

**ELECTRIC VEHICLES AND
INFRASTRUCTURE IN SONOMA
COUNTY, CA**

**NACAA Membership Meeting
May 7, 2012**

Barbara Lee

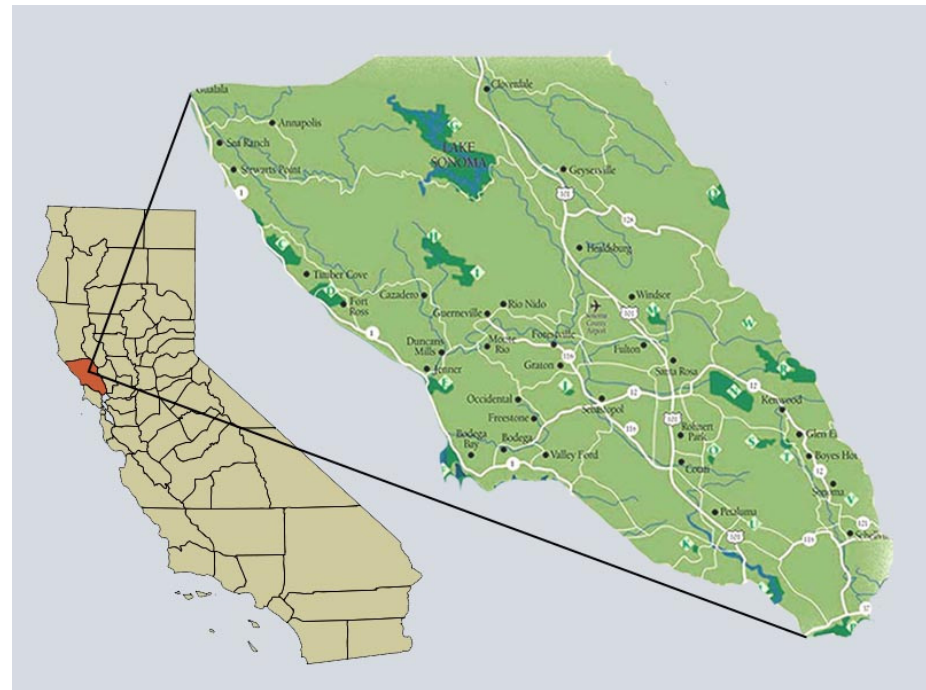
CALIFORNIA CONTEXT

- AB 32
 - Reduce GHG 20% below 1990 by 2020
- Zero Emissions Vehicle Mandate
 - 15% of sales by 2020
- Governor's Executive Order #B-16-12
 - 2015: all major cities EV-ready
 - 2020: CA will have infrastructure for 1 MM ZEVs
 - 2025: 1.5 MM ZEVs in CA
 - 2050: all personal transportation will be ZE
- Plug-in Electric Vehicle Collaborative
 - Public-private partnership to bring PEVs mainstream



SONOMA COUNTY CONTEXT

- Suburban & rural county north of San Francisco
 - 483,000 people, 9 cities
 - 1500 square miles, 60,000 acres, 2500 lane miles; about 62% of land use is agriculture
 - Economy based on agriculture, tourism



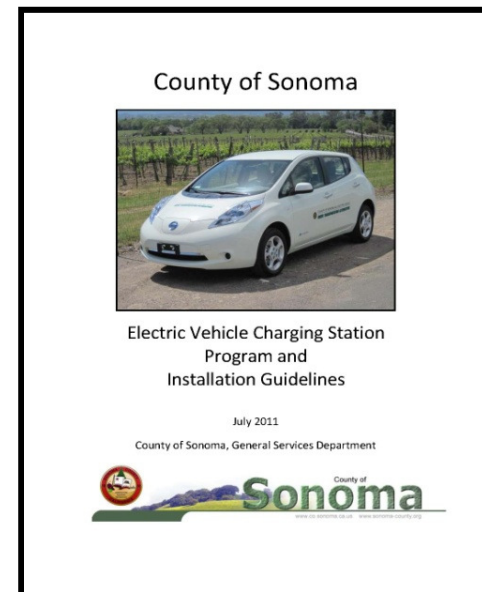
SONOMA COUNTY CONTEXT

- County, all cities have aggressive GHG reduction targets
 - 20% below 2000 by 2010
 - 25% below 1990 by 2015
- Regional Climate Protection Authority coordinates reduction planning and programs
- County has lead on Electric Vehicle program
- Nissan Leaf Roll-out Site



