**DRAFT PROPOSAL**

**An Assessment of Plug-in Electric Vehicle Demand Beyond Early Adopters: What Role Can the Workplace Play in Transforming the Market and Maximizing Zero-Emission Mileage?**

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Check if applicable:

Animal subjects \_\_\_\_\_\_\_

Human subjects \_\_\_\_\_\_\_

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Abstract

This research explores ways in which workplaces can facilitate household PEV sales. Its purpose is to develop workplace-centered innovative approaches for transforming the PEV market that can be applied across the broad typology of organizations. Our research team will conduct focus groups, interviews and surveys with employers and employees from organizations and businesses throughout California. Using quantitative and qualitative research methods, we will measure the extent to which organizations are capable and willing to support the PEV market, as well as maximize their own “zero-emission miles”. We will evaluate the best means for motivating businesses in this regard and categorize the most effective measures that can be taken to help employees move into the PEV market. Our results will be operationalized through a guidebook of “best practices” that can be applied across all California businesses.

In order for plug-in electric vehicles (PEVs) to move beyond niche markets and become a real choice for the majority of American car buyers, innovative marketing strategies must be pursued. Key to reaching prospective PEV buyers is getting the message to them in an environment in which they are comfortable and confident. To this end, the workplace offers a practical and vast market opportunity for PEVs. The workplace is a central social institution where individuals forge trusting relationships and seek knowledge regarding issues that directly affect them. It is in this environment where car buyers can really begin to understand how a PEV might fit into their life.

The workplace offers many opportunities to experience and learn about PEVs. It is a primary source of information for major purchase decisions and where fellow employees provide critical reference points for validating perceptions. Employees connect with and learn firsthand from co-workers who already own PEVs. Recent research conducted at UC Davis shows these interactions, connections and experiences can help move prospective buyers closer to a PEV purchase. In addition, many organizations have installed workplace chargers and purchased PEVs for their own fleets. However, only a few, mostly in the computer technology industry, have taken additional actions to help employees experience PEVs in a way that enables them to better understand how such a vehicle could fit into their own life. Companies that have implemented innovative programs and policies are proud to share with us stories of how their efforts resulted in employee PEV purchases. More importantly, they also conveyed the business case for their actions including public image enhancement, reduced operating costs, and a strategic advantage in recruiting and retaining top talent.

We will assess the best practices implemented to date by the leading organizations and evaluate the effectiveness of various strategies. We believe these same innovative programs, if properly tailored and applied, could be successfully implemented across the broad array of businesses and public agencies operating in California. The need for this research was underscored by U.S. Energy Secretary Steven Chu on January 31, 2013 with the announcement of the *Workplace Charging Challenge*. Casey Jones from the International Parking Institute, one of the thirteen initial corporate members of the *Workplace Charging Challenge*, provided this business perspective: “We can transform the way employers view their role in supporting PEV use and take a huge leap forward in protecting our environment.” This proposed research will help companies who share that view to work together towards a common goal.

One product of this research will be a best practices guideline that will include a ranking of measures and policies with regard to their overall effectiveness. Special attention will be given to measures that mutually benefit both the organization and employee while maximizing “electric mileage”. Our findings will be compiled as a guide that can be disseminated to businesses and agencies across California. With proper guidance and employee engagement, the workplace can be a conduit through which the private PEV market is transformed.

Introduction

Challenges to plug-in electric vehicle (PEV) market development are well known and significant. The auto industry is slow to change and the consumer vehicle market is slow to turn over. Furthermore, the PEV market faces challenges because of limited infrastructure, higher vehicle purchase prices, a general lack of consumer familiarity, range concerns, limited vehicle body style and brand availability, and the perceived risks and uncertainties associated with adopting a new technology. Conventional alternative fuel vehicle (AFV) marketing strategies are losing effectiveness as the early-adopter market becomes saturated. In order for PEVs to move beyond niche markets and become a real choice for the majority of American car buyers, innovative marketing strategies must be pursued. As President Obama stated in his first *EVs Everywhere* speech (March 7, 2012), stakeholders must approach the problem from every angle.

Even in California, where the PEV market has been stimulated by regulatory strategies as much as venture investments, most car buyers have little access to direct experiences or even “kick the tire” opportunities. Car dealerships remain the primary places where prospective buyers go to learn about and test drive AFVs. Beyond the dealership, opinions are too often shaped by conflicting, misinformed, out-of-date, or sensationalized sources.

Key to reaching prospective PEV buyers is getting the message to them in an environment in which they are comfortable and confident. They must have confidence in their sources. Research at UC Davis shows consumers rely heavily on the experiences, stories and opinions of those they trust most when evaluating the meaning and reality of PEVs (Axen and Kurani, 2011). They turn to individuals in their social network -- including neighbors, friends and co-workers -- to better understand the economics, practical considerations, drawbacks and value of such vehicles. To this end, the workplace offers a practical and vast market **o**pportunity for PEVs.

The Workplace Can Transform the Household PEV Market

The workplace is a central social institution where individuals forge trusting relationships and seek knowledge regarding issues that directly affect them. It is a primary source of information for major purchase decisions where fellow employees and friends validate perceptions (Kasperson et. al. 1988). It is in this environment where prospect car buyers can really begin to understand how a PEV may fit into their life. Employees connect with co-workers who own PEVs, ask questions, go for rides, obtain sources for information, learn about new and forthcoming PEV offerings, or just become more cognizant of the technology. They see their co-workers’ PEVs charging every day, join internal PEV list-serves and e-mail groups, or simply engage co-workers to hear about firsthand experiences in order to better understand the implications of owning a PEV. Face-to-face communication between individuals that frequently interact can alter behavior (Hvide and Per Östberg, 2012) and the workplace offers plenty of opportunities for face-to-face interactions. Recent research conducted at UC Davis shows these interactions, connections and experiences can help move prospective buyers closer to a PEV purchase (Axsen and Kurani 2012; Nesbitt and Davies, forthcoming).

In effect, the workplace is an informational resource and showcase for PEVs. This is ideal for busy individuals with little time to research the technology and functionality of such vehicles. In addition, the workplace can dispel misconceptions about PEVs and mitigate the perceived risk associated with investing in a new technology. Our preliminary research shows that positive experience with advanced technologies at work provides a critical path to moving those technologies into households (Nesbitt and Davies, forthcoming, Nesbitt et. al., 2012). Positive workplace experiences along with onsite charging opportunities, provides assurances which allows employees to feel more confident and comfortable with a PEV purchase.

In a recent study at UC Davis, organizations were given a state-of-the-art demonstration PEV pickup truck for long term use. When asked how the PEV compared to other vehicles they drove, most made an immediate comparison to their private vehicle(s) (Nesbitt and Davies, forthcoming). In fact, many conveyed to us that they had already given considerable thought to how they could use the demonstration PEV in their personal lives and how they would justify the higher purchase price (e.g., the fuel cost savings would allow them to buy a bigger truck). All were disappointed to find out that the manufacturer had no intentions to market the demonstration vehicle.

In the same study, we found that employees were more comfortable purchasing items they used at work and were even willing to pay more for those products when purchased for personal use, compared to similar brands and models. In fact, real world first-hand experience from using products at work proved decisively persuasive when purchasing similar products for their household. This was true for computers, cell phones, and in one case, even a pickup truck. One research subject conveyed to us how he was so impressed with particular pickup truck he drove regularly for work that he personally purchased the exact same make and model. In another example, an employee specifically purchased the exact tool which he had experienced at the workplace, despite the $1000 price tag which was far more than he had ever spent on a tool and far more than he was planning to pay.

Of course, interpersonal influences at work can also have a negative effect and can even knock a potential PEV buyer off their purchase trajectory. Therefore, it is every bit as important to develop a means of providing current and accurate information at work and to make available resources where employees can get multiple perspectives and true accounts of issues that could impact their decision. It also highlights the need to make sure that employees have a positive PEV experience and for the company to be receptive to their suggestions.

To date, this task seems to be left up to ad hoc groups of employees who own PEVs. These owners are typically strong advocates who are very active in organizing and promoting the use of PEVs. They have proven to be critical coordinators (e.g., implementing informal onsite charging policies and etiquette), effective promoters (e.g., bringing PEV manufacturers to the workplace to demonstrate their products), and all-round PEV champions. One proud, motivated group raised the profile of PEVs at their company by getting management to move the chargers right up to the front door so visitors can see their PEVs charging. We will contextualize the value of such efforts with regard to PEV market expansion. PEV owners are excellent ambassadors and an important resource available to the workplace. However, it is difficult for them to contribute effectively in an environment without top-down support or a favorable corporate culture.

