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I Am Not an Environmental Wacko!
Getting from Early Plug-in Vehicle Owners to
Potential Later Buyers

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1 ABSTRACT

2 Several conceptual frameworks regarding the spread of new ideas and products rely on
3 movement of information from early to potential later actors. In the case of plug-in electric
4 vehicles (PEVs), achieving social benefits requires that many more households become PEV
5 owners than have so far. Poor information flow beyond existing PEV owners has previously
6 been noted in discussions with them; missing are reports from both sides of such conversations.
7 Workshops were convened with PEV owners and owners of internal combustion engine vehicles
8 (ICEVs) in three regions throughout California. Workshops allowed participants to create an
9 agenda in which ICEV owners asked questions about PEVs, PEV owners responded to those
10 questions and added more they wanted to talk about. ICEV owners were almost universally
11 surprised to hear PEVs are for sale—thus their questions are basic and they had little to
12 contribute to discussions of future developments. PEV owners construct “accounts”—both in the
13 sense of (generally informal) accounting for the costs of buying a PEV (including private
14 benefits conferred by public policy) and in the sense of giving an account, i.e., telling a story of
15 life with a PEV. Despite the universality (across the three study regions) of many incentives,
16 PEV owners’ accounts show substantial regional variation. The effect on ICEV owners of
17 hearing these accounts was routinely, if not uniformly, to promote a more positive interest in
18 PEVs.
19

1 **INFORMATION FLOWS BETWEEN EARLY AND POTENTIAL ACTORS?**

2 Achieving social benefits from plug-in electric vehicles (PEVs) requires existing PEV owners
3 continue PEV acquisitions into the future and, more importantly, the far greater number of
4 vehicle owners who have not yet acquired a PEV do so. Several approaches hypothesize
5 processes and effects of information flow from “earlier actors” to “as-yet-to-be-actors” (1, 2, 3,
6 4). Axsen and Kurani (3) demonstrate information flows about PEVs more likely entail the
7 translation and reflexive re-contextualizing of information by all parties in such conversations
8 rather than simple one-way transmission of information from one participant to another.

9 Communication between PEV owners and between PEV and ICEV owners—as told by
10 PEV owners—has been reported. (Though a higher proportion of PEVs are presently leased than
11 is typical for conventional vehicles, for simplicity terms such as “purchase,” “own,” and
12 “owners” will be used except when the distinction between buying and leasing is essential.) For
13 example, (5) describe the use of social media to form a community of early PEV owners.
14 Encounters of people who are not PEV owners with both PEVs (6, 7) and with the process of
15 considering becoming PEV owners (8) have been reported. Burgess et al (9) discuss encounters
16 between PEV drivers and ICEV owners—with the distinction that the PEV drivers were not PEV
17 owners, but drivers in a brief trial. Further, they only report from the PEV drivers. While (1, 2, 3,
18 4) also rely on households driving a PEV in a trial, they do report from both sides of
19 conversations between PEV drivers and members of their social network (outside their
20 immediate household). What remains missing is an exploration of what is said between early
21 actors (people who already own a PEV) and potential as-yet-to-be-actors (people who own only
22 ICEVs) from both sides of such conversations. Next, the general idea of 1) bringing together
23 PEV and ICEV owners, 2) in a workshop setting, 3) in three different regions is described.

24 **PEV and ICEV Owners**

25 Prior research (5) characterized social interactions of very early PEV owners—interactions both
26 prior to and after she or he moved from “becoming” to “being” a PEV owner, as well as their
27 interactions with ICEV owners. Information about interactions between PEV and ICEV owners
28 was thin; generally described by the PEV owners as unremarkable, cursory, and happenstance.
29 One PEV owner described carrying a small card she printed with answers to the few questions
30 she was most often asked; she had tired of being accosted in parking lots to answer these same
31 few questions. If people had new questions, she would stay to talk, but if her card covered it, she
32 preferred to cut-off the discussion. To be sure, other PEV owners are engaged in “dissemination”
33 (2, 3, 4) to ICEV owners. Still, the contrast between the importance of information flow from
34 early to potential later actors in many conceptual frameworks and descriptions of cursory or
35 absent interactions between PEV and ICEV owners prompted the question, “What would be said
36 in a deeper conversation between PEV and ICEV owners?”

37 **Workshops**

38 This question prompted the design of workshops in which PEV and ICEV owners would engage
39 in several activities convened among different subsets of all the participants. A workshop setting
40 takes the ICEV owners from their day-to-day world in which they may not know anyone who
41 drives a PEV to a discussion with PEV owners representing a variety of PEVs. That the ICEV
42 owners live in a thin PEV-information environment was partly constructed by the researchers—
43 in one of the three regions participating ICEV owners did not personally know a PEV owner.
44 Regardless, the ICEV owners talk was also interpreted in all three workshops as descriptive of
45 thin PEV-information environments.

