



Community Readiness for Electric-Drive Vehicles

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Mission

To advance the energy, economic, and environmental security of the United States by supporting local decisions to reduce petroleum use in transportation.

Goal

Reduce petroleum use by 2.5 billion gallons per year

- Replacement
- Reduction
- Elimination



Accomplishments

- Saved nearly 3 billion gallons of petroleum since 1993
- Put more than 775,000 alternative fuel vehicles (AFVs) on the road
- Installed more than 6,600 alternative fueling stations

Electric-Drive Vehicles

- Hybrid Electric Vehicles (HEVs)
- Plug-In Hybrid Electric Vehicles (PHEVs)
- All-Electric Vehicles (EVs)



Clean Cities

Map of the United States showing Clean Cities locations. Red dots indicate the locations of Clean Cities across the country. The map is color-coded by region: West (orange), Midwest (yellow), Northeast (green), and South (orange). Labels for various Clean Cities are provided, including Western Washington, Columbia-Willamette, Rogue Valley, Treasure Valley, Eastern Sierra Regional, Sacramento, East Bay, San Francisco, Silicon Valley, San Joaquin Valley, Central Coast, Antelope Valley, Los Angeles, Long Beach, San Diego Region, Coachella Valley Region, Valley of the Sun, Tucson, Land of Enchantment, Dallas/Ft. Worth, Central Texas, Alamo Area, Houston/Galveston, Baton Rouge, Southeast Louisiana, Space Coast, Gold Coast, Palmetto State, Middle Georgia, Atlanta, Tennessee, East Tennessee, Centralina, Triangle, Virginia, West Virginia, Clean Fuels Ohio, St. Louis, Greater Indiana, South Shore, Chicago, SE Area, Wisconsin, Lansing, Detroit, Ann Arbor, NE Ohio, Pittsburgh, New Jersey, New York City and Lower Hudson Valley, Philadelphia, Delaware, State of Maryland, Washington DC, Connecticut*, Long Island, Ocean State, Massachusetts, Granite State, Maine, Vermont, Central New York, Genesee Region, Western New York, Capital District, Twin Cities, North Dakota, Winnipeg, Yellowstone-Teton, Northern Colorado, Denver, Southern Colorado, Utah, Kansas City, Iowa, and Central Oklahoma.

* Connecticut Clean Cities Include:

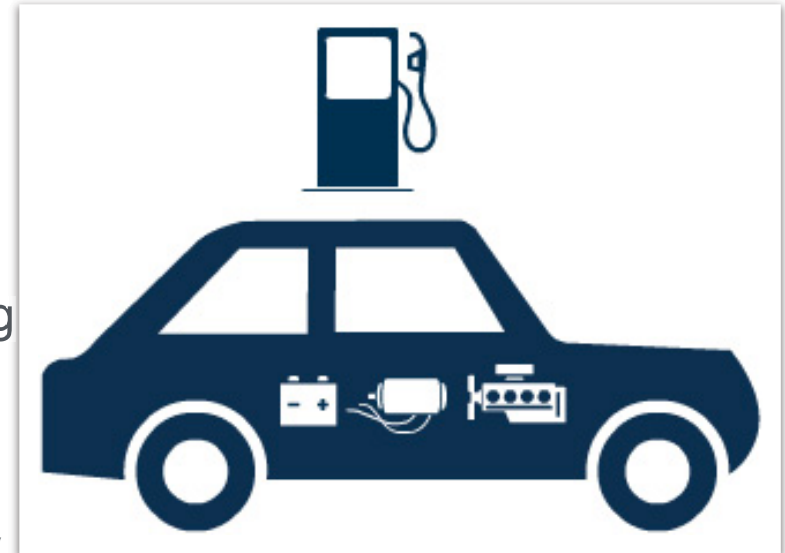
- Norwich
- New Haven
- Greater New Haven Area

- * Connecticut Clean Cities Include:
 - Norwich
 - New Haven
 - Connecticut Southwestern Area
 - Capitol Clean Cities of Connecticut

Map Date - 09/29/11

Powered by Engine and Electric Motor

- Internal combustion engine uses alternative or conventional fuel
- Battery charged by regenerative braking and engine
- Power from electric motor allows smaller engine and better fuel economy