Organizations Can Provide More Than PEV Fleet Vehicles and Chargers

Many organizations and businesses have their own PEVs. In addition to being rolling showrooms and on-road advertisement for PEVs, these vehicles can provide employees with first-hand experiences. Driving a PEV on a regular basis is the most effective way for employees to learn and understand the technology. It is also the most effective means of influencing prospective buyers.

The best place to learn about PEVs is “behind the wheel”. Driving a company PEV can help the employee visualize how they might incorporate such a vehicle into their life. Test drives, ride-and-drives, and vehicle demonstrations are all valuable but provide limited exposure. The workplace can provide individuals with real-world driving experience and, in some cases, even let the employee take the PEV home. Simply driving the vehicle home and plugging it in is valuable when assessing whether the technology is a viable household option. Moreover, research at UC Davis reveals that user experience with PEVs changes over time, generally improving as consumers become more familiar with the attributes and limitations of the vehicle (Kurani et. al., 2009; Woodjack et. al., 2012; Turrentine et. al., 2011). After several weeks, users become comfortable with range limitations, charging routines, and household vehicle re-assignments. They start to notice the cost savings, vehicle comforts and attributes, and subtle signs of approval from others. After incorporating a PEV into their day-to-day activities, individuals better understand how such a vehicle could fulfill their travel needs and, hence, start to visualize the vehicle in their household or fleet.

However, even when the experience does not result in a PEV purchase, driving a PEV can still beget significant benefits. Repeatedly, research subjects explain to us that driving a PEV made them more acutely aware of the impact their driving behavior can have on fuel economy and emissions **(**Kurani et. al., 2009; Nesbitt and Davies, forthcoming**)**. This is because of the sophisticated interface on most PEVs that provide a high level of feedback. In addition, driving behavior impacts, good and bad, are magnified in PEVs because of technology fundamentals. Many of our research subjects felt they significantly improved their driving behavior during the 4-6 week trial period during which they drove a PEV (Kurani et. al., 2009). Some reported that this improved driving behavior continued when they returned to their conventional gasoline vehicles. If this behavior is sustained, real, calculable fuel and emission reductions can be realized through exposure to PEVs, even when it does not result in a PEV purchase. Our proposed research will measure the extent and potential benefit of this phenomenon.

Work-related events can also set off a sequence of positive encounters through casual linkages. For example, if an employee is allowed to drive a company PEV home, it could pique their neighbor’s curiosity. Likewise, employees may share PEV stories with fellow workers or people they encounter while on the job. In our research at UC Davis, we found that people who drive PEVs often serve as ambassadors for the technology and enjoy responding to questions from others, strangers included (Kurani et. al., 2009; Nesbitt and Davies forthcoming). However, this also highlights the importance of keeping PEV drivers happy and informed so they are willing to share information and positive experiences.

In addition to fleet PEV acquisitions, many organizations are also installing chargers. Recently, there has been an increased interest in the ongoing effort to equip businesses and organizations with chargers. Much of this effort focuses on charging decision support frameworks. A number of entities are working on this issue including local municipalities (Sonoma County), air management districts (BAAQMD), the California governor’s office (2012 ZEV Action Plan), the federal government (Workplace Charging Challenge ), private consultants (CALSTART: EV Employer Initiative), EVSE manufacturers (Coulomb and Ecotality), businesses (SAP Labs, Google, and Qualcomm), utility companies (SDG&E) and others. We work closely with many of these organizations and will continue to contribute and support their efforts. Businesses need assistance sorting through the dozen or so EVSE manufacturers and all their products; finding equitable solutions with regard to who pays for the electricity, how they pay, and how associated tax issues are dealt with; where to place chargers, how many to buy, and how to prioritize access; how to provide access for the disabled, and much more. Our proposed research supports and complements those efforts.

However, new motivators and innovative strategies will be needed when chargers are no longer free to businesses (e.g., when ARRA and other funding sources are no longer available) and when PEVs reach market shares that cause businesses to rethink their practice of providing free electricity. There is also a need to make sure the chargers and vehicles are used after they are acquired and installed. Success should not be measured by a tally of hardware but rather by the number of “zero-emission miles” realized. Therefore, charger installation must be accompanied by PEV support.

When chargers are supported and used, they can significantly increase zero-emission miles. Recent simulation studies at UC Davis suggests that workplace charging has the potential to increase electric driving across a variety of PEV electric ranges, travel needs, and charging patterns. Workplace charging could enable a significant increase in electric mileage through additional PEV purchases and more time in electric mode driving (Davies, 2013). Workers without charging options at home can purchase an EV and rely on workplace EVSE access. Those with farther commutes can drive longer in all-electric mode or drive an EV when they otherwise could not because the roundtrip commute distance exceeds the vehicle range.

The purchase and use of PEVs in organizational fleets is also important. Maximizing PEV usage in fleets may require behavioral changes (such as making sure drivers plug in faithfully), re-assigning PEVs to multiple users, and route modifications. UC Davis researchers have done considerable research on the purchase and use of alternative fuel vehicles in fleet applications (Nesbitt and Sperling, 1998; Nesbitt and Sperling, 2001). Among other things, these studies reveal that fleet operations are dynamic and complex. Consequently, careful consideration must be given to fleets when introducing a new technology with unfamiliar attributes and limitations. However, overall organizational fleets present an ideal target market and application for PEVs.

The most sophisticated companies have taken even more steps to ensure they maximize electric travel. This requires more than just keeping the batteries charged. It requires strategic ways to make sure the PEV is used as often as possible and that the users cooperate with driving and charging guidelines. It involves education, fleet logistics, engaging employees, getting fleet operators involved, and a clear, visible commitment from the top levels of the organization. Successful PEV campaigns have provided security and benefits for PEV drivers through a number of measures such as a guaranteed ride home in the case of an emergency, provisions /reimbursement for commuting and charging a PEV at home, and preferential parking.

One concern is that, because some benefits accrue regardless of usage, companies may purchase PEVs and chargers but fail to use them maximally. For example, we repeatedly heard from businesses who felt that their PEVs and chargers provided a measurable advantage when it came to recruiting and retaining talented employees in a very competitive labor market. Likewise, the companies noted the public relations and image benefits of having clean state-of-the-art technologies. These finding are supported by an informal survey of 60 businesses with PEV chargers, which revealed that “employee recruitment and retention” was the top motivator for installing EVSEs followed closely by the desire to foster a “green corporate image” (CALSTART, 2012).

We do not see evidence so far to suggest PEVs and EVSEs will be purchased without a serious commitment to their deployment. In our interviews, incorporation of PEVs into the fleet and support of employee PEV use was a true reflection of the company culture. However, it could be an unintended outcome if the main focus is acquisition rather than usage. For example, we have seen instances where one individual was responsible for purchasing PEVs for the company fleet and another was told to “make it work”. We believe it is, therefore, important to address this issue upfront and make sure there are mechanisms in place to ensure cooperation and support for PEVs throughout the organization and for the duration of the deployment. It is important for decision-makers to keep in mind that maximizing “zero-emission miles” is the ultimate goal and that PEV purchases and charger installations are just the necessary first step. Follow-up is imperative to making sure equipment and vehicles are used properly. Our research will emphasize continued usage of PEVs long after the initial investment.

We do see evidence in our preliminary research of the potential for real household PEV market movement resulting from workplace leadership. UC Davis researchers have already found instances where workplace chargers and employer support has nudged employees into the PEV market. Notable are a few cases were individuals purchased an EV after their employer installed chargers, despite the fact that they did not have reliable access to charging outside of work. We will document those cases along with those where employees started using their EVs to commute only after an EVSE was installed at work (i.e., their roundtrip commute distance exceeded their EV range).

Previous Research and Most Relevant Publications

We are not aware of any studies or publications that specifically look at the potential impact the workplace could have the household PEV vehicle market. However, in a recent study for the U.S. DOE Clean Cities Program, we interviewed businesses and Clean Cities coordinators for the purpose of exploring the importance of some of the issues presented in this proposal.1 In addition , UC Davis researchers have conducted a number studies that deal with related issues. We have studied PEV market development with regard to social networks, consumer knowledge, driver attitudes, buyer expectations and company fleet needs. We have also conducted research on the adoption of advanced technology vehicles by organizational fleets.

In terms of understanding consumer evaluation of PEVs and how new car buyers make decisions about vehicle purchases this proposed research builds on previous studies by several UC Davis researchers (see references for relevant publications). Through the progression of these consumer and market research projects it has been observed that face-to-face interactions, experience driving a PEV, openness to lifestyle change, and support and encouragement from social networks can have a strong role in shaping perceptions and generating interest in PEVs. These studies and our extensive knowledge of PEV markets in general, will provide the foundation for this research.