1 **Three Regions**

2 The three study regions are identified by their principal cities: Fresno, Sacramento, and San Jose,
3 CA. Several variables guided their selection: differences in the uptake of PEVs and deployment
4 of PEV charging infrastructure, differences between the socio-demographic measures of early
5 PEV buyers and the populations of all vehicle buyers and new vehicle buyers, and variation in
6 the availability and likely valuation of incentives for PEV purchase and use. County-level
7 comparative data are presented in Table 1 (except where other data are the only available).

8 The sampling criterion included differing rates of participation in the early market for
9 PEVs. Santa Clara County (San Jose) has among the highest per capita registrations of PEVs in
10 California, followed by lower numbers in Sacramento, and lower still in Fresno. As a second
11 measure of participation in growing a PEV market, the regional development of “away-from-
12 home” PEV charging infrastructure matches the pattern of PEV sales. The regions differ by
13 population, and thus the number and variety of destinations that might be within range of any
14 given PEV. In particular, San Jose is part of the far larger San Francisco Bay Area conurbation.
15 The regions differ on measures of traffic congestion and extent of high-occupancy vehicle
16 lanes—and thus on the potential value of solo-occupant PEVs access to HOV lanes.

17 **BACKGROUND ON PEV INCENTIVES**

18 As they feature in the accounts of PEV owners, the variety of incentives available across the
19 study regions are reviewed first. Incentives are summarized in Table 2.

20 **PEV Purchase and Use Incentives**

21 A variety of incentives to purchase (or lease) and drive PEVs are offered by several governments
22 and businesses within the study regions. Some incentives are universally available and valuable
23 to anyone acquiring a PEV. Others are universally available but vary in potential value. Still
24 others, e.g., PEV parking and charging, are more targeted to or valued by specific people at
25 specific locations.

26 *Vehicle Purchase Incentives*

27 Starting in 2009 people who purchased a PEV were eligible for a federal income tax credit. For
28 the PEVs in this sample, the credit varied from \$2,500 for one of the plug-in hybrid electric
29 vehicles (PHEV) to \$7,500 for all the electric vehicles (EVs); the amount depends on battery
30 capacity. The tax credit goes to the buyer, so if the consumer leased the PEV, the consumer must
31 negotiate with the title-holder (typically the finance company) for the amount of the credit to be
32 taken off lease price.

33 At the same time, California established its Clean Vehicle Rebate (CVR) Project
34 providing rebates of \$1,500 to buyers of qualified PHEVs and \$2,500 to buyers of EVs. PEV
35 lessees may also apply for the rebate if their lease term is at least 36 months. Starting March 15,
36 2012, PEV buyers and lessees within the jurisdiction of the San Joaquin Valley Air Pollution
37 Control District (SJVAPCD)—which includes Fresno—were eligible for an additional rebate of
38 \$2,000 (PHEVs) or \$3,000 (EVs). The PEV must be registered within the SJVAPCD’s
39 boundaries and be retained by the owner/lessee for at least 36 months.

40 *HOV Lane Access*

41 California has allowed single occupant vehicle use of HOV lanes for selected clean vehicles—
42 presently, white stickers for EVs and green stickers for PHEVs. An unlimited number of white
43 stickers are available. Green stickers were initially limited to 40,000; these were all distributed

1 by the second quarter of 2014. As this limit approached, the state allocated another 15,000 green
 2 stickers. Both stickers provide access to HOV lanes until January 1, 2019.

3
 4
 5 **TABLE 1 Comparison of three study regions and California**

Region:	“Fresno”	“Sacramento”	“San Jose”	California
PEVs per 1,000 people ¹	0.49	0.97	5.54	1.80
Public Level 2 and Quick charge infrastructure: number of locations and total chargers ²	Fresno County Level 2: 5 locations 8 chargers Quick charge: 0 locations 0 chargers	Sacramento County Level 2: 74 locations 222 chargers Quick charge: 4 locations 8 chargers	Santa Clara County Level 2: 142 locations 370 chargers Quick charge: 18 locations 33 chargers	State Level 2: 1,703 locations 4,233 chargers Quick charge: 162 locations 280 chargers
Population, millions ³	Fresno County: 1.00	Sacramento County: 1.46	Santa Clara County: 1.86	State: 38.33
Median household income, 2008-2012 ³	\$45,741	\$55,846	\$90,747	State: \$61,400 PEV owners: \$100k to \$199k
Homeownership rate, 2008-2012, % ³	54.2 PEV owners: 92	57.6 PEV owners: 93	58.1 PEV owners: 89	State: 56.0 PEV owners: 87
Bachelor's degree or higher, % of persons age 25+, 2008-2012 ³	19.4 PEV owners: 71	27.9 PEV owners: 81	46.0 PEV owners: 90	State: 30.5 PEV owners: 83
Female, % ³	50.0 PEV owners: 23	51.1 PEV owners: 24	49.7 PEV owners: 24	State: 50.3 PEV owners: 24
HOV lane miles ⁴	0	69.8	174.9	1,552.7
Congested lane miles, percent ⁵	Fresno (city): 38	Sacramento (city): 60	San Jose (city): 77	na
Congested Time (number of rush hours per day) ⁵	Fresno (city): 2.5	Sacramento (city): 4.0	San Jose (city): 6.0	na