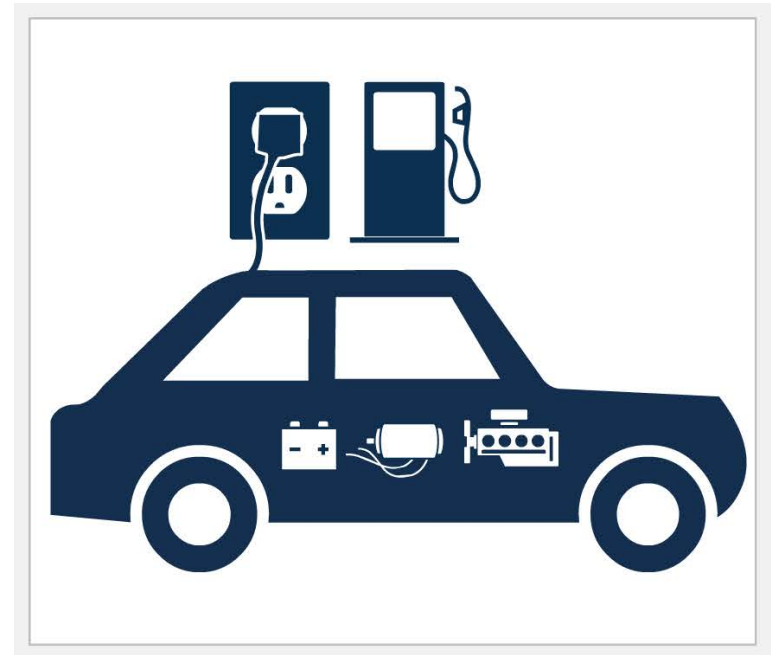


Fuel-Efficient System Design

- **Mild hybrid:** Cannot power vehicle using electric motor alone.
- **Full hybrid:** More powerful electric motor, larger batteries can drive vehicle on just electric power for short distances and at low speeds.

Powered by an Electric Motor and Engine

- Internal combustion engine uses alternative or conventional fuel
- Battery charged by outside electric power source, engine, and regenerative braking
- During urban driving, most power comes from stored electricity

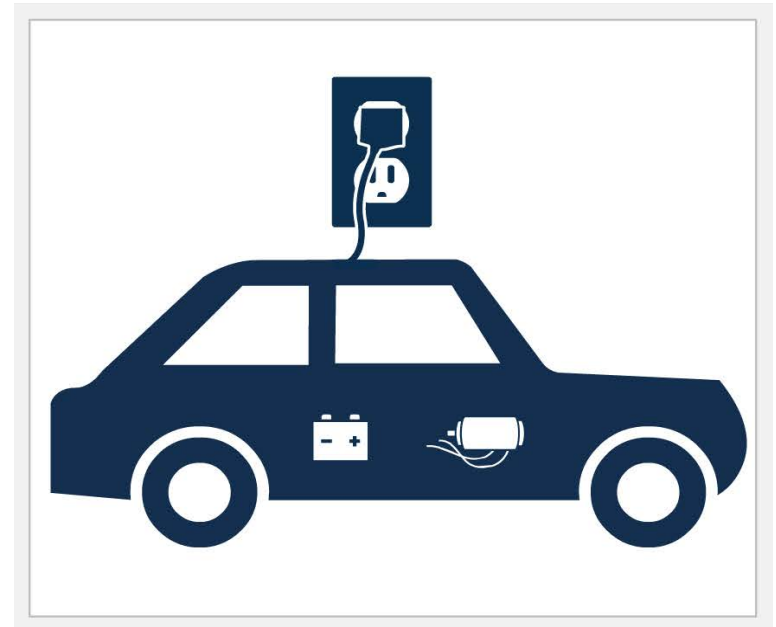


- Energy storage systems (batteries) are essential for HEVs, PHEVs and EVs
- Reducing the cost of the battery is crucial
- Types of energy storage systems include:
 - Lithium-ion batteries
 - Nickel-metal hydride batteries
 - Lead-acid batteries
 - Lithium-polymer batteries
 - Ultracapacitors
- The battery recycling market is currently limited
- Battery swapping options are being developed



Powered by an Electric Motor

- Battery stores electrical energy that powers the motor
- Battery charged by plugging into outside electric power source
- Zero tailpipe emissions, but air pollution may be produced through electricity generation



Driving Range

- EVs can travel about 100 miles per charge, depending on the model.
- A 100-mile range is sufficient for more than 90% of all U.S. household vehicle trips.

Benefits: Hybrid Electric Vehicles



Fuel Economy: Better than similar conventional vehicles



Low Emissions: Lower than similar conventional vehicles



Fuel Cost Savings: Less expensive to operate than a conventional vehicle



Energy Security: Reduced U.S. reliance on imported petroleum



Fueling Flexibility: Fuel from gas stations



Considerations

- **Purchase cost** can be offset by fuel savings, tax credits, and incentives.
- **Purchase prices** are expected to drop (relative to conventional vehicles) by 2015.

