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SUMMARY REPORT: CLEAN CITIES PLUG-IN ELECTRIC VEHICLE COMMUNITY READINESS PARTNERS DISCUSSION GROUP



U.S. Department of Energy



CENTER FOR CLIMATE
AND ENERGY SOLUTIONS

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An opportunity to discuss challenges and share best practices regarding efforts to prepare your community/region for plug-in electric vehicles and charging infrastructure deployment

Table of Contents	
Table of Contents	2
About this Report	3
Disclaimer	3
Acknowledgements	3
Session Overview	4
Vehicle Demand and Availability	4
Law and Regulatory Environment	5
Public EVSE Signage	5
ADA Compliance	7
Multi-unit Dwellings	7
Miscellaneous Observations	7
Vehicle Charging Standards	8
Nuts and Bolts of Charging Infrastructure	8
Workplace Charging and Parking Garages	8
EVSE Service Provider Business Models	9
Current PEV Driver Behavior	9
Fast Charging	9
Wireless Charging and Vehicle-to-Grid	9
Tabled Questions	10

About this Report

This report summarizes information shared by attendees of a workshop at the Electric Vehicle Symposium (EVS26) held on May 7, 2012 at the Los Angeles Convention Center in Los Angeles, California. The workshop session was prepared for the U.S. Department of Energy (DOE) grantees, subgrantees, and partners for the Community Readiness Planning projects awarded in 2011. (Grantees were not required to attend.)

The workshop session provided an opportunity to discuss challenges and share best practices that will prepare individual communities and regions for plug-in electric vehicles (PEVs) and charging infrastructure deployment. More than 90 individuals attended ranging from industry experts to nonprofit organizations to recipients of the aforementioned Clean Cities' grants.

The workshop allowed Clean Cities grantees and others in the PEV planning community to ask questions of PEV experts and other workshop participants on many topics including the vehicle market, the law and regulatory environment, charging standards, and charging infrastructure installation.

The workshop was sponsored by Clean Cities, a government-industry partnership within the U.S. Department of Energy's Vehicle Technologies Program. The Clean Cities program works to decrease petroleum use in the transportation sector by supporting community-level decisions that will lead to the deployment of environmentally friendly transportation technologies. More information about Clean Cities is available at www.cleancities.energy.gov.

Under contract to Argonne National Laboratory, the session was facilitated by the Center for Climate and Energy Solutions (C2ES), an independent, nonpartisan, nonprofit organization working to advance strong policy and action to address the twin challenges of energy and climate change. More information about C2ES is available at www.c2es.org.

Disclaimer

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All commentary in this report was paraphrased from the original accounts for readability.

Acknowledgements

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Session Overview

Recipients of the 2011 Clean Cities' *Community Readiness and Planning for Plug-in Electric Vehicles and Charging Infrastructure* grants and others in the plug-in electric vehicle (PEV) planning community have many questions about enabling PEVs to compete in their local markets. The objective of this workshop was to let participants identify and discuss the major issues they face in four topic areas:

- Vehicle Demand and Availability
- Law and Regulatory Environment
- Vehicle Charging Standards
- Nuts and Bolts of Charging Infrastructure Installation

In order to allow time for participants to lay out all their top issues, the session consisted mostly of a large group discussion. The workshop facilitator, the Center for Climate and Energy Solutions (C2ES), allocated time to each topic area. When time ran out, questions were queued to be answered later if time permitted.

Content noted with the heading, **Additional Commentary**, was provided after the workshop. Throughout comments included this report, hyperlinks were added wherever possible.

Vehicle Demand and Availability

Understanding vehicle demand and availability (i.e., the vehicle market) is critical to assessing an area's PEV readiness. With major automakers and other industry experts in the room, participants asked several questions aimed at identifying where vehicles have gone to date and why.

TO NISSAN AND GENERAL MOTORS, WHERE HAVE YOUR VEHICLES BEEN SOLD TO DATE?