6 1. <http://energycenter.org/clean-vehicle-rebate-project/cvrp-project-statistics>. Retrieved on 15 July 2014.

7 2. US Department of Energy, Energy Efficiency and Renewable Energy
 8 Office, http://www.afdc.energy.gov/data_download/ Accessed 14 July 2014. Counts include only public
 9 stations and exclude Level 1 charging and “legacy” chargers that cannot service presently marketed PEVs.

10 3. County and State data: US Census 2013 estimates: <http://quickfacts.census.gov/qfd/states/06000.html>. Last
 11 accessed on 14 July 2014. For PEV owners, see note 1. The PEV owner data are for multi-county regions
 12 that contain the county of interest.

13 4. California Department of Transportation HOV Inventory List, March 2013. Available
 14 at: http://www.dot.ca.gov/hq/traffops/systemops/hov/files/HOVInv_2013_Mar.xls Accessed 23 July 2014.
 15 Mileage shown includes both existing lane miles and lane miles under construction as of the inventory date.

16 5. Schrank, D. B. Eisele, and T. Lomax (2012) TTI’s 2012 Urban Mobility Report. Texas A&M Transportation
 17 Institute. Available at <http://mobility.tamu.edu> Accessed on 14 July 2014.

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Table 2 PEV purchase and use incentives in California plus additional incentives observed in each region

California	“Fresno”	“Sacramento”	“San Jose”
Federal income tax credit: \$2,500 to \$7,500	California, plus: San Joaquin Valley Air Pollution Control District PEV purchase rebate: \$2,000 (PHEV) or \$3,000 (EV)	California, plus: City of Sacramento: free parking and charging in a city-operated parking garage downtown. Parking: \$200 per month Charging: variable	California, plus: Employer-provided charging (free): variable value Home EVSE purchase and installation rebate: up to \$1,500. (Available during the period these PEV owners acquired their PEVs. This program is now over.)
California Clean Vehicle rebate: \$1,500 (PHEV) or \$2,500 (EV)	Employer-provided charging (free): limited amount, variable value	Employer-provided charging (free): variable value	
California HOV lane access to single occupant vehicles: Individual valuation of time savings		HOV = 2 or more people	HOV = 3 or more people
Away-from-home charging (free or paid), but varying regionally			

Free Charging and Parking

While there is no federal, state or local policy to provide free away-from-home charging to PEV owners in California, most away-from-home charging was free during most of the period up to and including the workshops. The deployment of public and workplace PEV charging is an important inducement to buy and drive a PEV, even if not aimed at a specific PEV owner. An important example for sampling PEV owners was in Sacramento: a city garage in downtown provided free charging and parking for PEVs. This was a large additional incentive for specific PEV owners, amounting to approximately \$200 per month for parking, plus whatever savings they realized on the cost of charging.

METHODS

Data: Workshop Design

Drawing on both focus group design and methods for collecting qualitative data, the workshops capture data in a constructed social setting. Experimental design has been developed for the study of small group interaction (10). Focus groups help understand how individuals contextualize and categorize phenomena as part of a collective (11). The focus group method guides interaction around a researcher-supplied topic and elicits the effort by participants to explain or defend their views to other participants (12). Compared to focus groups, workshops are often described as involving more participants, engaging in a sequence of events over longer periods of time, allowing for and focusing more on the interaction between participants, and involving creative activities. “Workshop” describes the gatherings convened for this research because they had more than twice as many participants as is typical for focus groups (~20 vs. ten or fewer), moved through a sequence of activities intended to produce creative outputs, and lasted twice as long focus group typically do (four hours vs. two).