SONOMA COUNTY EV INITIATIVE

- Infrastructure
- Vehicles
- Policies & Coordination

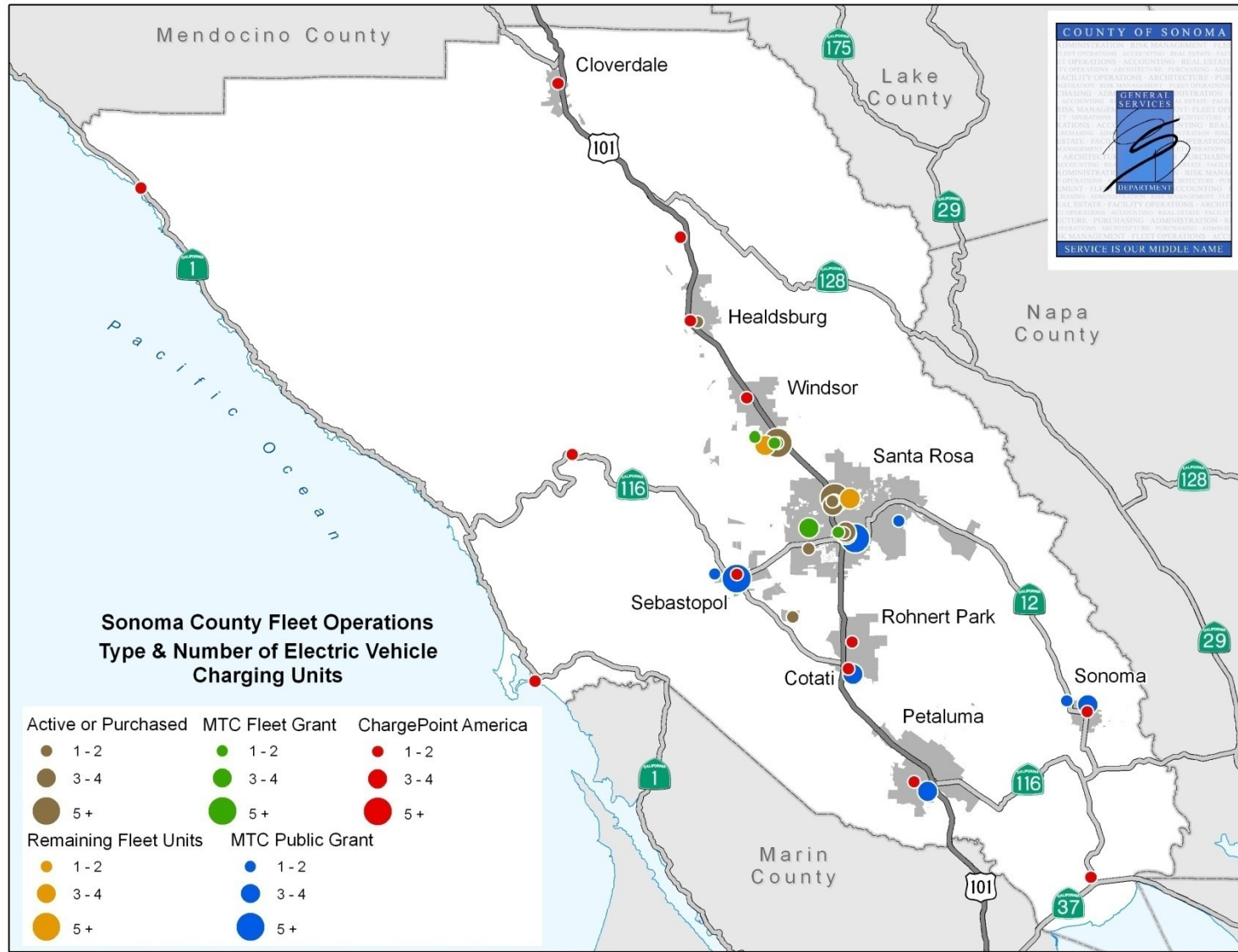


INFRASTRUCTURE: SONOMA COUNTY ELECTRIC TRAIL

- Approximately 50 stations already installed at County, City, and Special District sites
 - More than half are restricted for public fleet use
 - Remainder available to the public
- Expect a total of 130 publicly installed stations by the end of 2012
 - Most of these will have public access
- County manages grants and installation for cities, except Santa Rosa
- Private entities also installing infrastructure