1. UC Davis has written a report for the U.S. DOE Clean Cities program titled: “Meeting the Alternative Fuels Transition Challenge: Opportunities to Move the Market.” 2012. We are waiting final authorization to publish the key findings from this report.

Project Objectives

The primary objectives of this research are to determine ways in which the workplace can maximize zero-emission miles and facilitate development of the PEV household market. Already we have found that the most motivated champions of PEV technology are PEV owners and the place where individuals are likely to learn and really experience PEVs is the workplace. We will take this to the next logical step by exploring ways in which every day workplace occurrences can be turned into PEV market opportunities. We will determine what strategies are most effective in the workplace today, what prospective buyers think needs to be done, and what more could be accomplished in terms of helping employees understand PEVs. We will rank the effectiveness of specific actions, with special consideration given to measures that mutually benefit both the organization and employee. The resulting compilation of best practices will be assembled into guidelines which can be disseminated and used to facilitate development of the household PEV market.

A second objective is to develop performance measures which can be used to gauge the success of work place actions. We will develop a means to determine how many employees purchase or use a PEV, at least in part, because of employer support. More importantly, we will develop performance metrics to calculate the number of gasoline miles replaced by electric miles for both employer and employees.

The California Air Resources Board will likely realize direct, immediate, and cost-effective benefits from this research. Results can be applied to help CARB meet program goals that stipulate PEV production/sales targets and commercialization benchmarks. Stimulating the PEV household market the through workplace strategies will also provide real, quantifiable emission and greenhouse gas reductions.

We provide a means for those businesses cheering from sidelines to get involved. We will enable them to adopt the practices already proven effective by businesses who are leading by example. Although these leaders are primarily from the high-tech industries (Google, Hewlitt Packard, Qualcomm, etc.), we believe their practices and policies can be effectively implemented across the broad spectrum of organizations and fleet types. Results from this study will also help organizations and consumers filter out fact from hype and aid in deciphering the extensive, often conflicting, information regarding PEVs.

**Our research will address the following questions.**

* What workplace interactions, activities, measures, purchases, and policies have been implemented to date that facilitate the purchase of a PEV by employees or otherwise maximize “electric miles”? (UC Davis researchers will develop a full typology of these strategies)
* Which of these influences have been most effective? (measured in terms of “zero-emission miles” and PEVs sold)
* How effective are these influences when implemented across a broad spectrum of businesses and public agencies that vary in size and type?
* What role do PEV-owning employees currently play? How do they feel they can be most helpful to their prospective PEV-buying co-workers?
* What do employees need or want from employers to help them make informed decisions or overcome perceived challenges associated with owning a PEV?
* What role can fleets play to help nudge employees towards the PEV market? How effective are their rolling PEV showcases in helping shape the market?
* Can driving a PEV at work result in long-term improved driving behavior in conventional vehicles?
* How many people experience PEVs through their work fleet? Is the exposure adequate? Do drivers provide feedback and share their experiences?
* How important are workplace chargers? How important is charger access to employees considering the purchase of a PEV?
* How much influence and support can be provided through social media and work-related “wikis”?
* What are the extended benefits of workplace efforts? What is the long-term effectiveness in terms of influencing employee social networks?

Tasks

**The following tasks will be conducted by UC Davis researchers.**

1. Identify lead businesses and agencies in California taking innovative steps to encourage, support, and promote PEVs in the workplace and outside the organization for their employees. Document 4-6 case studies that highlight the best practices to date.
2. Conduct approximately 30 person-to-person interviews. Half will be with employees in order to identify preferred workplace behaviors, influences, and information sources used in making vehicle purchases. Use interviews to find out what would be most helpful to employees considering a PEV purchase. Other half of interviews will be with businesses and agencies which have demonstrated leadership in promoting PEVs. These interviews will help us better understand the decision process and help identify the most critical decision-makers within the organization (PEV-related decisions can come from many places within an organization).
3. Design and administer a comprehensive online survey to approximately 800 businesses and public agencies in California. Document the needs, practices, knowledge, and attitudes of the businesses and agencies with regard to PEVs. The sampling frame will be generated from commercially available databases.
4. Conduct approximately 5 focus groups with employers and 5 with employees to better understand what role the workplace can play in spurring the household PEV market. When possible, employers will be represented by individuals identified as the “position of importance” in the organization as determined from Task 2.
5. Develop comprehensive guidelines and “best practices” that can be used by businesses and public agencies statewide.
6. Develop a presentation explaining the guidelines and best practices for a conference of CARB’s choice.
7. Draft final report
8. Amend final report

Potential Co-Funders

UC Davis is currently seeking co-funding opportunities for this project. At this time, we have approach several interested parties including the U.S. Department of Energy. We have found significant interest in this proposed research and anticipate even more interest with the recent announcement of the *Workplace Charging Challenge* initiative. Any additional funding will be used to expand the scope of the project.

Proposed Project Schedule

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|  | Month |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Task |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |  |
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m p p p md F

p = Quarterly progress report

d = Deliver draft final report

F = Deliver final report

m = Meeting with ARB staff

Estimated Cost by Task

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task | Labor | Employee Benefits | Subcontractor | Travel | Supplies & Expenses | Indirect  Costs | Misc. | Total |
| 1 | 15000 | 1500 |  | 5000 |  | 3000 |  |  |
| 2 | 15000 | 1500 |  | 10000 |  | 3000 |  |  |
| 3 | 15000 | 1500 | 15000 |  |  | 3000 | 3000 |  |
| 4 | 15000 | 1500 | 50000 | 5000 |  | 3000 | 3000 |  |
| 5 | 15000 | 1500 |  |  |  | 3000 |  |  |
| 6 | 15000 | 1500 |  | 3000 |  | 3000 |  |  |
| 7 | 15000 | 1500 |  |  |  | 3000 |  |  |
| 8 | 15000 | 1500 |  |  |  | 3000 |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | **$250,000** |

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Resumes

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**EDUCATION**

Ph.D., Civil and Environmental Engineering, University of California, Davis, June 1996.

M.S., Civil and Environmental Engineering, University of California, Davis, June 1990.

B.S., Civil Engineering, North Carolina State University, Raleigh, May 1985.

**PROFESSIONAL EXPERIENCE**

**Institute of Transportation Studies, U.C. Davis, August 2007 – present.**

Researcher, Plug-in Hybrid and Electric Vehicle Research Center. Recent and ongoing projects include:

* Clean Cities Evaluation – Researching means for increasing the effectiveness of the Clean Cities Program with emphasis on promoting alternative fuel vehicles in fleet applications.
* Chrysler PHEV Fleet Demonstration – Managing three-year demonstration project involving 28 PHEV pick-up trucks placed in select fleets. Researching commercialization issues related to PHEVs.
* California Strategic Plan for PEVs – Co-authored *Taking Charge*, a comprehensive plan for providing technology and policy guidance to the state of California to help facilitate PEV market growth. Worked with the Plug-in Electric Vehicle Collaborative (PEVC), a diverse, high-level PEV stakeholder collaborative, to develop state implementation strategies.
* Plug-in Electric Vehicle Demonstration and Market Research Program – Oversaw a two year project that placed PEVs into 80 households for periods of 4 to 6 weeks. Data collected from users and vehicles helped identify key issues affecting wide-scale acceptance of advanced vehicle technologies.

**California Air Resources Board, Sacramento, January 2001 – July 2007.**

Air Resources Engineer, Research and Planning Divisions. Responsibilities included:

* Project Manager/ Systems Analyst, Carl Moyer Program – Oversaw System Development Team tasked with developing a statewide incentive program management system for clean transportation technologies. Provided technical support for the Carl Moyer Program and guidance to staff on assessing clean innovative transportation projects. Developed analytical tools used to evaluate a wide array of technologies.
* Project Engineer, Innovative Clean Air Technologies Program – Worked with researchers, engineers, industry leaders, and multiple stakeholders to promote the commercialization of innovative clean technologies.
* Associate Member, Joint Agency Climate Team – Participated on a governor-appointed, multi-agency task force directed to develop a California climate change roadmap and greenhouse gas reduction plan. Also, provided technical support and recommendations for the California Climate Action Registry for greenhouse gas reporting and tracking protocols.
* Worked with U.S. Environmental Protection Agency and European Union Commission for the Environment to quantify mobile air-conditioning greenhouse gas emissions and develop control strategies. Worked with international coalition of scientists and policymakers to identify research needs and develop a strategic plan to mitigate greenhouse gas emissions from mobile air-conditioning units.