All three workshops were guided by a six-step protocol. Given the exploratory approach, interaction was moderated in a semi-structured manner permitting unstructured dialogue among

1 participants. First, the PEV owners and ICEV owners were kept separate and given a 10-minute
2 introduction to the workshop. Second, the two groups were brought together to generate an
3 agenda for their discussion. Because of the high level of complexity of information about PEVs,
4 the widely differing levels of expertise, and the potential for conflict, for example, through the
5 possible politicization of PEVs, the agenda creation exercise from Open Space meeting process
6 (13) was used. Third, participants were divided into two mixed groups of PEV and ICEV owners
7 to discuss the agenda topics. Fourth, the two groups recombined to share what each had talked
8 about, allowing for questions and answers. Fifth, the participants were divided into three mixed
9 groups each led by a different researcher in a conceptual game to elicit thoughts and opinions
10 about the benefits and drawbacks of driving and owning a PEV or an ICEV. Sixth, the PEV and
11 ICEV groups separated for a closing discussion.

12 Workshops were conducted in January (Sacramento), March (San Jose), and June
13 (Fresno), 2014.

14 **Sample**

15 Purposive sampling was used: “Purposive sampling increases the range of data exposed and
16 maximizes the researcher’s ability to identify emerging themes that take adequate account of
17 contextual conditions and cultural norms” (14). Sampling was done in three-stages: criterion
18 sampling, maximum variation sampling, and convenience sampling. The first stage criterion
19 sampling selects cases that meet particular criteria. For the PEV owners this meant owning or
20 leasing a PEV. In Sacramento the ICEV owners were selected based, in part, on their not
21 personally knowing a PEV owner. In San Jose and Fresno, the ICEV owners could know
22 someone who drove a PEV.

23 Maximum variation sampling represents the diversity of households from the first stage.
24 PEV owners were sampled for maximum variety based on the type of vehicle they drove, their
25 income level, age, gender, if they had children, and whether they were employed or retired. In
26 Sacramento the PEV owners were also sampled based on whether they commuted in their PEV
27 to downtown Sacramento and whether they had a home charger. The goal of this stage of
28 sampling was to be sure ICEV owners would be introduced to as many different types of PEVs
29 and PEV owners as possible. ICEV owners were sampled to be similar, as a group, to samples of
30 PEV owners. In the case of gender, the target population was buyers of all vehicles, thus the
31 samples are balanced on gender rather than being predominately men.

32 Convenience sampling is based on access to a sample. In Sacramento and Fresno,
33 snowball sampling (10) was used to bolster PEV owner recruiting. This was not necessary in San
34 Jose. Further, to hear PEV owners’ accounts of access to free charging and parking at the work
35 end of their commute trips, sampling for PEV owners in Sacramento started with an e-mail
36 distribution list for information regarding the city-operated downtown parking garage offering
37 those services.

38 The Sacramento workshop consisted of nine PEV and nine ICEV owners. 12 were male
39 and 9 female, ranging in age from 23-73. Ten did not have children in the home; 11 did. The San
40 Jose workshop group consisted of 11 each of PEV and ICEV owners. 12 were male and 10
41 female, ranging in age from 29-67. 14 did not have children in the home; eight did. In Fresno
42 there were eight PEV owners and nine ICEV owners. Nine were male and eight female, ranging
43 in age from 27-66. Eight did not have children in the home; 10 did.

44 The PEVs illustrated by the sample included 20 EVs and 10 PHEVs. The EVs included
45 the Mitsubishi i-MiEV, Fiat 500E, Ford Focus EV, Nissan Leaf, Toyota RAV4EV, and Tesla S.
46 These vehicles span the presently available spectrum of price, performance, luxury, driving

1 range, and charging power. The PHEVs included the Honda Accord Plug-In, Toyota Prius Plug-
2 In, and Chevrolet Volt. These vehicles are more nearly similar than the EVs; pertinent
3 differences include their electric driving range.

4 **RESULTS**

5 As participants were not selected to represent a population, these results reflect the experiences
6 of specific samples of PEV and ICEV drivers within three different regions. Throughout,
7 personal names are pseudonyms, often appended with (ICEV) or (PEV) to insure the reader
8 knows whether the speaker is one or the other. While effort has been made to limit commercial
9 names, in a few instances the specific vehicle is added to the speaker's identifier because it is
10 essential to interpret or understand a statement.

11 The agenda creation exercise in all three workshops resulted in the selection of two
12 primary topics for the subsequent discussion groups: PEV costs and charging infrastructure. The
13 first was by overwhelming acclaim of the participants. While the second always appeared during
14 topic generation, it did not generate the same interest; researchers selected it based on their prior
15 interest. Other ideas from the agenda creation exercise tended to enter the discussion as framing
16 of PEV owners' accounts, e.g., why buy a PEV, life with a PEV, and the future of PEVs. Other
17 ideas were also re-introduced during the concept game, e.g., PEV safety and the effect of
18 batteries on the environment. These results will focus on PEV costs and charging infrastructure.