MAP OF CHARGING STATIONS



VEHICLES (COUNTY FLEET)

- Light duty fleet:

- 246 vehicles (about 30%) are hybrid, plug-in hybrid (OEM and converted), extended range hybrid, and battery electric



- Medium and Heavy duty fleet:

- Includes 5 hybrid transport vans and trucks
- putting hybrids & alt fuel into service where available

- Transit Buses:

- 100% natural gas fueled (some from compressed landfill gas from County landfill)



VEHICLES: IN-USE EXPERIENCE

- Total fleet 10-year VMT increased by 10,000,000 miles compared to prior 10 year period
- Saved 10,000 gallons of gasoline in last 10 years
- Average fleet fuel economy increased 16% in last five years
- Met 2010 target to reduce GHG emissions from County fleet operations by 20% from 2000 levels
- Reduced maintenance costs for hybrid and BEV vehicles; examples include:
 - Less frequent (or no) oil/filter changes (3k to 5k miles, based on laboratory analysis of fluids)
 - Reduced wear on brake pads in MD and HD hybrids (pads last 3x longer, savings of \$500 per replacement)



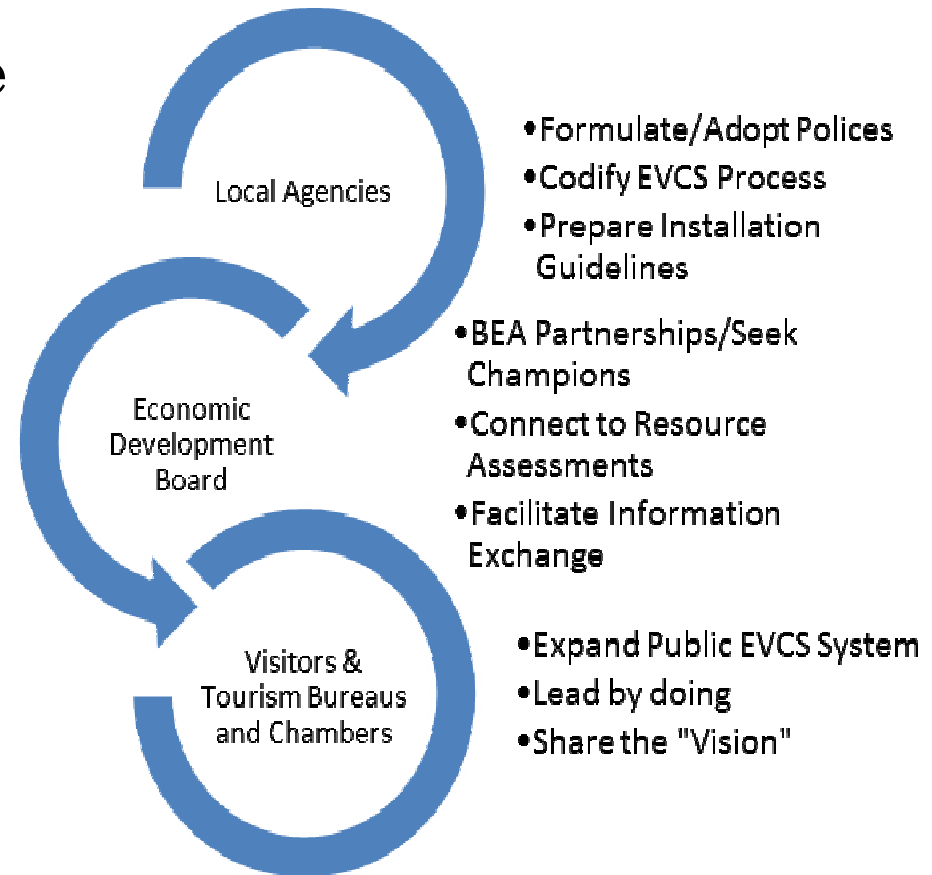
FUEL COST COMPARISON

Vehicle Type	Cost per mile	Cost per 100 miles	Cost per 500 miles
Compact Car (gasoline)	\$ 0.1063	\$ 10.63	\$ 531.67
Compact Hybrid (Prius)	\$ 0.0709	\$ 7.09	\$ 354.44
PHEV (Peak Charge)	\$ 0.0571	\$ 5.71	\$ 285.61
PHEV (Off Peak)	\$ 0.0536	\$ 5.36	\$ 268.11
EV (Peak)	\$ 0.0360	\$ 3.60	\$ 180.00
EV (Off Peak)	\$ 0.0192	\$ 1.90	\$ 96.00



POLICIES & COORDINATION

- Coordinating Task Force
Fleet Manager, Air District, Key County Departments, Counsel, Risk Mgmt, Cities, RCPA
- Developed infrastructure installation and permitting guidelines
- Working on uniform charging, parking, and rate policies



FUNDING TO DATE (INFRASTRUCTURE, BEVS)

Metropolitan Transportation Commission Fleet Grant