General Motors has sold about 25 percent of Chevrolet Volts in California alone. Texas also has a significant number. Nissan LEAFs are now at dealers as the supply shortages from the 2011 tsunami are over. The LEAF is available in all 50 states. Current potential customers appear more like mass-market customers than early adopters. Multi-car households are the main purchasers. New car buyers are different from the general population, having higher income and education.

Additional Commentary: HybridCars.com provides monthly sales data at the national level for PEVs. See <http://www.hybridcars.com/market-dashboard.html>.

REQUESTS FOR PROPOSAL FOR CLEAN CITIES GRANTS WERE DONE OVER 1 ½ YEARS AGO. LOTS OF NEW DATA AND BEHAVIOR INFORMATION IS NOW AVAILABLE. WHAT IS DIFFERENT NOW VERSUS WHEN THE GRANTS WERE DEVELOPED?

Nissan originally believed about 90 percent of vehicles purchased would be for fleets, and the remaining would be individual retail sales. The opposite appears to be true. The economy was one factor. Some public fleets are not allowed to spend money at the moment (e.g. [California Department of General Services](#)). Nissan also believed most vehicles would be leased, but most have been bought. Lastly, Level 1 charging was anticipated to be used only a very small amount of time (about 5 percent); it is being used about 15 percent or so for the LEAF, currently.

Purchasing for the Chevrolet Volt has become a normal dealer-lot purchase process. There have been no real neighborhood recharging issues; utilities do not appear to be concerned in most areas. In California, utilities still want advance notice for electric vehicle supply equipment (EVSE) installation or vehicle purchase if possible. Also permitting

for EVSE installation has not been as much of an issue as first thought. Some East Coast issues have been reported with respect to EVSE installation permitting, but utilities have stepped in to provide necessary training. The National Electrical Contractors Association (NECA) has helped cities become much better prepared for permitting. There is surprisingly a wide range of permitting costs - from \$14 to \$624 across the United States, with an average of \$174. About 50 percent of Volt drivers are using Level 1 charging at home. Perhaps more are presently adopting Level 2 stations at home because of incentives than will be true in the long term.

WHY WERE SALES IN THE FLEET MARKET LESS THAN ANTICIPATED AND HOW CAN WE ENCOURAGE MORE FLEET SALES?

Some fleets cannot use tax credits (e.g., public fleets). Fleet managers are naturally conservative in order to avoid issues. Public fleets in state and local governments faced budget crises and have not been able to spend money. Less bottom-up activity and more top-down activity (i.e., CEOs/Governors setting goals) could help PEVs in fleets.

Other ways to encourage more activity in fleets are ride and drives, so individuals can experience the cars first hand, and having communities target large employers by working with them on their fleet vehicles, executive leased cars, and installation of employee charging.

Concern was raised over potential abuse with the cash-for-clunkers program, which has led to some hesitation by government in converting the existing PEV tax subsidy to a direct rebate.

WOULD A DIRECT DISCOUNT PROVIDED TO MANUFACTURERS TRANSLATE TO A DISCOUNT IN VEHICLE PRICE TO CONSUMERS (I.E., A SUPPLY-SIDE SUBSIDY DIRECTLY TO THE AUTOMAKER)?

General Motors would support this idea. Nissan would support the idea of converting the existing federal tax credit on PEVs to a rebate at the dealership. Nissan does believe that automakers will have to prepare for a world without such generous support.

CAN DEALERS PROVIDE INFORMATION ON COSTS TO POTENTIAL BUYERS ON DIFFERENT RECHARGING OPTIONS?

Dealers go through a certification process. The automakers have been given dealers tools and equipment (e.g., EVSE) for their dealerships, and staff have been trained. Some dealers are “into it, while some are not.” More education is needed. It takes more time on average to sell a PEV when compared to a conventional vehicle.

Dealer videos for training are available for use from Southern California Edison (SCE) at www.sce.com/pev. SCE offers Home Fueling Advisors for dealers to help with purchase-ready consumers. These advisors can provide a personalized rate analysis and individual support to help customers prepare their home for a PEV.

