Collaborating to Rev-Up the Clean Vehicle Market

New Initiative Convenes State and Local Leaders at UC Davis

1. Introduction

In October 2013, the UC Davis Policy Institute, in collaboration with the Institute of Transportation Studies and the Plug-in Hybrid and Electric Research Center, convened key leaders from state and city governments to share experiences and discuss opportunities and challenges to accelerate markets for zero-emission vehicles (ZEVs). The gathering served as the kick-off event of a new initiative, Zero Emission Market Acceleration Partnerships (Zero Emission MAP), to assist cities and states meet their sustainable transportation goals by making available to them 25 years of UC Davis interdisciplinary expertise and research in technology, infrastructure, consumer behavior, and policy aspects of ZEVs. Zero Emission MAP engages local, regional and state governmental, nongovernmental and research institutions from around the nation as well as industry to do leading-edge analysis, develop best practices and integrate them across jurisdictions.

Representatives of ten states and nine cities gathered at West Village, on the UC Davis campus. West Village is the largest planned zero net energy development in the United States. Most of the focus was on battery electric vehicles (EV) and plug-in hybrids electric vehicles (PHEV), collectively referred to as plug-in electric vehicles (PEV), which are the ZEV technologies currently in the market. Each of the states and cities represented has taken steps toward supporting markets for PEVs in recognition that this evolution in the transportation sector is needed to attain energy and environmental goals. ZEVs represent a critical component of strategies to achieve long-term sustainability of the transportation system.

Participants agreed that now is the time to think collaboratively. No state or city can succeed in supporting the ZEV market alone. “It’s all of us as equal partners,” said a participant. “We all need to learn from each other and include the latest information from research and demonstrations.”

Although California is often credited for its longstanding leadership in this arena, the state and local jurisdictions that participated in the Zero Emission MAP meeting have demonstrated leadership of their own by implementing a variety of initiatives tuned to their respective jurisdiction’s unique needs and characteristics. Most share one or more key components of success:

1. Leadership from executive offices. Such leadership manifested itself in various forms. Examples include Governor Brown’s Executive Order to put 1.5 million ZEVs on
California roads by 2025, and Mayor Parker’s launch of the Houston Drives Electric program. Among the states that attended the Zero Emission MAP meeting were signatories of an eight-state memorandum of agreement to put 3.3 million ZEVs on the road by 2025, which was announced the following day at a meeting of the California Air Resources Board.\(^1\)

2. Leadership from legislatures. States and cities have passed laws to support the early ZEV markets. Examples include the State of Georgia’s income tax credit and the State of Washington’s motor sales tax exemption for PEVs.

3. A plan or general direction that enables key agencies or offices in each state or city to work collaboratively and more effectively. In California, the ZEV Action Plan directs state agencies to address barriers to ZEVs within their sector by key dates.

4. Institutionalized or relatively formal partnerships between the public, private, and academic sectors that are not entirely embedded in government. Examples include the Northeast Electric Vehicle Network, the Maryland Electric Vehicle Infrastructure Council, the California Plug-in Electric Vehicle Collaborative, and the Illinois EV Advisory Council to the Governor.

Several themes came up repeatedly throughout the day, including the following:

- For almost every success or step forward, it seems, there are barriers and challenges that slow progress;
- Jurisdictions need to clarify their roles before they invest in ZEV market enhancement activities to ensure they are making the most efficient and appropriate decisions, the best use of limited public funds, and progress toward long-term policy goals;
- How to leverage limited public resources to achieve much larger public and private benefits, which translates to ZEVs on the road in the long term; and
- Policy at the local, state and federal level will continue to play an important role in supporting the ZEV market because targeted policy solutions are a necessary response to many of the barriers raised.

This report summarizes the discussion in four sections: Key Challenges, Current State and Local Government Actions, Existing Shared Resources, and Sample of insights from UC Davis Research.

### 2. Identifying the Challenges

The following categories of issues resonate across all jurisdictions: money, infrastructure, relationships, and information dissemination. Each is discussed in more detail below.

#### Financial Resources

While most of the investment and expenditure for ZEVs will come from the private sector in the form of automotive RD&D and consumer purchases, public investment in various forms can be

\(^1\) The signatories of the MOU are California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island and Vermont.
an enabler for ZEV markets. Below we highlight some of the challenges for public investment that were raised in the meeting.

