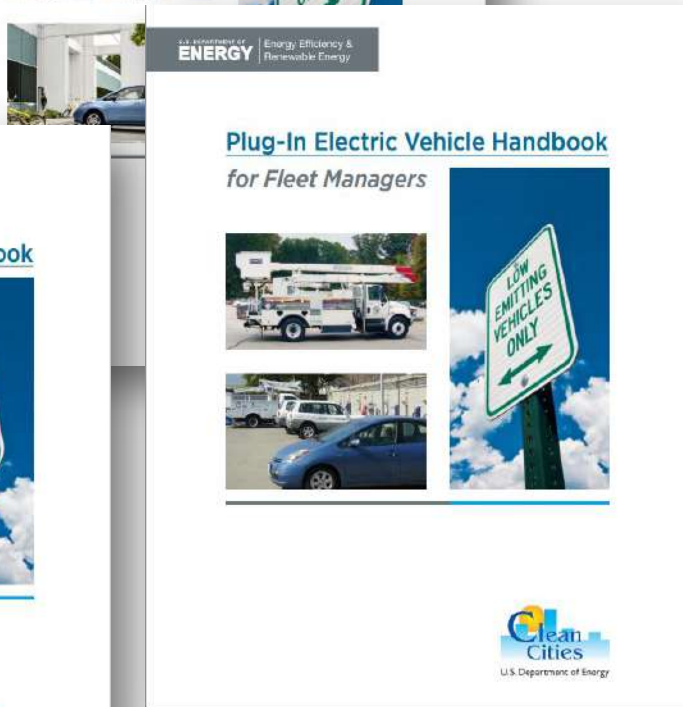
afdc.energy.gov/tools

PEV Handbooks

Helpful Resource:

Clean Cities PEV Handbooks are great resources for fleet managers, station owners, and individuals who are ready to start using PEVs and infrastructure.

afdc.energy.gov/publications



More Information

Vermont Clean Cities Coalition

<https://vtccc.w3.uvm.edu/poneilly@uvm.edu>

Alternative Fuels Data Center (AFDC)

afdc.energy.gov

Electric Drive Transportation Association (EDTA)

electricdrive.org

Plug In America

pluginamerica.org

FuelEconomy.gov

The screenshot shows the homepage of the Alternative Fuels Data Center (AFDC), part of the U.S. Department of Energy's Energy Efficiency & Renewable Energy division. The page features a green header with the AFDC logo and navigation links. Below the header, there are several sections: 'Fuels & Vehicles' with icons for Biodiesel, Electricity, Ethanol, Hydrogen, Natural Gas, and Propane; 'Maps & Data' with a list of resources and a 'Fuel Prices' graph; and 'Tools' with a list of calculators and search tools. A large banner at the bottom reads '10 ways to get started' and 'Cut fuel costs, reduce emissions, and bolster U.S. energy security.' with an image of a yellow van.

References and Resources

- AFDC Vehicle Cost Calculator (<http://www.afdc.energy.gov/calc/>)
- AFDC EV Emissions page (http://www.afdc.energy.gov/vehicles/electric_emissions.php)
- AFDC Alternative Fuel and Advanced Vehicle Search (<http://www.afdc.energy.gov/vehicles/search>)
- AFDC Station Locator Database (<http://www.afdc.energy.gov/locator/stations/>)
- FuelEconomy.gov's Alternative Fuel Vehicles (AFV) page (<http://www.fueleconomy.gov/feg/alternatives.shtml>)
- Clean Cities Plug-In Electric Vehicle Handbook for Fleet Managers (http://www.afdc.energy.gov/pdfs/pev_handbook.pdf)
- Clean Cities Plug-In Electric Vehicle Handbook for Workplace Charging Hosts (http://www.afdc.energy.gov/uploads/publication/pev_workplace_charging_hosts.pdf)
- Clean Cities Plug-In Electric Vehicle Handbook for Public Charging Station Hosts (<http://www.afdc.energy.gov/pdfs/51227.pdf>)
- Clean Cities 2015 Vehicle Buyer's Guide (<http://www1.eere.energy.gov/cleancities/publications.html>)
- Argonne National Laboratory's (ANL) *Well-to-Wheels Energy Use and Greenhouse Gas Emissions Analysis of Plug-in Hybrid Electric Vehicles* report (<http://www.transportation.anl.gov/pdfs/TA/559.pdf>)
- Electric Drive Transportation Associations (EDTA) Electric Drive Sales Dashboard (<http://electricdrive.org/index.php?ht=d/sp/i/20952/pid/20952>)
- National Fire Protection Association EV Safety Training (<http://www.evsaftytraining.org>)
- National Alternative Fuels Training Consortium First Responder Safety Training (http://www.naftc.wvu.edu/course_workshop_information/first_responders)
- Plug In America's Vehicle Tracker (<http://www.pluginamerica.org/vehicles>)