**CALSTART, Pasadena, June 1997 – December 2001.**

Chief Engineer, Consulting and Research Departments. Responsibilities included:

* Managed several projects aimed at introducing alternative fuel vehicles and clean transportation technologies into new markets. Collected data and conducted analytical research.
* Assessed market potential for new technologies and proposed implementation strategies for clients representing airports, universities, seaports and the trucking industry. Conducted life-cycle cost and emission analyses to determine cost and benefits of deploying advanced technologies.
* Assisted in developing technology roadmap for advances in heavy-duty hybrid electric vehicles. Helped project market size for heavy-duty electric vehicles and identify factors likely to affect market development.

**RESEARCH EXPERIENCE**

**Institute of Transportation Studies, Davis, January 1988 – June 1996.**

* DoctorateResearch. Analyzed alternative fuel vehicle purchase decisions within an organizational context. Data were collected on 2,700 fleets in California using focus groups, one-on-one interviews, and a multi-part statewide survey.
* Masters Research. Assessed the potential impact of roadway-powered electric vehicles with respect to air quality, global warming, life-cycle vehicle costs, infrastructure costs, and electricity generation.
* Other research project efforts included:

**–** Analyzing and comparing the technology, marketability, environmental impacts and costs of alternative fuel vehicles, and identifying key factors imperative to the successful implementation of new transportation technologies.

**–** Quantifying the potential private market for electric vehicles in major metropolitan areas.

**–** Conducting alternative fuel vehicle demonstration programs and market studies.

**–** Forecasting fleet demand for alternative fuel vehicles and evaluating the needs and concerns of fleet operators.

**TEACHING EXPERIENCE**

* Instructor, Part-Time, California State University, Sacramento, January 1997 – June 2001.

Taught graduate and undergraduate courses on advanced transportation engineering, transportation planning, traffic systems, and traffic flow theory.

* Teaching Assistant, University of California, Davis, August 1994 – December 1995.

Assisted in preparing course materials, conducting laboratories, and giving lectures for undergraduate transportation courses.

* Teaching Assistant, North Carolina State University, Raleigh, January 1985 – June 1985.

Taught upper-level geotechnical engineering laboratory.

**SELECT PUBLICATIONS and TECHNICAL REPORTS**

McCarthy, Ryan W., Thomas S. Turrentine, Kevin A. Nesbitt, Joshua M. Cunningham, Josh Boone (2010) “Taking Charge: Establishing California Leadership in the Plug-in Electric Vehicle Marketplace”. *California Plug-in Electric Vehicle Collaborative*.

Kurani, Kenneth S., Jonn Axsen, Nicolette Caperello, Jamie Davies-Shawhyde, Peter Dempster, Marilyn Kempster, Kevin A. Nesbitt, Tai Stillwater (2010) “Plug-in Hybrid Electric Vehicle (PHEV) Demonstration and Consumer Education, Outreach, and Market Research Program”: Volumes I and II. Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-10-21.

Nesbitt, Kevin A. and Daniel Sperling (2001) “Fleet Purchase Behavior: Decision Processes and Implications for New Vehicle Technologies and Fuels,” *Transportation Research Part C: Emerging Technologies*, Vol. 9, No.3, pp. 297-318.

Nesbitt, Kevin A. (2000) “The Use of Natural Gas Ferries in the Golden Gate National Recreation Area: A Preliminary Assessment of the Economic Feasibility and Environmental Impacts,” calstart, Pasadena.

Nesbitt, Kevin A. and Daniel Sperling (1998) “Myths Regarding Alternative Fuel Vehicle Demand by Light-Duty Vehicle Fleets,” *Transportation Research Part D: Transport and Environment*, Vol. 3, No. 4, pp. 259-269.

Nesbitt, Kevin A. and Daniel Sperling (1998) “Debunking 7 Myths About Fleets’ Use of Alternative Fuel Vehicles,” *Tech Transfer*, Institute of Transportation Studies, Technology Transfer Program, University of California, Berkeley.

Nesbitt, Kevin A. (1996) "An Organizational Approach to Understanding the Incorporation of Innovative Technologies into the Fleet Vehicle Market with Direct Application to Alternative Fuel Vehicles," University of California, Davis, UCD-ITS-RR-96-6.

Nesbitt, Kevin A., Kurani, K. S., and DeLuchi, M. A. (1992). "Home Recharging and the Household Electric Vehicle Market: A Near-Term Constraints Analysis," *Transportation Research Record*, No. 1366.

Nesbitt, Kevin A. (1990) "Highway Electrification: The Implications of Uncertainty," *Journal of the Transportation Research Forum*, Vol. XXX, No. 2.

Nesbitt, Kevin A., Sperling, D., and DeLuchi, M. A. (1990) "An Initial Assessment of Roadway-Powered Electric Vehicles," *Transportation Research Record*, No. 1267.

Nesbitt, Kevin A., Sperling, D., and DeLuchi, M. A. (1989) "An Assessment of Natural Gas and Electricity as Transportation Fuels," UCD-ITS research report.

**HONORS and AWARDS**

University of California, Transportation Center Fellowship

University of California at Davis, Transportation Fellowship

Chevron Transportation and Energy Fellowship

GAANNP Graduate Student Fellowship

Transportation Research Forum National Student Paper Award

Institute of Transportation Engineers Research Award

Board Member, Mentorography, Inc.

**Thomas S. Turrentine**

196 Seacliff Dr. Aptos, CA 95003 831-685-3635 tturrentine@ucdavis.edu

Director, Plug-in Hybrid Electric Vehicle Research Center;   
Associate Director Energy Efficiency Center;  
Institute of Transportation Studies  
University of California, Davis

Office 530.752.1768

**Education**

Ph.D. Anthropology, University of California, Davis  
Dissertation: “Lifestyle and Life Politics: Towards a Green Car Market,” UCD-ITS-RR-94-30ITS Davis177 pp. 1995.

M.A. Anthropology, University of California, Davis  
B.A. Latin American Studies, University of California, Santa Cruz

**Administrative**

Director of the Plug-in Hybrid & Electric Vehicle research center at UC Davis funded by the California Energy Commission which began in February 2007. Dr. Turrentine is P.I. The center has grown to 4 full time researchers, 5 PhD and MS students, several affiliated faculty and has resulted in research contracts with several auto companies developing electric and plug in-hybrid vehicles.

Electric Transportation Track Director for the Sustainable Transportation Energy Pathways Program at the Institute for Transportation Studies. A consortium study funded by 20 major oil, energy and manufacturing companies for 4 years.

Associate Director of UC Davis Energy Efficiency Center; Transportation Track.

Operating Agent (study group leader), International Energy Agency, Annex 14 (Sweden, USA, Austria, UK, Switzerland) Lessons Learned in the Deployment of Electric Vehicles: Co-agent Annex 18 (USA, UK) EV readiness

Advisory Board, Future Energy in Transportation, US DOE

**Research**

Dr. Turrentine uses anthropology methods and theory to explore potential consumer response to alternative fuels, vehicle technologies, road systems, and policies with environmental benefits. For over 20 years, Dr. Ken Kurani, (a Civil Engineer at ITS) and he have studied potential markets for electric, natural gas, hybrid, fuel cell, neighborhood electric vehicles, traveler information systems, station cars, and automated cars. They have implemented multi-phase, multi-year projects that stand as authoritative explorations of the future of automotive technology.

These projects have included the following innovations and contributions:

Adaptation of social theory to transport research pathways, notably the critical theory of Anthony Giddens, to understanding the automobile and "green auto technologies" in the cultural context of late-modernity.

Development of "interactive" interview gaming approaches with small samples of households (25-100) that look closely at their lifestyles, values and goals to explore household automotive consumption choices for new technologies and policies.

Subsequent mid-sized surveys (several hundred) using "reflexive" methodologies that elicit deeper consideration of alternatives by participants to increase the validity of transport surveys exploring future behavior.

Technology demonstrations that place new vehicle and other transport technologies in households and businesses for greater realism and lifestyle feedback.

**Recent and new projects:**

P.I. $650,000 California Air Resource Board, Household PEV User Data Collection Project.

P.I. $860,000 UCD Research Investments in Science and Engineering Program, Transforming Consumer Energy Use (2012-2014)

P.I. $500,000 CEC “Sustainable Cities; PEV Infrastructure Planning” (2011-13)

P.I. (55,000) Clean Cities Strategies (2012) DOE /ORNL

P.I. $2.7 million from California Energy Commission for PH&EV Research Center core funding (2010-2013)

P.I. $576,000 Chrysler PHEV Pick-up Truck Research (2011-2013)

P.I. $600,000 Ecotality-Nissan Leaf demonstration in San Diego (2011-2012)

Plug-in hybrid electric vehicle (PHEV) consumer studies with Dr. Kurani. Funding from UCEI ($36,000), the PHEV center ($325,000) and ARB ($1.8 million completed in 2010)

P.I. on BMW MINI E driver’s use of vehicles ($239,000) completed in 2010.