- Government has traditionally relied on gas tax revenues to finance road infrastructure, and high levels of ZEV market penetration could result in reducing this source of funding. Revenue for the maintenance and construction of road infrastructure is a recurring theme across all jurisdictions. It concerns decision makers and has been raised by opponents as an argument against ZEVs. Several participants expressed concern that this issue will become a growing barrier. At least one jurisdiction is considering a special registration fee for PEVs to supplement road coffers.
- Despite a significant infusion of funds from a variety of sources for early PEV charging station installations, there is a dearth of funding available for planning and identifying the best locations for that infrastructure, one participant noted.
- Inefficient use and “gifting” of public funds are other widespread challenges. These issues are more likely to be raised when public charging is offered for free at government sites, when publicly funded public chargers are not used, when people who are perceived as wealthy benefit from financial incentives to purchase PEVs, and when companies that accepted government grants or loans fail.
- The workplace is a high-priority target for infrastructure planning in many jurisdictions because it is, along with their residence, the place where most drivers park their cars for long periods. It is also seen as an enabler for the segment of the market that does not have an easy home-charging solution. However, it is also sometimes perceived as an employee benefit. While many individual workplaces can develop their own policies based on interpretation of IRS rules, in some unionized workplaces, barriers have not been resolved.

**Infrastructure**

Participants discussed numerous challenges that they face or could face associated with PEV charging infrastructure.

- There is widespread concern about easy access to and interoperability of charging stations due to different ownership and networks. Today, a PEV driver would need to carry multiple cards to access different charger networks. Several participants concurred that a national interoperability standard is necessary and that different regional standards are undesirable. If a national standard fails to materialize by 2015, California has indicated it will push for a keep-it-simple universal access via credit card.
- One state noted that they are looking for help redefining fuel. “We have a law that requires charging stations at rest areas but we are prohibited from selling fuel at rest areas.” This is a universal challenge along federal Interstates.
  - Some local jurisdictions have been able to work around the issue with local toll roads that have a different highway designation.
  - A non-policy approach that was suggested is to invite private entities to “adopt” publicly accessible charging infrastructure.
The business case and market for EV charging infrastructure networks is not yet clear. The market is immature and somewhat unstable as suggested by the fact that some early players have gone out of business, leaving stranded assets and some consumers without access to their favorite chargers.

On a related point, many are watching closely the transfer of assets between ECOtality and Blink Acquisition, because Blink Acquisition may not be required to take all of ECOtality’s charging locations, in which case some could become stranded assets.

There is widespread agreement that local building codes need to be amended and ordinances need to be developed to accommodate PEV charging. Many jurisdictions are tackling this issue, as discussed later in this report.

If chargers are placed in high-visibility locations but are not regularly used, in addition to drawing criticism about inefficient use of public funds, people complain that spaces are being taken away from the general public and it presents a messaging problem.

In many cities, prospective PEV buyers live in multi-unit developments, which have their own set of complications and often do not have garages and rely on on-street parking.

Providing charging in on-street parking spaces presents municipalities with logistical challenges. In residential neighborhoods that rely on on-street parking, the challenge is even more complex due to ownership in public right-of-way. Cities cannot give away space or allocate the curb for private use. Even if a parking ordinance were to allow parking while charging, cities face liability issues. Additionally some neighborhoods have expressed apprehension about on-street charging. Some cities that are exploring car sharing with PEVs are also wrestling with barriers to installing infrastructure on the street.

Charging social rules or etiquette is also an issue for current drivers as highlighted in a UC Davis paper.

A number of other charging and infrastructure-related topics and questions were raised in the meeting but not discussed at length. For example, one participant questioned whether it makes sense to continue to invest in Level 2 charging, when many stakeholders are urging a focus instead on Level 1 charging coupled with DC Fast Charging. A representative from Boston noted that the city purposely chose to invest in DC Fast Charging instead of Level 2, given its charging station usage on the street (rather than in long-term parking garages). Another asked if a lack of an SAE standard for DC Fast Charging is a barrier to its adoption. Still another noted networking problems with some DC Fast Chargers in Chicago and asked if others were also having this problem. These kinds of questions and interactions were valuable for information exchange. The topics represent significant issues that will likely continue to attract discussion and debate throughout the industry.

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2 Blink Acquisition is a wholly owned subsidiary of Car Charging Group, Inc.
**Relationships**

Participants discussed numerous unique and nuanced challenges that are inevitable, given the many organizations and individuals who are stakeholders in the early PEV market.