County – 22 Vehicles/Chargers	\$585,000
SCWA – 5 Vehicles/Chargers	\$125,000
<u>City of SR – 4 Vehicles/Chargers</u>	<u>\$100,500</u>
Total MTC Fleet Grant	\$810,500

MTC – Public Charger Grant

25 public access EV chargers \$230,000

BAAQMD – Transportation Fund for Clean Air \$21,870

ChargePoint America Grant /NSCAPCD Funds

36 public access chargers \$385,000

TOTAL \$1,447,370



UPCOMING CA INFRASTRUCTURE PROJECT

○ NRG Settlement:

- \$20 M in rebate to rate payers
- \$102 M for DC fast charging
- \$40 M for EVSE readiness at multi-family dwellings, workplaces, and public facilities

○ Details on DC Fast Charging

- \$50.5 M for at least 200 DC fast charge "Freedom Stations"
- \$40 M for at least 10,000 "make-ready" conduit hook-ups
- \$3 M for fixed operating costs during the initial "open charging" period
- \$5 M for technology demonstrations
- \$4 M TBD



CLEAN TRANSPORTATION FUNDING SOURCES

- FHA-TCSP (Transp. Commun. Sys. Preserv.)
 - Planning, capital projects
- EPA-HUD-DOT: Partnership for Livable Communities = gateway funding for:
 - Building Blocks (50-75 communities selected; planning)
 - Smart Growth Imp. Assistance (approx. 5 community demonstration projects selected)
- EDA (Economic Development Agency)
 - \$100k - 200k for infrast. planning in distressed commun.
 - Leverages other federal grants; offered quarterly
- EPA Brownfields & Area-wide Brownfields Grants
- HUD Sustainable Communities Challenge Grants
- DOE EV Infrastructure Grants
 - New RFP coming in a few weeks; “shovel-ready” projects
- Funders Network for Smart Growth and Livable Communities
 - Requires partner who is community foundation; provides 1:1



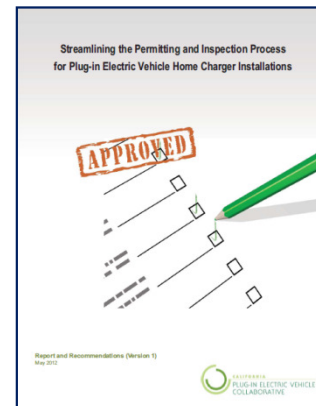
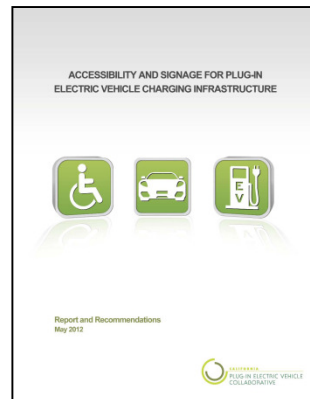
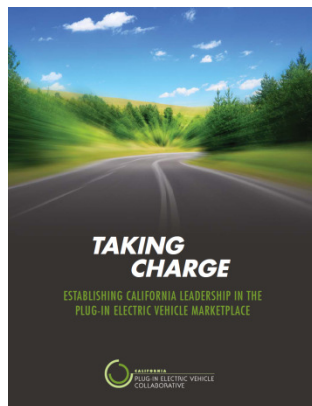
PEVC RESOURCES: www.pevcollaborative.org