Consumer behavior and advanced vehicle energy instrumentation with Dr. Kurani. With funding from UTS ($60,000) and ORNL ($250,000).

Clean vehicle markets in China. Funding from Energy foundation to work with China on EV demonstration projects in Shanghai area. ($80,000) Partnership being developed with VW Corporation to study use of electric vehicles on Chongming “Eco Island”.

World EV Cities and Ecosystems Web Portal, Collaborative project with IEA, EVI, Clinton Initiative, RMI

**Publications**

Nesbitt, Kevin A. Thomas S. Turrentine, Jamie Davies, Dahlia M. Garas, Tobias Barr (2012). “Meeting the Alternative Fuels Transition Challenge: Opportunities to Move the Market.” *Publication pending.*

McCarthy, Ryan W., Thomas S. Turrentine, Kevin A. Nesbitt, Joshua M. Cunningham, Josh Boone (2011) “*Taking Charge: Establishing California Leadership in the Plug-in Electric* Vehicle Marketplace.” [*California Plug-in Electric Vehicle Collaborative*](http://www.pevcollaborative.org/), UCD-ITS-RP-10-26

Turrentine, Thomas S., D.M. Garas, A.H. Lentz, J.F. Woodjack (2011) “The UC Davis MINI E Consumer Study”, UCD-ITS-RR-11-05

Heffner, R.R., K.S. Kurani, and T.S. Turrentine (2009) “Driving Plug-In Hybrid Electric Vehicles: Reports from U.S. Drivers of HEVs converted to PHEVs, circa 2006-07.” Accepted for publication Transportation Research Record.

Turrentine, T.S. “Fuel Economy: What Drives Consumer Choice?” (2007) *Access* Number 31, pp. 14-19.

Heffner, R.R., K.S. Kurani, and T.S. Turrentine (2007) “Driving Plug-In Hybrid Electric Vehicles: Reports from U.S. Drivers of HEVs converted to PHEVs, circa 2006-07.” Submitted to Transportation Research Record.

Heffner, R.R., K.S. Kurani, and T.S. Turrentine (2007) “Symbolism in the Early Market for Hybrid Electric Vehicles.” *Transportation Research D*. v.12. pp. 396–413

T. Turrentine and K. Kurani, "Car Buyers and Fuel Economy?"  
In *Energy Policy 35*, January 2007 pp. 1213-1223.

Kurani, K.S., T.S. Turrentine, R.R. Heffner (2007) “Narrative Self-Identity and Societal Goals: Automotive fuel economy and global warming policy.”*A Policy Agenda for Global Climate Change*, Eds. Jim Cannon and Dan Sperling, Elsevier Academic Press, January 2007, pp. 217-238.

Heffner, R.R., K.S. Kurani, and T.S. Turrentine (2006) “Symbolism and the Adoption of Fuel Cell Vehicles.” *World Electric Vehicle Association Journal*. v.1.

Heffner, R., K.S. Kurani, and T.S. Turrentine, “Automotive Semiotics.”  
UCD-ITS-RR-06-01, January 2006.

Heffner, R.R., K.S. Kurani, and T.S. Turrentine “Vehicle Image in Hybrid Electric Vehicles.” In *Proceedings of the 21st Electric Vehicle Symposium.* Monaco. April 2005.

Sperling, Dan; E. Abeles; D. Bunch; A. Burke; B. Chen; K. Kurani; T. Turrentine. “The Price of Regulation.” *Access Magazine*, No. 25, Fall 2004.

Kurani, K.S., T.S. Turrentine, R.R. Heffner, and C. Congleton, “Prospecting the Future for Hydrogen Fuel Cell Vehicle Markets,” Chapter 3 in Sperling, D. and J.S. Cannon (Eds) *The Hydrogen Energy Transition*. Elsevier Academic Press, 2004.

Kurani, K.S. and T.S. Turrentine, “Automobile Buyer Decisions about Fuel Economy and Fuel Efficiency,” ITS-RR-04-31. September 2004.

Kurani, K.S., T. Turrentine, R. Heffner and B. Williams, “Constructing Hydrogen Demand: Mining the past and prospecting the future.” In, Proceedings of Hydrogen Demand Workshop, Institute of Transportation Studies, University of California: Davis, CA. June 21-23, 2004.

T. Turrentine, “Reflexivity in Transport Studies.” *Delivering Sustainable Transport: A Social Science Perspective*, ed. Amanda Root, Pergamon, Amsterdam, pp. 61-76, 2003.

T. Turrentine, "Identity, Lifestyle and the Gaming Interview"  
In *Delivering Sustainable Transport: A Social Science Perspective*. Ed. Amanda Root, Pergamon, Amsterdam, pp. 97-116, 2003.

R. Forman et al (14 co-authors including T. Turrentine) *Road Ecology: Science and Solutions* Island Press, Washington, 465 pgs, 2003.

T. Turrentine and K. Kurani, “Options: Limits and Opportunities in Household Activity Space Formation.” *Perpetual Motion: Travel Behavior Research Opportunities and Application Challenges*, ed. Hani Mahmassani, Pergamon, Amsterdam, pp. 43-69, 2002.

K. Kurani and T. Turrentine, “Marketing Clean and Efficient Vehicles: A Review of Social Marketing and Social Science Approaches.” Institute of Transportation Studies, University of California, Davis, UCD-ITS-RR-02-01 54 pgs.  August 2002.

R. O'Bryan, D. Sperling, M. Delucchi and T. Turrentine. “*Transportation in Developing Countries: Greenhouse Gas Scenarios for Chile”* Pew Center on Global Climate Change, August 2002.

K. Kurani, T. Turrentine, “Exploring Potential Fuel Cell Vehicle Markets: Lessons from Other Advanced Vehicles.” *Understanding Fuel –Celled Vehicles: Handbook for FCV Workshops,* Ed Sitaram Ram Ramaswany and Kitty Wu, UCD-ITS-RR-01-08 (1) December 2001.

T. Turrentine and K. Kurani, “Marketing Clean and Efficient Vehicles: Workshop Proceedings.” Institute of Transportation Studies, University of California, Davis, UCD-ITS-RR-01-06 March 2001.

R. O’Ryan, T. Turrentine, “Greenhouse Gas Emissions in the Transport Sector 2000-2020: Case Study for Chile.” Institute of Transportation Studies, University of California, Davis, UCD-ITS-RR-00-10, September 2000

M. Delucchi, K. Kurani, K. Nesbitt, T. Turrentine, “How We Can Have Safe, Convenient, Clean, Affordable, Pleasant Transportation Without Making People Drive Less or Give Up Suburban Living.” Institute of Transportation Studies, University of California, Davis, UCD-ITS-RR-02-08, September 2002.

Kurani, K.S., T. Turrentine and S. Co. “Employee Travel in Yosemite National Park.” Report to U.S. Department of Interior, National Park Service, Yosemite National Park. ITS-RR-00-1. April 2000.

Co, S., K.S. Kurani and T. Turrentine. “A Study of Visitor Bicycle Use in Yosemite Valley.” Report to U.S. Department of Interior, National Park Service, Yosemite National Park. ITS-RR-00-2. April 2000

Turrentine, T. and K.S. Kurani. “Progress in Electric Vehicle Technology and Electric Vehicles from 1990 to 2000: The Role of California’s Zero Emission Vehicle Production Requirement.” Report to the California Electric Transportation Coalition. August 2000.

Turrentine, T. and K.S. Kurani. “Design of Traveler Information Web Sites for Rural Tourism: Case Study of the Yosemite Area Traveler Information Web Site.” UCD-ITS-RR-00-14. January 2000.

T. Turrentine and K. Kurani. “Adapting Interactive Response Techniques to a Self-Completion Type Survey.” *Transportation No*. 25: 1998 pp. 207-222.

T. Turrentine and K. Kurani. “Consumer Benefits of EVs and Plug-in HEVs”, Electric Power Research Institute, EPRI TR-110780, June 1998.

P. Jovanis, A. Stein, K. Kurani, V. Thairani, T. Turrentine. “Evaluation of the TransCal Operational Field Test.”California Department of Transportation, New Technologies and Research Program UCD-ITS-RR-98-13, December 1998.