- Some of the challenges identified related to the importance and difficulty to work with automakers and their dealers.
- While the relationship with dealers is predominantly a state-level question, states rely on California to continue working with automakers to ensure that there is product that consumers want to buy. Some states expressed frustration about the fact that they do not see a sufficient supply of PEV. Participants highlighted the following examples:
  - Honda is not selling the Fit EV and by the time of the meeting had offered only four units for sale in one eastern state.
  - Though drivetrains and motors for the Chevy Spark are made in a plant in one eastern state, GM has yet to confirm when the Spark will be available there.
  - A representative said that in a western state there are billboards advertising plug-in cars that are not available in that state.
  - It was noted that, under the California ZEV regulation, the *Section 177 states*\(^4\) have the authority to survey automakers to learn how many models they plan to bring to market in the next year.
  - Without a commitment from the car companies to make the vehicles available, it is more difficult for states to adopt policies to offer incentives or for the private sector to help by, for example, incorporating PEVs into their fleets.
- Although most auto dealers that sell PEVs have installed charging stations in their stores, they do not consider community-wide charging infrastructure to be their responsibility. A lack of consumer access to charging stations, however, may inhibit vehicle sales. For this reason, a better integration of dealers’ sales strategy with public charging investments, issues and considerations in their community, is advisable in order to sell PEVs.
- Professional sports teams often have existing advertising and co-branding relationships with major automakers. But one city representative noted, with frustration, that it took three years to convince the involved players, including an OEM, to include PEVs in their static display at the game.
- Property developers and architects are key stakeholders in the early ZEV market who need education about PEVs and should be the target of relationship-building efforts. One participant noted the need to engage them early – before they start designing buildings and before local planners approve their project. Because they already deal with a wide range of local and state requirements, for parking spaces, ADA access, and the like, they may be resistant to adding PEV charging station access unless required to do so by law. In the meantime, until building codes change, having good relationships

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\(^4\) Section 177 of the U.S. Clean Air Act gives states the option to adopt air quality standards set by California instead of the federal standards. State that select California’s standards are informally known as “Section 177 states”.

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and identifying incentives to include charging station access early in the construction process, will more likely result in success.

**Information Dissemination**

Education, outreach, marketing and advertising are a perennial challenge for government entities, which typically have small funding availability compared to major manufacturers, questions about their appropriate role, and limited expertise compared to industry and research institutions. “Though it is the job of automakers and dealers to sell plug-in vehicles,” one person noted, “there is still a need for government-led public education, advertising and marketing because the public needs to be informed more generally. Many people want to do the right thing to help reduce climate change, but they don’t know what to do first.” Others opined that governments should use their bully pulpits to raise general awareness and to expose people through institutions, such as using PEVs for drivers’ education to introduce the new technology to the next generation of car buyers.

One participant noted that the Zero Emission MAP initiative should consider focusing part of its efforts on engaging all key partners, including the OEMs, to get behind ZEVs and work collaboratively. “We’re asking, ‘Why us?’ and they [in reference to the OEMs] are saying they don’t want to do it.”

Another participant said that s/he was not quite convinced that OEMs are putting their best marketing minds behind the technology and wondered: “When will we see a PEV advertised in a Super Bowl commercial?”

Several participants offered specific tactical suggestions:

- Remember that automakers’ advertising budgets are linked to vehicle sales. PEV sales are a small fraction of their business, so their advertising budgets for PEVs are limited.
- Invest in a social media campaign to create a buzz about the technology and spur consumer demand. Once consumers demand the cars, a tipping point is reached and car companies will fund more traditional advertising.
- One participant has discussed potential infrastructure agreements with OEMs that allow them to market their vehicles on the charging stations.
- Although utilities are funding the Electric Generation project\(^5\), one participant suggested that a national campaign may not be the best consumer outreach approach, especially given regional differences, and that a regional outreach effort me be more fruitful.

On the topic of messaging, participants offered the following:

- The Zero Emission MAP initiative needs to reinforce regulatory certainty to ensure that states are committed to supporting the market and to respond to arguments that states are not doing enough. At the same time, states need to recognize that OEMs have a real challenge with dealers, because they do not dictate how dealers sell cars.

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\(^5\) [http://theelectricgeneration.org/](http://theelectricgeneration.org/)
• We need to say why PEVs matter. We know right now that people care about energy security, but the real benefits are broader. We should focus on a vision for messaging 10 years from now, to be able to make the argument that PEVs make sense.
• PEVs are the most affordable commuter car you can buy today.
• The perceived vs. real costs of electricity need to be explained, along with widely divergent environmental benefits of electricity depending upon generation source.