○ Available Now:

- Taking Charge: Strategic Plan 2010
- Recommendations Report: Accessibility & Signage
- PEV infrastructure Permit Streamlining resource
- PEV infrastructure Maps & Applications resource
- Communication Guides

○ Coming soon:

- PEV Readiness Toolkit for cities



PEVC COMMUNICATION GUIDES

- How do PEVs Benefit California?
- What are the Benefits of Driving a PEV? What cars are Available?
- PEV Charging: Where and When?
- Fuel Costs: PEVs vs. Gasoline Cars?

HOW DO PEVS BENEFIT CALIFORNIA?

Plug-in Electric Vehicles (PEVs) benefit all Californians by bringing cleaner air, energy security, fuel cost savings, and economic growth while leveraging the state's leadership in technology and innovation.

KEY MESSAGES

- PEV Benefits Include:
 - Improving air quality and lowering greenhouse gas (GHG) emissions, resulting in better health and productivity.
 - Creating new clean energy jobs.
 - Enhancing energy security and national security by lowering dependence on foreign oil imports.
 - Providing fuel cost savings that can help stimulate the local economy.
 - Leveraging California's culture of leadership in technology and innovation.

BETTER AIR QUALITY FROM PEV MATTERS

- Transportation emissions are the primary source of carcinogenic particulate matter, air toxins and smog in California.
- The transportation sector is the greatest source of GHG emissions in California. Greenhouse gases cause climate change, and with thousands of miles of coastline, California is particularly vulnerable to climate change impacts.
- Low income and minority communities are disproportionately affected by transportation emissions and therefore stand to benefit the most from cleaner air.

PEVS DRAMATICALLY LOWER SMOG AND GREENHOUSE GAS EMISSIONS

SMOQ (FORMER EMISSIONS) WELL-TO-WHEEL COMPARISON*

Vehicle Type	CO ₂ (gallon)	CO ₂ (lb)
Gasoline	~0.015	~0.035
Gasoline Hybrid	~0.010	~0.025
Plug-in Hybrid	~0.005	~0.015
Plug-in Electric	~0.002	~0.005

GREENHOUSE GAS EMISSIONS WELL-TO-WHEEL COMPARISON*

Vehicle Type	CO ₂ (gallon)	CO ₂ (lb)
Gasoline	~100	~220
Gasoline Hybrid	~50	~110
Plug-in Hybrid	~25	~55
Plug-in Electric	~10	~22

*Based on California PEV Collaborative (2012). California Air Resources Board. Advanced Clean Cars Summary (2012). Three leading emissions models estimate regional gasoline (PG&W) and diesel (PG&W) well-to-wheel (WTW) CO₂ emissions. Diesel, Plug-in Hybrid, and Plug-in Electric (PEV) emissions are based on the well-to-wheel (WTW) CO₂ emissions. The WTW CO₂ emissions are based on conventional emissions from production, distribution, and refueling of fuel and the generation of electricity.

WHAT ARE THE BENEFITS OF DRIVING A PEV? WHAT CARS ARE AVAILABLE?

Driving a Plug-in Electric Vehicle (PEV) is an exhilarating experience. PEV owners across the country have discovered the "PEV Style."