19 **You can buy what now?**

20 Overarching all these results, ICEV drivers described themselves as being generally unaware of
21 PEVs prior to the workshop. In Sacramento and Fresno, most were unaware that PEVs were for
22 sale. By the end of each workshop, many ICEV drivers discussed lack of awareness as a main
23 hurdle to PEV sales. Given what they learned at the workshop, other ICEV owners believed the
24 lack of larger body styles was an important barrier. Brenda (ICEV) put these together: "Maybe if
25 there was more awareness, then more people would be buying. Then the demand will be greater,
26 and there will be more variety...because if there was enough awareness there would be his
27 [refers to another ICEV driver in the group] truck and a minivan for me that I could drive and I'd
28 be saving a lot of money."

29 ICEV drivers were concerned foremost about the costs of buying and driving a PEV; they
30 had not thought about day-to-day activities such as using public charging. When conversations
31 with the PEV drives briefly touched on infrastructure, they had questions about how PEV drivers
32 find chargers and where they are located, how much it costs to charge at home and away from
33 home, the price to install a home charger, and what happens if the PEV driver forgot to charge.

34 **PEV Costs**

35 Given some basic awareness of the availability of PEVs, ICEV owners' most frequently
36 suggested discussion topics were PEV purchase costs; they had no initial questions about
37 purchase incentives—because they did not know incentives existed. PEV owners responded with
38 accounts of costs, incentives, and benefits both private and public of owning and driving a PEV.

39 *PEVs owners' accounts of PEV costs.*

40 The PEV owners in the San Jose group collectively told an account of how buying a PEV saved
41 them money. While other accounts incorporate specific numerical values, this account is a good
42 representation of how PEV drivers in all workshops incorporated incentives into their accounts
43 of what it costs to own a PEV. Landen (PEV) starts: "The incentives [are] another big one

1 because there are both state and federal rebates for EVs which will also offset the difference in
 2 price.” He includes free PEV charging at his work place: “They have on-site chargers which are
 3 free so I can actually charge my car at work. It doesn’t cost me a penny.” Though Landen
 4 occasionally charges his PEV at home, he describes cost savings there as well: “The cost to fill
 5 up an electric car is much less than the cost to fill up a gas car so the costs of running the car are
 6 much lower [than a gas car].” Other PEV owners told of rarely or never paying to charge their
 7 PEV because (free) workplace charging was all they needed. A few employers went even further
 8 than providing free charging. Mark’s employer pays a monetary bonus to employees who buy
 9 one: “[My employer] put in a policy, and it’s the reason I bought my car. If you buy an electric
 10 vehicle they’ll give you \$250 a month. Also, they put in 12 chargers.” PEV owners also argued
 11 for cost savings from lower maintenance. Calvin said, “My maintenance for [the three years of
 12 his lease] is zero. There’s no oil changes. You have to keep the fluids topped off and that’s it.”
 13

14 **Fresno: San Joaquin Valley Air Pollution Control District Clean Vehicle Purchase Rebate**
 15 Fresno PEV owners were clear that most bought their PEV because it saves money. Their
 16 accounting included purchase rebates, tax credits, lower home electricity prices, savings from
 17 forgone spending on gasoline, and [expectations of] reduced maintenance costs. After recounting
 18 the California state rebate, the federal income tax credit, and the additional San Joaquin Valley
 19 Air Pollution Control District rebate, Zoe (PEV) said, “The math is cuckoo crazy.” Trent (PEV)
 20 explained, “It was solely a financial decision...we did the math and I can own and operate that
 21 [PEV] for about 90 bucks a month...we’re saving hundreds of dollars a month.” Elizabeth [PEV]
 22 corroborated his account, “My car payment is less than the gas was for my [prior ICEV
 23 minivan]...and [the electric utility] gives you a cheaper rate for my whole house not just the
 24 charging station: four cents a kilowatt off peak, ten cents partial peak. So to go my 60 miles is
 25 about 40 cents.” By her account, she saves \$500 a month driving a PEV instead of her prior
 26 ICEV minivan.
 27

28 **Sacramento: local free parking and charging.** Those PEV owners in the Sacramento
 29 workshop who parked in the Sacramento city garage offering free PEV parking and charging
 30 added those savings to their account. Brittany said, “\$180 that I’m saving in parking, \$150 in
 31 gas...it all adds up.”