Law and Regulatory Environment

The law and regulatory environment brings together a broad set of players including electric utilities, regulators, state transportation officials, parking authorities, and many more. This portion of the session focused on areas most germane to the Clean Cities Coalitions and similar stakeholders such as signage, compliance with the American with Disabilities Act (ADA), and EVSE in multi-unit dwellings.

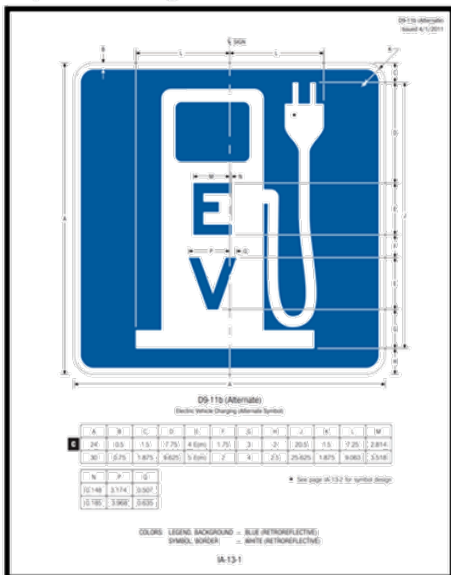
Public EVSE Signage

The signs in Figure 1 were shown to workshop participants and their feedback was solicited. The left sign is from the U.S. Department of Transportation’s (DOT) Manual on Uniform Traffic Control Devices. U.S. DOT gave interim approval to this sign on April 1, 2011. The middle sign is similar to the U.S. DOT

sign, but also contains the charging levels supported at the charging station. The right sign is an adaptation of the U.S. DOT sign intended to resemble a parking sign for the disabled.

- Participants remarks
 - It is odd for the sign to resemble a gasoline pump.
 - Providing the charging levels would be helpful.
 - Some kind of tow warning to conventional vehicles should also be included.
 - Consistency is important, though it is difficult to achieve consistency at the local level.
 - The color blue indicates it is a special parking spot.
 - Mass-produced signs can be less expensive.
 - The sign can act as an advertisement for an “EV” community.
 - Using an image of a car with a plug might be better (similar to the logo at www.pluginamerica.org).
 - Friendly signs can work better. Portland, Oregon has signs that say “thank you for saving this space for an EV to recharge.”
 - Signage helps locate charging stations. Errors in data exist including where EVSE are located, when they are available, and what kind of charging level they support. Existing mobile and web-based apps are insufficient.
 - Regarding changing the sign with U.S. DOT, it took 17 years to get the sign so it may be prudent to avoid trying to change it.

U.S. Department of Transportation: Alternative Electric Vehicle Charging Symbol Sign



Source: MUTCD, <http://1.usa.gov/H0vX5A>

Similar Sign to U.S. DOT, but with charging levels



Modified U.S. DOT sign in use in City of Auburn Hills, Michigan



Figure 1: Public EVSE signage options

ADA Compliance

- AeroVironment representative has installed 1,000 stations at dealerships, hotels, and malls. EVSE must be properly designed to comply with ADA. For instance, pedestals will not work if they are not wheelchair accessible.
- California has a statewide best practices document online here: <http://bit.ly/KWOriJ>.
- Clean Fuels Ohio has EV charging for disabilities guide on their website here: <http://bit.ly/KWOqLC>.
- Chevrolet Volt drivers do not require preferred parking.
- The City of Atlanta released a study on municipal best practices for EV readiness: <http://bit.ly/KWOYB7>.
- NECA has an information bulletin for installers about ADA compliance vs. accessibility.
- Advanced Energy has a handbook for installing EVSE, which includes information about ADA compliance: <http://bit.ly/KWOpHv>.
- The American National Standards Institute (ANSI) recently released a standardization roadmap for PEVs, which highlights the lack of standards for physical security: <http://bit.ly/KWOCKT>.
- San Diego requires the first EVSE in a parking lot to be ADA accessible (vs. compliant): <http://1.usa.gov/JyT7AN>.
- **Additional Commentary:** Sonoma County also issued guidance for accessibility of EVSE: <http://bit.ly/JyTwDq>.
- No ADA guidance has been issued for compliance for publicly available charging. ADA compliance could be a problem for wrap-around charging cable designs. The Occupational Safety and Health Administration (OSHA) also prohibits cables on the ground.