KEY MESSAGES

- The California PEV Driving Experience:
 - Drive a PEV Now: With several models available today and dozens coming in the next few years, major automakers are committed to PEV as an essential part of their current and future model lines.
 - Experience the Most Technologically Advanced Fuel Efficient Car Today: PEVs deliver top performance, smooth acceleration, great torque and quiet comfort from their ICEs, plus the best in high-tech convenience. PEVs are best of the line - this is not your grandfather's gas car!
 - Save Green by Being Green: With lower fuel costs (electricity vs. gasoline) and higher efficiency, PEVs continue to spend less than the average gasoline vehicle.
 - Fast Anywhere: PEV owners can charge when and where. In plug-in, similar to recharging a cell phone or laptop. Most drivers re-charge their PEVs at night. Plug-in about looking for cheap parking at night? Look for PEVs to start charging whenever convenient charging sites are available.
 - Fast Anywhere: PEVs come equipped with a charger cord that can plug into a standard wall outlet, or a home charging station can be installed for faster charging. Plus, California has the largest network of publicly accessible PEV charging stations in the nation, and the network continues to expand. With the help of several new smart phone apps, you can find a charging station and open reserve a spot. And, charging stations at work are also becoming increasingly available.
 - Clear the Air, Improve Public Health, Reduce Your Carbon Footprint: Clean California electricity enables PEVs to significantly reduce greenhouse gas emissions and cut down on air pollution. California electricity generation continues to get cleaner every day.
 - Support Energy Independence: PEVs Use Cleanly Generated Base Domestic Sources: Clean California electricity relies heavily on imported oil, while electricity is generated more locally. PEV drivers help reduce our dependence on imported oil by operating their fast-charged station or fast-but-provided locally in the state.
 - Bring the Pleasure of California PEV Driving: For many PEV drivers, that means driving to high-mountain resorts (PEV drives, and take road trips, and take that outdoor gear parking, discover the auto insurance, and the "buckle up" sign from other motorists.
 - Travel Set: Californians are leaders and PEVs are no exception. Over half the PEVs in the country are here. Green technology and clean energy will propel California's economy in the 21st century. PEV adoption and infrastructure startups are creating new manufacturing, construction and service jobs. In the first half of 2013, California businesses reported nearly 75 percent of the total global electric vehicle venture capital investment. PEVs show California's future, today.

PEV CHARGING: WHERE AND WHEN?

California electricity offers cost-effective, efficient electric fuel, improved air quality, a reduced carbon footprint and less dependence on imported petroleum.

KEY MESSAGES

- Most charging occurs at home, at night.
- Workplace charging is the second most frequent choice.
- There are more than 1900 public charging locations in California today; this will continue to expand over the next several years.
- Public charging stations are available today at public parking lots, retail chains such as Kohl's and Walgreens, board destinations, entertainment venues, and airports.

HOME CHARGING

- Important job sites that lack charging stations at home, at night, benefit include:
 - Homeowners of battery electric vehicles.
 - Lower cost of nighttime off-peak electric rates.
 - A lot less "range anxiety" every morning!
- Every new PEV comes with purchase reimbursement that pays for a regular household Level 1.
- To charge at home, PEV drivers can also purchase and install charging equipment, using a dedicated 240 volt circuit similar to that used by a clothes dryer (Level 2 charging).
- Many manufacturers offer PEV charging equipment - referred to as "Onboard Vehicle Speed Braking and Charge" (OVC). PEV drivers can choose among a number of brands (including those made by California companies).
- Some great sites: www.fuelnet.com, www.chargepoint.com, www.blaupunkt.com

WORKPLACE CHARGING

- Some workplaces allow employees to "top off" charge while at work, to "top off" the charge that took to drive to work. Employees often both Level 1 and Level 2 charging opportunities.
- Companies such as Google, Apple, Netflix and others allow employees to charge their cars at work.
- Charge up faster: PEV drivers can also purchase and install charging equipment, using a dedicated 240 volt circuit similar to that used by a clothes dryer (Level 2 charging).
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PUBLIC CHARGING

- PEV drivers can find public charging sites using apps or mobile phone apps. For a list of the most popular in the California PEV Network, visit: www.CAplug.com
- A growing list of smart phone apps enable PEV drivers to plan routes and/or charge for their drive electric vehicles based on vehicle charge time or a household-level charge, and for the correct charge rate to be used.
- Other and better options for charging PEVs are emerging.
- DC Fast Charging stations will be built in California 2012. They can recharge a PEV in as little as 30 minutes.
- Some charging may offer California's efficient ability for charging PEVs in the future.
- Innovative charging, where what's being "recharged," is being "reused," is being tested.

FUEL COSTS: PEVS VS. GASOLINE CARS?

Driving on electricity is usually much cheaper than using gasoline. Plug-in drivers have the additional benefits of more stable electric prices and the convenience of refueling at home or in the community.