32 *ICEV owners respond to PEV cost*

33 The ICEV owners were amazed by these accounts. This exchange from Fresno was typical:

34 Zoe (PEV): Through the California Air Resources Board I got \$2,500 and
 35 through the local valley air district I got \$3,000 so that’s \$5,500.
 36 Shirley (ICEV): Wait a minute. You got checks back?
 37 Trent (PEV): It’s cash. 5,500 bucks.
 38 Elizabeth (PEV): And that doesn’t include the \$7,500 from the federal
 39 government.

40 The amount of available incentives was surprising to ICEV drivers in all three
 41 workshops, but the additional amount available in Fresno created a total incentive that shocked
 42 the ICEV owners there. Part of this was because they had no idea such incentives existed. Ericka
 43 (ICEV) explained, “When you look at [commercial advertising of PEVs], I didn’t know anything
 44 about the rebates.” Sam (ICEV) was floored when Elizabeth (PEV, Mitsubishi i-MiEV)
 45 explained that she paid a total of \$6,100 after incentives. Sam responded, “That’s a hell of a
 46 starting place. What you guys are talking about as far as cost goes, because...[\$6,000], you can

1 spend that on a week vacation.” Ultimately, though the ICEV owners were impressed with the
2 cost savings afforded by incentives, they were also wary the incentives would not last.

3 **Single Occupant HOV Access**

4 *PEVs owners’ accounts of single-occupant vehicle access to HOV lanes.*

5 HOV lane access is offered to PEV owners throughout the state (subject to the differences and
6 restrictions noted at Table 2). The accounts of PEV owners in Sacramento and Fresno strongly
7 differed from those in San Jose. None of the Sacramento PEV drivers focused on the benefits of
8 HOV lane access; the few who used HOV lanes already had access because they already
9 carpooled (typically with a spouse). As expected, PEV participants in Fresno did not focus on
10 HOV lane access, as there are no HOV lanes in Fresno.

11 Though the value of single-occupant access to HOV lanes didn’t enter the financial part
12 of the accounts of why buying a PEV makes sense, that access was highly valued by many of the
13 San Jose PEV owners. As Paul put it, “So, I really bought [the PEV] for the carpool lane.” The
14 appeal of the HOV lane access was time savings. Landen said, “The fact that you get to drive in
15 the HOV lane during peak hours, that quite literally cuts my commute time nearly in half. So I’m
16 saving a good hour a day.” There were a few who viewed the HOV sticker as a benefit but it was
17 not their primary motivator. According to Calvin (PEV), “[HOV lane access] was a minor
18 convenience. I drive early enough that [I rarely benefit]. It’s nice. I didn’t turn it down. If I didn’t
19 get it, that would not have changed my mind about the car.”

20 *ICEV owners respond to HOV lane access*

21 The difference in accounts of PEV owners of HOV access across workshop locations affected
22 the corresponding discussion with ICEV drivers. In San Jose, where PEV owners extolled the
23 virtues of HOV lane access, ICEV owners responded. Olivia (ICEV) said, “I think there’s a huge
24 amount of value to those stickers. I don’t personally commute right now but had I been still
25 doing that horrid commute...I would have bought a car that guaranteed me a sticker.” In
26 contrast, the topic did not feature much in the Sacramento or Fresno workshops.

27 **Social benefits**

28 *PEV owners account for social benefits*

29 More so than the Sacramento or Fresno PEV owners, the San Jose PEV owners also accounted
30 for social benefits. Environmental benefits such lowering their “carbon footprint” or reducing
31 noise and air pollution were recounted. Landen (PEV) said, “It seems better not to be spewing
32 fumes into the air.” They also spoke of geo-political benefits, specifically making the US less
33 dependent on foreign oil. Miles explained, “[Driving PEVs] puts us in a stronger Middle East
34 foreign policy position...in the global picture, the people that we buy oil from are not our
35 friends. Why are we helping them and enriching them?”

36 A minority of the PEV owners in Fresno spoke about local environmental benefits, and
37 even for them, environmental benefits were not the primary reason they bought the car. This
38 exchange between PEV drivers reveals that reduced emissions of local pollutants become
39 important after they became PEV owners. Still, both place much greater weight on the financial
40 aspects of their account.

1 Elizabeth (PEV): After I got it...one of my kids has mild asthma...so I was like,
2 “Oh, I’m not contributing to his asthma, one less car on the
3 road.”

4 Trent (PEV): My daughters were born premature...They were in the
5 incubator for 3 weeks with lungs trying to develop...This is
6 better for them—and I didn’t care about that stuff before.

7 Elizabeth (PEV): But it’s still the cost.

8 Other Fresno PEV participants were quick to separate themselves from any
9 environmental statement. Jessica (PEV) said, “My impression was it’s more the ‘go green’
10 people that drive these cars, but I’m not one of them...I’m not this huge tree hugger either. I’m
11 very far from being liberal.”