Benefits: Plug-in Hybrid Electric Vehicles



Fuel Economy: Better than HEVs and similar conventional vehicles



Low Emissions: Lower than HEVs and similar conventional vehicles



Fuel Cost Savings: Less expensive to operate than an HEV or conventional vehicle



Energy Security: Reduce U.S. reliance on imported petroleum



Fueling Flexibility: Fuel from gas stations or charge at home or in public



Considerations

- **Purchase cost** can be offset by fuel savings, tax credits, and incentives.
- **Public charging** infrastructure is in development.
- **Battery recycling and reuse** options are in development.

Benefits: All-Electric Vehicles



Fuel Economy: Does not use liquid fuels



Low Emissions: Zero tailpipe emissions



Fuel Cost Savings: Less expensive to operate than conventional vehicles



Energy Security: Reduces U.S. reliance on imported petroleum



Fueling Flexibility: Can charge at home or public charging stations



Considerations

- **Purchase cost** can be offset by fuel savings, tax credits, and incentives.
- **Public charging** infrastructure is in development.
- **Battery recycling and reuse** options are in development.

Light-Duty Vehicles

- HEVs widely available
- PHEVs and EVs rolling out nationwide

Heavy-Duty Vehicles

- Variety of HEVs, PHEVs, and EVs available
- PHEV conversions



Neighborhood Electric Vehicles (NEVs)

- Several makes and models available
- Neighborhood commuting, light hauling, delivery, off-road service

Use: Charging Electric Drive Vehicles



EVSE Options						
	Current Type	Amperage (amps)	Voltage (V)	Kilowatts (kW)	Charging Time	Primary Use
Level 1	Alternating current (AC)	12-16 amps	120V	1.3 to 1.9 kW	2-5 miles of range per hour of charging	Residential charging
Level 2	AC	Up to 80 amps	240V	Up to 19.2 kW	10-20 miles of range per hour of charging	Residential and public charging
Level 3 (in development)	AC	To be determined	To be determined	To be determined	60-80 miles of range in less than 30 minutes	Public charging
DC Fast Charging	Direct current (DC)	Up to 200 amps	208-600V	50 to 150 kW	60-80 miles of range in less than 30 minutes	Public charging

- Most owners will charge vehicles at home, making Level 1 and Level 2 the primary options.
- Level 2 charging equipment now costs \$500 to \$7,000.
- Installation requires permitting and licensed contractors.



- Permitting and Inspection
- First Responders
- Government Fleets
- Planning
- Incentives
- Public Education



- Installation of residential and commercial EVSE
- Notification of utility
- ADA compliance
- Signage
- Multi-unit dwellings
- Best Practices

- Police and Fire Department personnel
- New technologies = new challenges
- Training
 - Recognizing vehicles
 - How to approach vehicles
 - Safety – what's different?



- Energy Policy Act (EPAAct) 1992 covered fleets
- Policies
 - Purchasing
 - Charging
- Networking
- Funding Opportunities
 - Grants
 - Federal, State, Local Air Districts
 - Vehicles, Training, Infrastructure
 - Rebates

- General Plans
- SB375 Sustainable Communities Strategies
- Public Stations
- Energy Use



- Preferential Parking
- Expedited permitting
- Public recognition
- Fee reduction or waivers



- Promote local government activities
- Partner with local agencies, utilities to host workshops
- Post resources on local government website
- Distribute brochures at local government counters
- Topics: emissions benefits, tax incentives/rebates/grants, permitting process



- Research and Development
- Resources
- Training
- Conferences

Other sources:

California Air Resources Board

California Energy Commission

California Plug-in Electric Vehicle Coalition (PEVC)

California Center for Sustainable Energy

Utility companies

Public charging stations

- Make EVs and PHEVs more convenient
- Increase useful range

Public charging infrastructure locations

- Shopping centers
- City parking lots
- Airports
- Hotels
- Office buildings



- HEVs and PHEVs require slightly less maintenance than conventional vehicles
- EVs also require less maintenance than conventional vehicles
 - Battery, motor, and associated electronics don't require frequent maintenance
 - Regenerative braking reduces brake wear
 - Fewer moving parts than a conventional vehicle



For More Information



Clean Cities

FuelEconomy.gov

Alternative Fuels &
Advanced Vehicles
Data Center



San Joaquin Valley Clean Cities Coalition or Kern Energy Watch

www.valleycleancities.com or www.kernenergywatch.com

Clean Cities

www.cleancities.energy.gov

Alternative Fuels & Advanced Vehicles Data Center (AFDC)

www.afdc.energy.gov

California Plug-in Electric Vehicle Coalition (PEVC)

<http://www.evcollaborative.org/toolkit>

Clean Cities Coordinator Contact Information and Coalition

www.afdc.energy.gov/cleancities/progs/coordinators.php

For More Information



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