KEY MESSAGES

- Driving on Electricity Can Be Cheaper: \$0.10 per kilowatt hour (kWh) is the equivalent of driving on gasoline that costs less than \$1 per gallon!
- Plug-in Electric Vehicles (PEVs) drivers may find residential time-of-use (TOU) rates worth considering. On a TOU rate, household electricity costs kWh vary according to the time of day electricity is used.
- Electricity Prices Are More Stable Than Oil Prices: Oil prices are typically generated from domestic sources, and its price is more stable. Oil prices fluctuate widely, and are highly influenced by world events.

HOW MUCH DOES IT COST TO DRIVE?

Vehicle Type	Cost per Mile (CPM)
Gasoline Car	~\$0.15
PEV (at \$0.10/kWh)	~\$0.03
PEV (at \$0.15/kWh)	~\$0.05
PEV (at \$0.20/kWh)	~\$0.07

ELECTRICITY PRICES ARE MORE STABLE THAN OIL PRICES

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PEVC COMMUNICATION GUIDES:

- How Do Communities Become PEV Ready?
- How Do Multi-Dwelling Units Become PEV Ready?
- Workplace Charging: Why and How?
- PEV Batteries: Safety, Recycling, and Reuse?

HOW DO COMMUNITIES BECOME PEV READY?

California is leading the nation in Plug-in Electric Vehicle (PEV) sales today, with dozens of new plug-in models coming to market. PEVs benefit local communities by bringing clean, healthy air, a reduced carbon footprint, quieter streets, lower fueling and operation costs for households.

KEY MESSAGES

- PEV Ready Communities Take Action
 - Showcase construction permitting and inspection processes for PEV charging installation, train permitting staff and building officials.
 - Offer first responder training to police and fire personnel.
 - Update building codes, zoning and parking rules to be PEV ready.
 - Address PEV charging needs in apartments and condos.
 - Create a plan to deploy public charging and participate in regional infrastructure planning.
 - Encourage local employees to offer customer and workplace charging.
 - Utilize the resources of the local vehicle utility to promote PEV adoption and training.
 - Communicate which buildings are PEV ready, why it's good for the community, and quality of life benefits.
- Leadership "Walks the Talk"
 - Identify a PEV champion in your organization or community to guide the process of becoming PEV Ready.
 - Purchase and drive a PEV and install workplace and public charging.
 - Establish incentives for home and commercial charging, as well as preferred PEV parking. Encourage green buildings.

"It Takes a Village" to Become PEV Ready: Stakeholders and Roles

PEV Drivers Encourage PEV Ready communities	Electric Utilities Offer incentives for PEV. Advocate for PEV-friendly community.	Automakers Sell and lease PEVs.	Employers Encourage employees to drive PEVs (offer workplace charging).
State Government Regulatory advice, purchase incentives, PEV Ready program, PEV Ready Recognition criteria	Multiple Vehicle Supply Equipment (MVE) Manufacturers Offer charging vehicle incentives.	Residential/Property Managers Install publicly and privately owned PEV charging stations. Develop strategy to install PEV charging in Multi-Unit Dwellings.	Local & Regional Agree to standards. Develop PEV Ready program.
Public Scholarships, local PEV car sharing, vehicle lease.	Employment/Advocacy Provide education, health insurance, and other benefits.		

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HOW DO MULTI-UNIT DWELLINGS BECOME PEV READY?

Over one-third of Californians live in rentals or multi-unit complexes. In San Francisco and Los Angeles over half the residents live in Multi-unit Dwellings (MUDs). Charging for multi-unit complexes is necessary for the success of PEVs.

KEY MESSAGES

- California is at the beginning of a major transition to fueling cars with electricity. Multi-unit Dwellings (MUDs), condominiums, cooperative, mobile home parks, or townhouses need creative and innovative charging solutions.
- Leadership is important in solving the challenges of PEV charging. Home Owner Associations (HOAs), building owners and property managers will want to start getting PEV ready now.

INNOVATIVE CHARGING SOLUTIONS

Multi-unit Dwellings come in a variety of configurations. Parking arrangements for these residential buildings are equally diverse, ranging from dedicated or assigned parking to no parking at all. If charging at the PEV driver's assigned parking space is not possible, other possible charging solutions it might include:

EQUIPMENT

- Set up Level 1 charging (120-volt).
- Install charging equipment that can serve more than one PEV.
- Use charging stations with advanced technology to address issues such as slow charging, billing and payment for electricity, and access by multiple users.