K. Kurani, T. Turrentine, J. Wright and S. Co. “YATI Changeable Message Sign and Highway Advisory Radio, July 1998 Field Test Report.’’ California Department of Transportation, New Technologies and Research Program UCD-ITS-RR-99.

K. Kurani, T. Turrentine and J. Wright. “Where, When, How Fast and How Much? Questions about Consumer Demand for Home, Away from Home, Time of Day, and Speed of Recharging for Electric Vehicles.” *Proceedings of the 14th International Electric Vehicle Symposium and Exposition*. Orlando, Dec. 1997.

K. Kurani, T. Turrentine, L. Dantas and P. Jovanis. “Yosemite Area Traveler Information (YATI) System User, Institutional, and System Performance Evaluations for the July 1996 to June 1997 Field Operational Test.” Report to the Merced County Area Governments and the YATI Management Board. Institute of Transportation Studies, University of California: Davis, California. UCD-ITS-RR-97-14.

T. Turrentine, D. Sperling, and D. Albright. “ISTEA Renewal: Environment and Equity.” UCD -ITS RR-97-19 November 1997.

K. Kurani, T. Turrentine and D. Sperling. “Testing Electric Vehicle Demand In ‘Hybrid Households’ Using A Reflexive Survey.” *Transportation Research D*. Vol. 1: No.2. 1996 pp. 244-256.

T. Turrentine “Redefining the Market: Six emerging markets for small electric vehicles.” (1996) Proceedings *of the North American EV & Infrastructure Conference*, San Diego (Dec.) not paginated.

M. Lee-Gosselin, B. Faivre d’Arcier & T. Turrentine. “Le marché pour les véhicles électrics: il ne suffit pas de se demander combien nous on vendrons.” *Routes et Transports*, AQTR Montreal. Vol. 26: No. 3, Fall 1996 pp. 6-13.

K. Kurani, T. Turrentine and D. Sperling. “Demand for electric vehicles by hybrid-households.” *Proceedings of the 13th International Electric Vehicle Symposium*. Osaka, Japan, Oct. 1996 pp. 245-252.

T. Turrentine and K. Kurani. “Advances in Electric Vehicle Technology from 1990 to 1995: The Role of California’s Zero Emission Vehicle Mandate.” *Electric Power Research Institute*, EPRI TR-106274 Feb. 1996.

T. Turrentine and M. Gosselin “Vehicle labeling for improved consumer knowledge: survey methodological considerations.” *AMDC (Automobile mobility data compendium) Technical Memorandum* prepared for Natural Resources Canada. April 1996.

T. Turrentine and K. Kurani. “Technological Spin-Offs and Other Indirect Benefits of New Electric Vehicle Technologies” Electric Power Research Institute, EPRI TR-106275, Feb. 1996.

K. Kurani, D. Sperling and T. Turrentine. “The Marketability of Electric Vehicles: Battery Performance and Consumer Demand for Driving Range.” (1996) *Proceedings, The 16th Annual Battery Conference*. C. S. U. Long Beach, Long Beach CA. Jan. 1996.

K. Kurani, D. Sperling, T. Lipman, D. Stanger, T. Turrentine and A. Stein. “Household Markets for Neighborhood Electric Vehicles in California.” Institute of Transportation Studies, University of California: Davis California. Report UCD-ITS-RR-95-6. 1995.

T. Turrentine. “Who will buy electric cars?” *Access* No. 6(Spring) 1995 pp. 19-24.

G. Hopper, T. Turrentine and E. Gallagher. “Battery mix and aggregate battery demand for electric vehicles in California.” *Proceedings of the 10th Annual Battery Conference on Applications and Advances*, C.S.U. Long Beach CA Jan. 1995 pp. 10-112.

T. Turrentine and K. Kurani. “The Household Market for Electric Vehicles: Testing the Hybrid Household Hypothesis - A Reflexively Designed Survey of New-car-buying, Multi-vehicle California Households.” Report prepared for the California Air Resources Board and The California Environmental Protection Agency. Institute of Transportation Studies, University of California: Davis California. Report UCD-ITS-RR-95-5. 1995.

T. Turrentine and K. Kurani. “Multi-staged interactive stated response methods” *Urban travel survey methods: measuring the present, simulating the future.* P. Bonnel, R. Chapleau, M. Lee-Gosselin, C. Raux. *Les chemins de la Recherche No. 42*, Centre Jacques Cartier, Lyon, 1995 pp. 387-416.

T. Turrentine and K. Kurani. “Segmentation and Size of the Market for Battery Powered and Hybrid Electric Vehicles in California: A Diary Based Survey of New Car Buyers in California.” *Proceedings, The 12th Annual* W. *International Electric Vehicle Symposium (EVS-12) and Electric Vehicle Exposition*, Anaheim CA. Dec. 1994 pp. 65-72.

K. Kurani, T. Turrentine and D. Sperling. “Demand for Electric Vehicles in Hybrid Households: An Exploratory Analysis.” *Transport Policy.* No. 1: Vol 4, October 1994 pp. 244-56.

Kempton and T. Turrentine. “Fuel cell, electric and hybrid automobiles: Why would people buy them?” *Proceedings of The Fuel-Cell and Electric Vehicle Workshop*. Department of Energy and U. of Florida, Wash. D.C. Jan. 1994.

T. Turrentine and K. Kurani. “Lifestyle and limited range: A market segmentation approach to the electric vehicle market,” *Proceedings of the World Car 2001 Conference*, U.C. Riverside, The Mission Inn, June1993.

T. Turrentine, D. Sperling and K. Kurani. “Market Potential of Electric and Natural Gas Vehicles: Preliminary Report.” University of California, Davis. Institute of Transportation Studies. 1992 UCD-ITS-RR-92-8. Sept.).

T. Turrentine and D. Sperling. “Theories of new technology purchase decisions: The case of alternative fueled vehicles.” UCTC Working Paper #129 July1992.

T. Turrentine and D. Sperling. “How far can the electric vehicle market go on 100 miles.” Proceedings *of the First Urban Electric Vehicle Conference*, Stockholm, invited plenary speaker. May 1992. pp. 259-270.

T. Turrentine, M. Lee-Gosselin, K. Kurani and D. Sperling. “A Study of Adaptive and Optimizing Behavior for Electric Vehicles Based on Interactive Simulation Games and Revealed Behavior of Electric Vehicle Owners.” *Proceedings of The World Conference on Transport Research*, Lyon, France, April1992.

T. Turrentine and D. Sperling. “Development of the alternative fueled vehicles market: Its Impact on Consumer decisions processes.” *Proceedings of the 6th International Conference on Travel Behavior*, Quebec, May 1991. pp. 208-227.

T. Turrentine, D. Sperling and D. Hungerford. “Consumer acceptance of adaptive cruise control and collision avoidance technology.” *Transportation Research Record* No. 1318, 1991, pp. 118-121.

**Professional Activities**

Operating Agent, International Energy Agency, Annex 14, Lessons Learned in the Deployment of Electric Vehicles (Sweden, Switzerland, USA) 2007-2009. Lessons Learned Workshops Chair: Santa Cruz Oct.4 07, Anaheim Dec 10, 07, Geneva, March 10, 08; Tokyo May 17, 21 08; Gothenburg Sept. 17 08; Stockholm Sept 21, 08; London Sept. 2009; Boston Oct. 2009.

Conference co-organizer *Plug-in 2009,* Long Beach Convention Center, August 2009, (4 day international conference)

Conference co-director *Plug-in 2008*, San Jose Convention Center, San Jose California, July 2008, (4 day international conference)

(Presiding) Conference Session, 2007 Transportation Research Board Annual Meetings, *Hybrid Vehicle Markets*

(Presiding) Conference Session, 2006 Transportation Research Board Annual Meetings, *Issues in Hybrid Vehicle Markets*

(Session Chair) *The Hydrogen Market*, Hydrogen Demand Workshop, ITS Davis, Buehler Alumni Center 2005.

(Co-director) *Marketing Clean and Efficient Vehicles*, An Institute of Transportation Studies Workshop, U.C. Davis March 23-24, 2001

(Co-director) *Sociological and Ecological Effects of Roads in the Sierra Nevada*, Fallen Leaf Lake, October 22-24, 1999.

(Director) *Conference on Transportation and Environmental Policy for the 21st Century*, Asilomar Conference Grounds, August 24-27, 1999.

(Co-chair) *The 1999 Summer Data Collection for Yosemite National Park*, Presidio, San Francisco Nov. 7-8 1999.

(Workshop Coordinator and Chair) *ISTEA: Renewal: Environment and Equity*, An Institute of Transportation Studies Workshop, U.C. Davis May 30, 1997

(Co-chair) *The Electric Vehicle Market*, An Institute of Transportation Studies Workshop, U.C. Davis. November 7, 1996.