3. Current State and Local Government Actions
The following sections outline some of the actions that state and local jurisdictions are taking to support ZEVs. The presentation is organized according to the following categories: infrastructure, incentives, utility rate structures, fleet procurement and outreach/education.

PEV Charging Infrastructure
This section discusses charging infrastructure activities that are underway at the regional and statewide level as well as at the local government level.

Regional and Statewide Charging Infrastructure Activities
• Regional corridors connect urban areas, such as the “Electric Highway” in the states of Washington and Oregon where fast charging stations are being deployed along Interstate 5 and other corridors. California is examining options to deploy infrastructure along its part of I-5 to coordinate with Washington and Oregon.
• The “Green Corridor” will connect Burlington, Vt. and Montreal, Que., and continue down the Eastern Seaboard.
• Highway and turnpike service plazas, where drivers typically stop for 20-30 minutes at a time, offer a high-visibility and effective opportunity for DC Fast Charging. Connecticut is developing a plan for deployment along its turnpike.
• Oregon and Washington are planning their charging infrastructure with popular recreation and tourist destinations, such as wine regions, in mind. The goal is to develop a PEV tourism industry in partnership with tourism industry partners. By planning PEV charging infrastructure in places where drivers likely would not otherwise take their PEV, the strategy introduces PEVs and charging to communities that typically would not be high on the early-introduction list. The initiative also is linking with businesses that offer targeted smart phone apps.
• California is currently prioritizing charging at work and in multi-unit developments such as condominiums and apartments. The state is preparing a tailored solicitation for grant applications to address these priority targets.
• The California “Drive the Dream” event brought together top employers in the state to publicly commit to support PEVs through actions such as workplace charging, fleet purchases, employee discount programs, etc.
• Participants stressed the importance of charging stations being interoperable. It was suggested that if a national standard fails to materialize by 2015, California might push for a universal access via credit card.
The California Department of Measures and Standards is working on a method of measurement for energy consumption at the charging site and how to charge for that usage.

California is also developing a requirement that there be multiple payment methods and that signage indicate billing rate and methodology.

Nissan is installing 43 DC Fast Charging stations in the Washington-Baltimore-Annapolis region. Participants agreed in that there may be value in pressing others to do the same.

States should consider implementing mechanisms by which the location of public-access charging stations are reported to the National Renewable Energy Laboratory (NREL), which manages a database that is available to the public.

Local Charging Infrastructure Activities

Portland, Ore. is working at the interface of charging and private business, with mom-and-pop businesses with local road frontage. Recently the first privately owned public charging station in a public right-of-way was installed.

Boston engaged parking garage operators several years ago. Every new development in Boston has to get a transportation access plan agreement. The city now requires plans to include 5% PEV charging spaces. When the city gets pushback, it encourages carsharing partnerships.

Boston has a smart-parking demonstration with three charging stations as part of a smart-grid project. Located in front of City Hall, this is a high-visibility project.

On-street charging provides high visibility, which is good, as long as the stations are being used and not being abused by any one or two drivers. To avoid abuse, cities can enforce a time limit, such as 4 hours. Clear and standardized signage is very important.

Seattle has been working with The EV Project on home and public access charging, and with the Clean Cities Coalition on public access at government and fleet charging sites. The city had to address the issue of public gifts (providing free electricity for PEV charging) in its parking garages because the city owns the local utility, Seattle City Light. To address this issue, the city established a $2 fee per charging session and charges a fee for parking to ensure revenue neutrality. The city is tracking the usage of its charging equipment.

Incentives (Monetary and Non-monetary)

Participants discussed a range of incentives that their jurisdictions currently offer or are considering, including the following:

- Vermont offers low-interest (1%) loans for charging stations for businesses and municipalities.
- Several jurisdictions mentioned the value of matching grants and loans for residential, public, commercial and workplace charging in targeted locations, such as key municipalities.
- Vehicle purchase incentives, which take varying forms ranging from rebates to tax credits, are numerous and wide-ranging. They include tax incentives of $5,000 in
Georgia, rebates of up to $4,000 in Illinois and up to $2,500 in California and a tax credit of up to $1,000 in Maryland.

