SAN JOAQUIN VALLEY CLEAN CITIES COALITION

Community Readiness for Electric-Drive Vehicles

LAX Crowne Plaza

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About Clean Cities

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)
Basics: Hybrid Electric Vehicles (HEVs)

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.
Basics: Plug-in Hybrids (PHEVs)

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 breaking
- 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.
Basics: All-Electric Vehicles (EVs)

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.
Availability

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

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

- 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.
Local Government Participation

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

- Installation of residential and commercial EVSE
- Notification of utility
- ADA compliance
- Signage
- Multi-unit dwellings
- Best Practices
Local Governments: First Responders

- Police and Fire Department personnel
- New technologies = new challenges
- Training
  - Recognizing vehicles
  - How to approach vehicles
  - Safety – what’s different?
Local Governments: Government Owned Fleets

- Policies
  - Purchasing
  - Charging
- Networking
- Funding Opportunities
  - Grants
    • Federal, State, Local Air Districts
    • Vehicles, Training, Infrastructure
  - Rebates
Local Governments: Planning

- General Plans
- SB375 Sustainable Communities Strategies
- Public Stations
- Energy Use
Local Governments: Incentives

- Preferential Parking
- Expedited permitting
- Public recognition
- Fee reduction or waivers
Local Governments: Public Education

- 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
US DOE Clean Cities Resources

- 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
Use: Charging in Public

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 break wear
  • Fewer moving parts than a conventional vehicle
For More Information

Clean Cities

FuelEconomy.gov

Alternative Fuels & Advanced Vehicles Data Center
For More Information

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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