Multi-unit Dwellings

- Advanced Energy will put out a multi-unit dwelling guide this summer.
- Clean Cities site has a webinar about multi-unit dwelling EVSE installations: <http://1.usa.gov/KrI3TH>
- When considering EVSE installation, there is a need to consider whether the vehicle owner has electrical access and can pay for charging, installation, and maintenance costs.
- Pending legislation exists in some states (perhaps Colorado and/or Illinois) requiring property owners to act on EVSE installation (or acknowledge the request from the resident).
- Electric panel capacity can be an issue for multi-unit dwellings. A suggested strategy is to reduce other loads to compensate for PEV demand; reducing load from lighting, for example, can result in lower peak power demand.
- California law states a vehicle owner has to provide additional insurance indemnifying Homeowners Associations (HOAs).

Miscellaneous Observations

- Regarding allowing neighborhood electric vehicles to travel up to 35 mph, crash safety is a top concern. An entirely new neighborhood electric vehicles regulation would be necessary.
- **Additional Commentary:** A federal low-speed vehicle regulation exists (<http://bit.ly/JZnyyk>) and federal safety standards exist for low-speed vehicles (<http://1.usa.gov/JZo6Eh>).

- The California PEV Collaborative published a report on the permitting process: <http://bit.ly/KrQRsJ>
- New York City submitted a request to the state public service commission to allow EVSE service providers not to be regulated as utilities, even for garages.

Vehicle Charging Standards

- Ted Bohn from Argonne National Laboratory provided a short presentation on vehicle charging standards including an update on the upcoming Society of Automotive Engineers (SAE) connector for DC fast charging. Slides will be available online at the C2ES website (www.c2es.org).
- **Additional Commentary:** UL approved connector standard called CHAdeMO exists today; existing DC fast charging stations in United States support the CHAdeMO connector. Details of the standard are at <http://www.chademo.com>. In addition, SAE expects to have modifications to its J1772 connector for DC fast charging approved in July or August (see <http://ev.sae.org/article/11005>).

Nuts and Bolts of Charging Infrastructure

Many workshop participants have to work on the ground day-to-day, and therefore, must understand the practical issues that come up related to EVSE installation.

Workplace Charging and Parking Garages

- Issues for employers and building owners to consider include:
 - Will the owner move the vehicle to allow someone else to charge or must garage personnel do so?
 - How does the employer cover EVSE installation, operating, and maintenance costs?
 - Can they charge an hourly cost for the electricity?
- Mechanism is needed to accommodate multiple vehicles on one charge circuit.
 - Warehouses have multi-hookups for forklifts.
 - Los Angeles Airport has free parking and charging for EVs. Unfortunately, cars remain parked at the same plug long term. There must be a way to accommodate more vehicles per plug.
 - At DOE, the employee must sign in and pay for the electricity. An attendant will plug in the vehicle and remove it when finished.
 - For public parking, citations can be given if the charging cable is unplugged from the parked car (e.g., Portland, Oregon).
- New York City has begun encouraging parking garage attendants to provide charging since EVSE provides an added value to their customers.
 - The local Clean Cities Coalition is helping to train attendants to deal with charging multiple vehicles.
 - The local Clean Cities Coalition is also encouraging third parties to set up and run EVSE services in garages.
- Regarding taxes, why is electricity for a PEV a taxable benefit issue, but coffee, which can be a similar cost, is not a problem?