• Many participating states and municipalities offer charging infrastructure incentives, which take varying forms ranging from rebates to tax credits.

• Several states offer or are considering PEV registration discounts. For example, Illinois charges $35 instead of $100 for PEV registration.

• Participants discussed – and many have taken advantage of – the numerous PEV readiness grants available to cities through entities such as the Clean Cities Coalitions of the U.S. Department of Energy.

• Carpool lane access for drivers of PEVs can a valuable non-monetary PEV incentive in congested urban areas. Some of the participant jurisdictions, such as the state of Tennessee, offer HOV lane access to PEVs. California has extended its law allowing PEVs to drive solo in the carpool lane through 2019.

• Free parking for PEVs while charging is another common incentive offered in many local jurisdictions.

Utility Rate Structures
Participants raised topics involving utilities, rates and their relationships to customers.

• Numerous jurisdictions are working with utilities on time-of-use (TOU) rates to incent off-peak charging and on concurrent efforts to evaluate grid and local distribution system impacts.

• An Illinois Commerce Commission rulemaking requires installers of PEV charging infrastructure to be certified.

• In California, there has been an interesting discussion about best times to incent charging. The state’s renewables policies may result in daytime excess capacity in some regions, leading some to propose rates that incent some daytime charging as well as the more common off-peak overnight timeframe.

• Utilities and regulators are examining a variety of issues such as demand charges, sub metering pilot protocols, smart PEV integration with the grid, vehicle-to-grid pilots, and battery second life.

Fleet PEV Procurements
Many states and cities are adding PEVs to their fleets.

• Some jurisdictions have procurement goals and specific commitments.

• The U.S. Department of Defense (DoD) Vector II “Targeted Acquisition of Plug in Electric Vehicles (PEVs) and Supporting Infrastructure” procurement is limited to states that have adopted the ZEV program. An RFP for a large number of PEVs and charging stations was at the time of the meeting going through the standard DoD and General Services Administration process. There are opportunities for states and other jurisdictions to piggyback on procurement and possibly make some of these chargers available for public use.
Outreach and Education
As noted earlier, outreach and education are often held up as one of the most important market enablers for ZEVs, however, public agencies typically lack the resources and the specific expertise to conduct comprehensive campaigns. Despite these limitations, participants discussed numerous strategies they have employed or are considering implementing, to support the ZEV market.

State-based Initiatives
- Consistent highway signage across state borders can be a market enabler. Oregon and Washington collaborated in developing and seeking approval from the U.S. Department of Transportation for highway signage that directs drivers to public-access charging stations.
- On the premise that people who own and drive a PEV are the best messengers, programs like Oregon’s EV Ambassadors are designed to get drivers talking about their cars and their experience to educate potential PEV drivers.
- The ZEV ombudsman, funded by the California Energy Commission, is a new position that will be based out of the Governor’s Office of Economic Development. The role of this position will be to address barriers in existing regulatory and government processes, i.e., to create a template for counties on hydrogen fueling station installations to enable compliance with the California Environmental Quality Act (CEQA) while also providing flexibility to meet their own local needs.
- State and local jurisdictions are seeking zoning and building code changes and streamlined permitting processes to shorten the wait time for charging station installations and enable their easy inclusion in future construction. Education and outreach about these installation requirements and processes are critical market enablers.

Local Government Initiatives
- Participants discussed several carsharing partnerships. Chicago and Boston have forged partnerships with Zipcar to provide PEV accessibility and visibility. Boston is exploring other providers, as well.
- Small-town PEV demonstrations, such as Bloomington-Normal EV Partnership in the state of Illinois, seek to put a large number of PEVs on the road in small communities, where they can be easily noticed and can make a big impact on consumer awareness.
- The City of Atlanta developed model ordinances to help the region’s many small local jurisdictions update their own building and zoning codes.
- Seattle developed information for consumers to understand that they need a permit, how to get it, and how to work with the city’s building department. Much of the city’s focus is currently on “garage orphans” (prospective PEV owners who do not have access to home charging) and public right-of-way (see challenges discussion).

Additional Opportunities for States
The following ideas are under consideration in different jurisdictions.
Some states are discussing creative solutions for PEV charging station installations, such as using the Stage 2 EPA Supplemental Environmental Project (SEP) settlement funds recovered through an enforcement action against an environmentally damaging activity. One state is considering a plan to install DC Fast Charging infrastructure using its SEP funding. Another state is in discussion with a chain of convenience stores about installing PEV charging, or to at least wire conduit for charging, in exchange for SEP credits.