12 Without expressing either pro- or anti-environmentalist identity, other PEV owners
13 simply didn’t account for the environment, as Hung (PEV) said, “I never really thought about
14 [the environment].”

15 *ICEV owners respond to social benefits*

16 Because PEV owners did not stress social benefits in their accounts, ICEV owners tended to
17 question whether PEVs provide such benefits—often in the form a question about whether PEVs
18 are really “cleaner.” These questions concerned both air pollution and battery disposal. Still, at
19 the end of the workshops when the ICEV drivers were asked to assess what they had heard and
20 discussed, some reflected on the desirability of achieving some social benefits or political
21 goals—even if they remained unsure about PEVs. This discussion from the end-of-workshop
22 discussion by the ICEV owners in Fresno is illustrative:

23 Alfred: Not being captive to the oil companies I think is a real benefit.
24 Absolutely.

25 David: And I’m not an environmentalist wacko, again to use that term, but I
26 like clean air. You know I like things being clean.

27 Scott: You said that too. I’m not crazy but I do like to be conscious.

28 Mike: Keep a low carbon footprint, like, why not?

29 **PEV Charging Infrastructure**

30 Charging PEVs is a complex topic involving not only where to charge, but at what power to
31 charge and who is able—by virtue of technical connection (literally, can a physical connection
32 be made, and if so, at what power)—or allowed by conventions and sanctions (15). Though not
33 aimed at an individual consumer, a developing charging infrastructure provides three possible
34 signs of a developing PEV market; 1) a single charging location may be part of 2) a perceptibly
35 increasing number of chargers, that 3) signifies commitment by other actors to continued
36 progress toward making life with at PEV convenient and affordable.

37 *PEVs owners accounts*

38 The PEV drivers were prompted to explain how they charge their vehicles, whether at home or
39 away. The topic of the downtown Sacramento parking garages that offered free parking and
40 charging was revisited (after first being included in the cost accounts of some Sacramento PEV
41 owners). Charging at locations other than these garages was mentioned—typically at stores,
42 malls, and some other public buildings such as libraries. Kevin and Carmen had each found a
43 free, publicly available charger near their workplaces; each was happy to walk the short distance
44 to work. Reggie (PEV) described to the Sacramento ICEV owners, “There’s over 250 charging

1 stations in Sacramento. Most people don't realize it. They put them in at restaurants, shopping
2 centers, grocery stores, movie theatres, so you can utilize it.”

3 The PEV participants in San Jose noted a shift toward billing for public charging. Derek
4 noted, “The parking garages in downtown San Jose...They have charging stations in there,
5 which used to allow you to charge for free...now you pay for them.” Still there were
6 convenience benefits. Mark (PEV) described, “Watching everybody else circling around and
7 cursing...looking for a parking spot and...I'm going to pull in right by the front door.”

8 In Fresno, the PEV owners lamented the lack of public charging, told of frustrating
9 encounters with local businesses about installing PEV charging, and dreamed of San Jose and the
10 San Francisco Bay Area as examples of infrastructure development.

11 *ICEV owners respond to infrastructure*

12 Despite the visibility of PEV charging infrastructure to PEV owners throughout the regions they
13 shared with the ICEV owners, the ICEV owners appear simply to not have noticed. ICEV
14 owners had questions about what kind of home charger is required, what happens if the battery is
15 depleted away from home, the benefits of using solar to charge the PEV, and locations of
16 chargers outside of their respective regions.

17 By the end of the evening the concept of a public charging station had been demystified.
18 As Shirley (ICEV) explained at the Fresno workshop, “To me charging stations were out there—
19 like the Jetson's whipping around with their cars in the air. But it makes sense. It's just a
20 refueling station for your car. So I can think about it in that way and that makes more sense.”

21 **Overall Responses of ICEV Drivers**

22 Their own lack of basic awareness of PEVs surprised the ICEV owners and frustrated many of
23 them. In Sacramento, three ICEV owners had recently purchased a car prior to their workshop.
24 They all stated they would have liked to have known PEVs were available. Elijah (ICEV) said,
25 “We bought a four cylinder Camry and we get great gas mileage. But if I would have realized all
26 of the incentives, I may have thought more of going to the electric.” Olivia (ICEV) in San Jose
27 echoed Elijah, “Well I seriously asked two dealers about [PEVs] and nobody told me
28 anything...if I got the incentives and it was the same price as my car and I had researched EV
29 more...I would have considered it.” One outcome of the workshops was the ability of ICEV
30 owners to see that they had not seen the signs of PEVs around them. Sam, commenting on public
31 PEV charging in Fresno (a region almost devoid of public charging at the time of the workshop),
32 “I haven't seen one [PEV charger]. And believe me I drive around. Believe me, about 200 miles
33 a day in this town. I haven't seen one station. Yet, I haven't been looking. But I haven't seen one
34 sign that says 'EV station here.' Or anything like this. Where are they?” The point is, he now
35 sees there is no PEV charging, that there aren't signs of PEVs where there could be.