(Chair) Conference Session: The Market for Electric Vehicles: Session 22, 6th World Conference on Travel Research, Lyon, France (June) 1992.

**Committees**

Guidance Committee to the Sentech/Oakridge PHEV Value Proposition study. December 2007-2009.

January, 1992 to present, Friend, Committee on Transportation Energy (A1F01), TRB

January, 1993 to present, Friend, Committee on Alternative Transportation Fuels (A1F06), TRB

Culture, Choice and Technology. Second OECD Workshop on Individual Travel Behavior (Invitation of OECD Environmental Directorate) Brighten, England (July) 1996

Values, Welfare and Quality of Life. First OECD Workshop on Individual Travel Behavior (Invitation of OECD Environmental Directorate) Paris, France (March) 1996

**Presentations**

“Transforming automobility: lessons from 20 years of research in California,” Invited Plenary, Millbrook Proving Grounds, United Kingdom, September 9, 2009.

“Lessons Learned in Deployment of Electric Vehicles,” Plenary Speaker, Plug-In 2008, San Jose, July 2008.

“PHEV vehicle markets,” SAE Hybrid Vehicle Symposium, San Diego California, February 5, 2008.

“Hybrid vehicle markets,” SAE Hybrid Vehicle Symposium, San Diego California, February 4, 2006.

“MPG and me” Workshop on real world fuel economy, Natural Resources Canada, Windsor, Ontario, January 24, 2006.

“The Consumer Viewpoint,” Hydrogen Societal Benefits and Costs Workshop, UC Davis, October 4, 2005

“How Do Car Buyers Think About Fuel Economy?” 84th Annual Meeting of the Transportation Research Board, Washington, DC, Jan 2005

“[Constructing Hydrogen Demand: Mining the Past; Prospecting the Future](http://hydrogen.its.ucdavis.edu/workshops/Workshops/Demand/resolveuid/b6a3121f9d28bed9454873fb10355c79)” K. Kurani, T. Turrentine, R. Heffner, and B. Williams, Hydrogen Demand Workshop, UC Davis, June 22, 2004

“Consumers and Fuel Economy Decisions,” Seminar, ITS Davis, April 2004

“Mobile Activity Locales: The Convergence of Mobility, Electricity and Communications,” Conference on Alternative Mobility Futures, Centre for Mobilities Research, Lancaster University, England, Jan. 2004

“Hydrogen Market Research Plan” Fuel Cell Workshop, Transportation and the Hydrogen Economy Workshop, Davis, CA, March 27, 2003

"The North American Road System" 70th Transportation Research Board Meetings in Session on Road Ecology. Washington DC, Jan 14, 2002 (invited).

“Fuel Cell Vehicle Markets” UC Davis Fuel Cell Vehicle Workshop, Sacramento, CA, Dec. 2001

“Social Marketing for Clean and Efficient Vehicles,” Electric Vehicle Association of the Americas, Sacramento, Nov. 2001.

“Electric Vehicle Markets,” ARB ZEV Hearings, Sacramento, CA, Sept 2001

“Roads and Vehicles” International Conference on Ecology and Transportation, Keystone, Colorado, Sept 24, 2001

“Markets for Clean and Efficient Vehicles,” New Visions in Transportation, Advanced Transit Association and the National Society of Professional Engineers, Aspen, Colorado, Oct. 2000.

“Traveler Information Websites for Park Regions: the Case of the Yosemite Area Traveler Information Website,” 79th Annual Meeting of the Transportation Research Board, Washington D.C., Jan. 2000.

“Policies for Fostering Sustainable Transportation Technologies,” Asilomar Conference Center, Monterey California, Aug. 1997.

“Defining a New Electric Vehicle Market: ‘Hybrid Households’,” Institute of Transportation Studies. University of California, Davis. Electric Vehicle Market Workshop, November 1996.

“Consumer demand for Electric Vehicles in California,” North American EV & Infrastructure Conference. Atlanta, Georgia, Dec. 1995.

“If you build them; who will buy them?: The second coming of electric vehicles,” Joint Meeting of the Society for the Social Studies of Science and the Society for the History of Technology. Charlottesville, Virginia, October 1995.

“The market for electric vehicles in California,” The Scandinavian Electric Car Rally, Goteborg, Sweden, July 1995.

“Electric vehicle owners: Tests of assumptions and lessons in future behavior from 100 EV owners in California,” 73rd Annual Meeting of the Transportation Research Board, Washington DC (Jan.) 1994.

“How far can the market go with limited range vehicles?” Electric Vehicle Forum, Westwood Marquis, March 5-6 1992.

**Honors and Awards**

1996 Post-Doctoral Fellowship, Groupe Reserche Institut de Mobilité et Sécurité (GRIMES) Université Laval, Québec.

1994 Chevron Fellowship, Institute of Transportation Studies

1990 U.C., Transportation Center Dissertation Fellowship

1989 Special Research Award, Graduate Dean Office, UC, Davis

1989 Graduate Research Awards, University of California, Davis

1984 Inter-American Foundation Master’s Research Fellowship

1982 Honors in Major, Latin Americana Studies, UC, Santa Cruz

**Jamie Davies, MS**

[jdavies@ucdavis.edu](mailto:jdavies@ucdavis.edu)

**EDUCATION**

**UNIVERSITY OF CALIFORNIA AT DAVIS**

Master of Science, Transportation Technology and Policy, March 2011

**Thesis:** *Assessing the impact of away from home charging infrastructure on PHEV electric miles traveled:* scenarios based on households’ use of a PHEV. **Committee members**: Kenneth S. Kurani (Chair), Joan M. Ogden and Thomas S. Turrentine.

**UNIVERSITY OF CALIFORNIA AT DAVIS**

Bachelor of Science, Environmental Science & Policy with specialization in energy policy, 2008

**QUALIFICATIONS SUMMARY**

Consumer Research Analyst at the UC Davis Plug-in Hybrid & Electric Vehicle Research Center, engaged in the evaluation of consumers’ use of and experience with alternative fueled vehicles. Emphasis on the design and practice of qualitative and quantitative research to measure consumers experience with PEVs, understand market potential, and assess impacts of vehicle attributes and charging infrastructure on driving experiences. Broader goals and motives of research projects are to understand vehicle environmental impacts, consumer and fleet purchase trends and behavior, how to build value for potential alternative fueled vehicle customers, and other strategies to increase market share. In pursuit of those research questions I have developed expertise in vehicle and consumer data analysis.

**WORK EXPERIENCE**

**CONSUMER RESEARCH ANALYST**

UC DAVIS PLUG-IN HYBRID & ELECTRIC VEHICLE RESEARCH CENTER at THE INSTITUTE OF TRANSPORTATION STUDIES, December 2012 to Present

Responsible for project design, management, analysis, publication and presentation of results for a variety of consumer and market research oriented alternative fueled vehicle research projects.

* Involved in the planning and execution of large, multi-stage original research studies directed at evaluating consumer understanding of PEV technology, use of in-vehicle energy feedback displays, market potential of various powertrain designs, charging infrastructure preferences and travel and charging data from PEV users.
* Continued experienced and practice with qualitative research methods. Including conducting interviews with PEV users, fleet managers and employers who have installed workplace charging. Currently developing novel methodologies for evaluating the role of interpersonal interactions on alternative fuel vehicle purchase decisions and “instant” feedback through the use of web connected devices and applications.
* Responsible for the data analysis and overseeing the development of appropriate collection and analysis infrastructure. This includes overseeing the development of databases and procedures for obtaining and storing large amounts of time series data, querying data, delivering meaningful summaries of vehicle performance and user behavior, and connecting vehicle use data with qualitative research insights to explain patterns.

**PROJECT ANALYST**

UC DAVIS PLUG-IN HYBRID & ELECTRIC VEHICLE RESEARCH CENTER, March 2011 to November 2012

Responsible for aiding in the analysis and publication of results for a variety of consumer and market research oriented alternative fueled vehicle research projects.

* Performed in depth data analysis of consumer PHEV use patterns (charging and driving) to evaluate impacts of PHEVs and charging infrastructure needs.
* Took results of in-use behavioral studies and compared them to assumptions commonly made by other analysts and experts in an effort to understand and document how actual user behavior differs from assumptions and what are the implications of those differences for PHEV energy use (the utility factor, grid impacts and vehicle preference). Academic paper is in review at the Journal of Energy Policy.
* Co-authored grid impact study examining methodologies to accurately predict charging loads from PEVs. Academic paper is in review at the Journal of IEEE Smart Grid.
* Performed interviews with fleet drivers of an OEM demonstration vehicle. Use qualitative research skills to perform content analysis and extract themes relevant to research goals and important future research questions regarding the EV market and consumer behavior.
* Successfully managed and completed entire research projects from proposal writing stage to final deliverables.