- A free PEV benefit is more obviously discriminatory (i.e., only very few get the benefit).
- Installation costs for Level 2 EVSE have been as high as \$40k (though typically \$3k-\$11k) depending on the distance to the power source. It is often cheaper to have the EVSE behind the building.

EVSE Service Provider Business Models

- Infrastructure already exists in North Dakota; many spaces have hookups for block heaters (i.e., Level 1 charging). Level 1 plugs for either the engine block heaters or PEVs could be a solution to equity issues in cold areas.
- What are good infrastructure business models (e.g., subscription network or pay as you go)?
 - In Hawaii, an EVSE installer is using advertising to attract PEV users who will purchase electricity at no cost to the site host.
 - Consumers will not want to pay for ½ day of charging when they only need an hour's worth of electricity.
 - With vehicle on-board meters, consumers could be billed on their house account for charging outside the home.
 - EVSE could be a useful way to entice customers to spend more time in existing retail stores (i.e., model is to sell retail products, not electricity).

Current PEV Driver Behavior

- Even Chevrolet Volt owners seek out public charging.
- According to the [EV Project](#), most charging is taking place in about 2 hours. There is a possibility of creating unnecessary problems by seeking faster and faster charging. The average user only uses 8 kWh per day, so Level 1 would accommodate them.
- The LEAF battery protects itself. Maintaining a state of charge of 20-80 percent is the best for the battery.

Fast Charging

- Fast charging could be important for multi-family units. Intercity connections are another opportunity for fast charging, though maybe not as much a priority. Use of fast chargers is growing over time.
- There is no data on willingness to pay for fast charging.
- Demand charges can be significant, and can make fast charging very costly to the business provider if allowable demand is exceeded.
- In Oregon, data on fast charger use is starting to appear now. One of first fast chargers was installed in a remote area, but had 168 recharging events in a month. Use is free.

Wireless Charging and Vehicle-to-Grid

- In 2014, a Nissan Infiniti plug-in hybrid will have wireless home charging. Workplace wireless charging is uncertain.
- Complete inductive charging standards are still in flux (e.g., communication).
 - SAE J1773 standard for inductive charging: http://standards.sae.org/j1773_200905/
 - IEEE has a wireless standards working group that started 3 months ago.
- Is vehicle-to-grid (V2G) here or coming?

- V2G is not yet economically viable in many cases.
- Vehicle-to-home (V2H) is being actively pursued, and is already being implemented in Japan. Worries are higher about the ability for the vehicle to communicate with the electrical equipment in the house than with the life of the battery. V2H was used to help in recovery efforts after the 2011 tsunami in Japan.
- General Motors is also doing V2H tests and experiments. It is only a matter of time before it enters the retail market. 2011 power outages in Connecticut are a perfect example of when it will be a valuable service to offer.

Tabled Questions

- Are there any cost trends for EVSE installation on street or in private or public garages (e.g., unionized labor costs, region-specific)?
- Are partnerships with rental car companies in the works (beyond what already exists)?
- Citing the Michigan Chevrolet dealer that is selling 25 Volts per month, what is being done to educate dealers? Are there specific training programs for sales staff?
- How will auto dealer groups and associations be involved in the PEV market?
- Are there forecasts for the used car market for PEVs?
- What lessons have we learned from drivers on where public charging should be sited?
- Are there guidelines for dealers who want to sell PEVs above the manufacturer's suggested retail price (MSRP)?
- Are there plans for depleted batteries (7 to 8 years into the future), and for use and help in buying new batteries?
- Is there a link between the renewable energy generation or energy efficiency aficionados and their willingness to buy a PEV?
- What are consumers willing to pay to for public charging, especially fast charging? Regarding vehicle charging, what is the willingness to pay per use versus subscription models?
- How can people be more pro-active on electricity rates like time variant pricing?
- How should signage look for wireless charging?
- Will lower maintenance costs become a disincentive to dealers to sell the PEVs aggressively, since they often make a good profit on their maintenance services?
- Are there laws on public charging regarding the definition of publically accessible?