36 The PEV owners' accounts of cost savings made PEVs appealing to ICEV owners
37 because the accounts made PEVs represent an idea ICEV owners valued: saving money. Further,
38 for many of the ICEV drivers this positioned PEVs in contradistinction to an identity they did not
39 want: environmentalist. Shirley (ICEV) explained, “What this has shown me tonight is that these
40 cars are not just for people who want to save the planet, lessen their carbon footprint. Like you
41 said, there's math behind it. There's genuine savings. There's a reason that I can relate to.” Some
42 ICEV owners ended the night more willing to consider a PHEV than an EV. Ericka (ICEV) said,
43 “I think I could lean towards an electric if it was a [PHEV] so I could have that security of being
44 plug-in and gas, in case I went out of range and I wouldn't have to be scared that I was going to

1 get stranded.” Still, a few were not willing to consider a PEV in their near future either because
2 of the lack of a desired large body style or because of a lack of desired range.

3 There is some concern that the incentives that were essential to the accounts of cost
4 savings might not last. Darrel (ICEV) said, “They want the early adopters to do these things so
5 they’re offering incentives but when do they say, in a year or two years, ‘No more free parking;
6 no more HOV’...because eventually [PEV owners are] going to be the majority and then there’s
7 no point to the HOV [access].” In a way, the PEV owners’ accounts of cost savings were so
8 convincing that some ICEV owners questioned whether the PEV owners would have bought
9 their PEV without the incentives.

10 **CONCLUSION**

11 One conclusion from convening these workshops with PEV owners (early actors) and ICEV
12 owners (potential later actors) is that processes such as diffusing, disseminating, or translating
13 information from early actors to potential later actors are not yet pervasive—even in places
14 where the vehicles have been marketed for more than three years now. Despite a small, non-
15 random sample, at a minimum this research establishes that—regardless of government spending
16 and other incentives to promote PEVs, of manufacturer investments in developing and deploying
17 PEVs, and of public and private investment in PEV charging infrastructure—whether
18 information is flowing to any substantively important degree from early actors to the necessary
19 potential later ones remains a valid question.

20 The stark conclusion of ICEV owners’ across a variety of PEV market development
21 contexts is that they were unaware, and thus not engaged in, processes of PEV market growth. In
22 two regions with comparatively lower PEV sales (but PEV sales, nonetheless), ICEV owners
23 were surprised to hear that PEVs are for sale. In a third region, which has among the highest per
24 capita PEV sales in California, the ICEV owners were more likely to know PEVs exist, but this
25 simple awareness had not prompted purchase consideration.

26 If prior to arriving for their workshop, these samples of ICEV owners were not
27 participating in information flows from early to potential later actors, neither were they engaged
28 in perception of information from any other source—including the PEV-information
29 environment in their region. PEV owners see their region as richly populated with signs of
30 existence and even importance of PEVs. They see other PEVs and PEV owner/drivers, PEV
31 charging and parking (or keenly perceive its absence), HOV lane access, purchase incentives and
32 the agencies and employers offering them, and more.

33 The ICEV drivers move through the same region, but not the same—to them it is devoid
34 of PEVs and signs (or more broadly, signifiers) of them. Staging conversations between PEV and
35 ICEV owners placed ICEV owners in a simulacrum in which these signs are pointed out to them
36 and interpreted for them. Placed into this context, the ICEV owners had an overwhelming
37 interest in PEV costs—revealing a prior assumption that PEVs are expensive. These ICEV
38 owners are skeptical or fearful of their ability to accomplish their desired travel in a PEV. PEV
39 owners respond with their accounts—partial and informal balances of costs and benefits
40 conveyed in stories about how they came to be a PEV owner and about life with a PEV. The
41 basic signs of the existence of PEVs and incentives are quickly conveyed. The accounting of
42 purchase prices and incentives in an effort by PEV drivers to portray themselves as having made
43 a financially sensible purchase re-positions what PEVs mean to the ICEV owners: PEVs are not
44 (only) for “environmental wackos” but for people who want to save money. The sustainability of
45 public spending on PEV purchase incentives to afford this meaning is another question raised by
46 ICEV drivers; will those incentives still be there if and when they consider a PEV?

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