LOCATION

- Track parking choice as PEV drivers can park where it's cheapest to rent a car.
- Use guest parking.
- Charge overnight in nearby municipalities, business buildings or shopping malls.
- Park at on-street charging locations close by.
- Use alternative charging options (workplace, public charging, DC fast charging, or car sharing services).

COST

- Bundle the cost of electricity with the cost of parking.
- Adopt energy efficiency measures to lower operational capacity in the building.

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WORKPLACE CHARGING: WHY AND HOW?

Seventy-four percent of Plug-in Electric Vehicle (PEV) owners express strong interest in workplace charging, and many businesses already see the value of installing charging.

KEY MESSAGES

- Workplace charging can benefit employees by reducing Plug-in Electric Vehicle range and helping employees "open" their commute.
- A growing number of California employers such as Google, SAP and 3M are installing charging for their employees. A few, like 3M, are going even further by offering employees tuition incentives to PEVs.

WHY SHOULD EMPLOYERS INSTALL WORKPLACE CHARGING?

- Decreases the employer's environmental leadership to employees and visitors—right in the parking lot.
- Meets greenhouse gas and carbon pollution emissions reduction goals.
- Supports the use of more domestic fuel.
- Attract and retain top-notch talent.
- Enhance the company's brand as socially and environmentally responsible.

Benefits for Employees

- Reduce employee commute time—many PEVs qualify for the carpool lane.
- Attract employees who don't have home charging.

WHO OFFERS WORKPLACE CHARGING?

WHAT ARE BUSINESS BENEFITS?

SAP has installed 16 chargers for employees and visitors. "We are proud to take the first step, recognizing that it will help us further our carbon emissions reduction strategy in the average, and encourage employee adoption of PEVs." *Rand Sweeney, SAP Labs North America*

Google has installed more than 70 workplace chargers at their Mountain View headquarters with plans for another 200 charging stations. "It's like taking jaywalkers from over 2,000 per day to the road or adding 10 million vehicles every year." *Rolf Schreiber, Google*

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PEV BATTERIES: SAFETY, RECYCLING, RE-USE?

Most Plug-in Electric Vehicles (PEVs), cell phones and laptop computers use Lithium-ion batteries because they are safe, highly efficient, cost effective, and made from supplies found throughout the world.

KEY MESSAGES

- Lithium-ion (Li-ion) car batteries are designed for recycling and contain no toxic materials or rare earth elements.
- World lithium deposits are sufficient to supply PEV batteries for decades.
- Used PEV batteries may have secondary life potential.
- More than 98% of conventional lead-acid car batteries are recycled in the U.S. today; the same or better is expected to be true for plug-in vehicles.
- Lithium battery recycling and possible post-automotive use of PEV batteries may benefit consumers through downward pressure on battery prices.

LEAD-ACID BATTERIES ADEQUATE FOR DECADES

- Batteries account for 30% of lithium demand, and lithium demand is likely to be dominated by batteries.
- Lithium reserves are large and widespread, with supply concentrations present on recent continents, and production increasing.
- Worldwide lithium reserves are estimated to be between 11 and 28 million metric tons. World supply of lithium is sufficient for many decades of growing PEV battery production, according to recent Department of Energy studies.
- PEV batteries require very small amounts of lithium about a third of a pound to deliver a 100% in a battery pack, or about 9 lbs. for a Nissan LEAF™ battery pack.
- Just one million tons of lithium (less than one tenth of world reserves) is enough to produce 200 million units of Chevrolet Volt (18 kWh battery) or 250 million units of Nissan LEAF™ (24 kWh battery).

World Lithium Reserves (Metric Tons)

Country	Reserve Tons*
United States	433,000
Argentina	36
Australia	200,000
Bolivia	2,400,000
Brazil	263,000
Canada	200,000
China	1,500,000
France	36
Germany	27,000
World Total	11,000,000

*Reserve tons does not take transportation, infrastructure, processing, and other costs into account. The amount of lithium available for use in a battery pack depends on the battery chemistry and the amount of lithium used in the battery pack. Source: U.S. Geological Survey, Mineral Resources of the World, 2000. *China and other nations have significant lithium reserves but do not report them.

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