**INTERN - Advanced Vehicle Testing Activity (AVTA)**

U.S. DEPARTMENT OF ENERGY, IDAHO NATIONAL LABS, Idaho Falls, June 2010 to October 2010

Worked as an analyst at the Advanced Vehicle Testing Activity (AVTA), which collects and analyzes in-use data from alternative fueled vehicles and charging infrastructure to understand usage patterns, evaluate petroleum displacement potential, and real world performance of commercially available alternative fuel vehicle technologies.

* Analyzed in-use vehicle data for over 200 PHEV-conversions deployed throughout the United States and Canada with a special emphasis on pattern recognition and impact of vehicle charging on the electrical grid.
* Developed survey and analysis methodology to better characterize the sample, with a focus on the representativeness of vehicle usage patterns and selection likely PHEV-buyers.
* Helped developed research questions and methodology for the EV project. Work included developing optimizing the placement of a network of recharging stations, fields necessary for database.
* Provided support to public agencies seeking technical assistance or access to research products, with a focus on summarizing complex research findings into actionable recommendations and best practices.

**EMERGING VENTURE ANALYST**

UC DAVIS ENERGY EFFICIENCY CENTER, December 2009 – June 2010

Served as an emerging venture analyst for the UC Davis Energy Efficiency Center, assuming a leadership role as the expert on electric transportation, mobility and alternative fuels. The Center works to advance the adoption of energy efficient technologies in the market place by identifying barriers to adoption and creating novel business solutions.

* Provided consultation and direction for the Center and industry partners on electric transportation and mobility. Used quantitative and qualitative research methods to assess potential market, barriers to adoption of PEVs, and impacts and benefit of PEVs to utilities and consumers. Particular emphasis was placed on understanding consumer expectations for EV charging and the role of the utility in shaping the EV ownership experience.
* Continued education through seminars on electric utilities and the policy framework in which they operate, as well as exploration of the goals and challenges of the industry
* Exposed to business and project management methods, including business plans and project planning
* Presented research to industry partners, including Southern California Edison and Pacific Gas & Electric

**GRADUATE STUDENT RESEARCHER**

UC DAVIS SUSTAINABLE TRANSPORTATION ENERGY PATHWAYS (STEPS) PROGRAM at THE INSTITUTE OF TRANSPORTATION STUDIES**,** June 2008 – June 2010

Employed as a student researcher within the Sustainable Transportation and Energy Pathways research group (STEPS), which compares vehicle fuel pathways with regard to consumer acceptance, lifecycle costs, infrastructure, and environmental impacts. Research was undertaken while concurrently enrolled in graduate classes and under the training and supervision of a principal investigator/ research staff member.

* Major contributor to an Air Resources Board and California Energy Commission funded plug-in hybrid vehicle demonstration and market research project where PHEV-conversions were deployed in households to understand consumer response and usage patterns. Responsible for project in-use vehicle data analysis, conducted in-depth 1 on 1 interviews with project participants, summarized respondents’ multiple interviews into narrative format and coded transcripts to look for broader trends and themes.
  + Helped refine interview protocol and adjust experiment methodology based on initial vehicle deployments, maintained and updated private and confidential participant records. Tabulated, analyzed and interpreted results of consumer preference survey using MATLAB and statistical software similar to SAS.
* Participated in a number of outreach and education events and clinics for the UC Davis hydrogen fuel cell demonstration project
* Presentation and discussion of research at industry conferences, stakeholder meetings, and for students and staff at various campus seminars

**INTERN – Land Use & Transportation Division**

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT**,** Dec. 2007 to Dec. 2008

Engaged as an Intern for the Sacramento Metropolitan Air Quality Management District, the local agency responsible for controlling criteria pollutant emissions through regulation, incentives and education and outreach. Within the district, the land use and transportation division regulates and mitigates, when necessary by law, the criteria emissions which result from new construction and the associated increase in travel.

* Aided staff in evaluating the impact of new construction projects on local air quality through the use of modeling software
* Contributed to commentary of project planning documents and proposed mitigation measures
* Expanded staff’s knowledge of air quality and transportation issues and policies through research and the creation of white papers
* Evaluated/ audited the effectiveness of district mitigation program to reduce emissions from heavy duty construction equipment
* Conducted on-site inspections and evaluations to monitor compliance with permits
* Participated in climate change training workshops provided by the Air Resources Board

**PROFESSIONAL SKILLS**

* Special expertise in the quantitative analysis of real world PEV use data from OEM and conversion vehicles.
* Highly capable and experienced at developing models and insights based on consumer informed inputs from surveys and interviews of new car buyers with the goal of increasing realism in research.
* Highly skilled in pattern recognition and analytical and statistical analysis. Advanced user of Microsoft office software, MATLAB, SAS and other statistical software used for crosstabs, cluster analysis and factor analysis. Experienced in analyzing in use vehicle data and modeling PHEV impacts based on large quantities of in-use vehicle data.
* Excellent communication abilities, written and oral. Skilled at writing research reports, peer reviewed journal article**s** and presenting salient findings clearly and concisely in public presentations.

**SELECT PUBLICATIONS**

Davies, Jamie., Karen Huss. *Cost Effectiveness and Ancillary Benefits of SMAQMD Construction Mitigation Program.* Sacramento Metropolitan Air Quality Management District, Research Report (2008)

Kurani, Kenneth S., John Axsen, Nicolette Caperello, Jamie Davies, Tai Stillwater (2009) *Learning from Consumers: Plug-In Hybrid Electric Vehicle (PHEV) Demonstration and Consumer Education, Outreach, and Market Research Program.* Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-09-21

Smart, John. Jamie Davies, Matthew Shirk, Casey Quinn, Kenneth S. Kurani. *Electricity Demand of a Diverse Fleet of PHEVs: Effects of Driving and Charging Behavior.* Electric Vehicle Symposium 25 (2010).

Davies, Jamie. Kenneth S. Kurani**.** *Households’ Plug-In Hybrid Electric Vehicle Recharging Behavior; Observed Variation in Households’ use of 5-kWh Blended PHEV Conversion.* Transportation Research Record (2011).

Nicholas, Mike., Gil Tal, Jamie Davies, and Justin Woodjack. *DC fast charging as the only public charging option?* *Scenario testing from GPS tracked vehicles.* Transportation Research Record (manuscript in preparation)

Davies, Jamie., Kenneth S. Kurani., *Replacing assumption with observation: Implications for energy and emissions impacts of plug-in hybrid electric vehicles.* (In review, Energy policy)

Alizadeh, Mahnooosh, Anna Scaglione, Jamie Davies and Kenneth S. Kurani., *Scalable simulation, telemetry and forecasting for electric vehicle charging demand.* (In review, IEE)

Nesbitt, Kevin A. Thomas S. Turrentine, Jamie Davies, Dahlia M. Garas, Tobias Barr

(2012). “Meeting the Alternative Fuels Transition Challenge: Opportunities to Move the

Market.” Publication pending.

**SELECT PRESENTATIONS**

*Households’ Recharging Behavior and Vehicle Use*: Results from the UC Davis PHEV Demonstration and Market Research Program. Presented at: **Plug-In 2009**, Long Beach CA, 2009.

*Households’ Plug-In Hybrid Electric Vehicle Recharging Behavior; Observed Variation in Households’ use of 5-kWh Blended PHEV Conversion.* Presented at: **Transportation Research Board (TRB) 2010**, Washington DC, 2010.

*Electricity demand of PHEVs operated by private households and commercial fleets: effects of driving and charging behavior.* Presented at **Electric Vehicle Symposium (EVS) 25**, Shenzhen China, 2010.

*Mitigating PHEV charging with PV energy systems.* Presented at: **Electric vehicle symposium (EVS) 26**, Los Angeles, Ca, 2012

*Assessing the potential impact of PHEV workplace charging for a group of commuters.* Presented at **Electric Vehicle Symposium (EVS) 26**, Los Angeles Ca, 2012

*Marginal Impact of Workplace Charging on Electricity Demand and Charge-Depleting Driving: Scenarios Based on Plausible Early Market Commuters' Use of 5-kWh Conversion PHEV*. Presented at **Transportation Research Board (TRB) 2011**, Washington DC.

*How much is enough? Examining electric vehicle range and charging infrastructure.* Scheduled to present at **Plug-in 2012**, San Antonio Texas