Efforts to quantify the benefit of PEV programs to an individual state can be useful for building political support. For example, the state of Oregon has estimated the economic impact of PEV programs at $266.56 million, with more than 1,500 jobs created.

There is great potential value in building partnerships with OEMs.

Engage in demonstration projects that assess the potential of PEVs for emergency backup generation.

Some cities are planning so-called “innovation districts” where PEV charging infrastructure would not only benefit cars but could perhaps serve complementary activities, such as food trucks, electric shuttle buses, wireless inductive demos, waterfront development/solar water taxis, and electric bikesharing projects.

Some states may be considering specialty license plates to help law enforcement enforce charging. These license plates are already used in Massachusetts.

**Existing Resources**

In addition to specific activities underway at the state and local level, several regional and multijurisdictional efforts offer resources to all interested in enabling the ZEV market.

- A ZEV-state task force has formed to enable the exchange of information on approaches to consumers and auto dealerships, most effective use of monetary and non-monetary incentives, best practices and controlling costs for infrastructure rollout, collaboration with utilities and electric vehicle service providers (EVSP) to manage load and promote efficient charging. States in this group are also participating in a ZEV consumer survey led by UC Davis.
- The Transportation and Climate Initiative (TCI) led a multi-state PEV readiness project with U.S. DoE funding. TCI worked with the Georgetown Climate Center, NYSERDA and regional energy agencies to identify and inform governments about barriers for PEV adoption. This effort has produced a series of guidelines and best practices documents on policies and implementation.
- California’s Plug-in Electric Vehicle Collaborative released documents on Workplace Charging and Guidelines for Multi-unit Developments.
Insights from UC Davis Research
UC Davis senior researchers, Dr. Thomas Turrentine, Dr. Kenneth Kurani, Dr. Michael Nicholas offered insights from various continuing research projects, some of which are summarized next:

- There is tremendous competition for consumers’ attention. For those working so hard to raise awareness of PEVs and ensure their market success, it is easy to forget that the average person knows very little, if anything, about PEVs and the work that we all are doing.
- Beyond the owners of PEVs, people are baffled about this technology. The drivers are the best messengers. They can explain with most credibility to other consumers the characteristics of PEVs. One thing that states and local jurisdictions can do is to amplify the voice of these messengers so people can see in them something they can identify with.
- Purchase incentives and rebates matter. Incentives have brought into the market people who otherwise would not have purchased a PEV. Incentives have monetary as well as non-monetary value. For example, to the average American, the idea of getting money back from the IRS matters.
- In UC Davis consumer interviews, people used the term, etiquette, over and over, much to the surprise of researchers. They would ask, “In an open parking space with free parking, how long can I charge?” and, “Can I plug in and unplug you?” Researchers observed a desire among drivers to know the rules for social interaction around PEV charging. Researchers also identified the existence of social friction to make full use of the public charging infrastructure. This is an area where local governments may be able to help. Charging etiquette is discussed in length in a UC Davis report.\(^6\)
- In workplaces, charging rules and etiquette have developed, and there is communication among drivers.
- How people value these cars evolves and increases over time. The initial reaction is “Oh Wow!” Next is, “This is fun to drive, quiet, cool.” A few weeks or a month later, there is even more meaning.
- Researchers have observed different motivations among all PEV buyers, with variations across regions or cities, for example, between Los Angeles and San Diego.
- As a matter of good messaging and education, we should stop using the phrase, “Range Anxiety.” Using that term fosters that notion in prospective owners. It is more helpful to build a case for the value of PEVs.
- The hybrid vehicle market provides the best reference case for how the PEV market may develop. Three generations of hybrids have been introduced over the last decade. (Toyota still “owns” the market.) In the first seven years the hybrid market represented about 1%-2% of sales. The second generation of hybrids introduced in 2004 brought a completely redesigned Prius along with a few other OEM models, and made big

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difference. In California and Japan, the hybrid market moved to 3%-6%. Generation 3, starting in 2010, is when hybrids became profitable. In Japan, the hybrid market already accounts for about 18%-20% of sales (due in part to strong government support). Researchers observe similar OEM strategies for PEVs, with respect to generations of vehicles planned for introduction.

- One of the most important tools for growing the PEV market is having access to information and data that reflects early PEV market experience. This is a critical need that the group of partner jurisdictions working with Zero Emission MAP can help address.