

### FALL 2015 SYMPOSIUM & ADVISORY BOARD MEETING

#### Symposium

Thursday, December 10, 2015

8:15 a.m. – 5:45 p.m. with reception to follow

[The ARC \(Activities and Recreation Center\)](#) Ballroom, UC Davis

*STEPS team will present insights from 2015 projects via presentations and posters.*

#### Advisory Board Meeting (*STEPS board members only*)

Friday, December 11, 2015

8:30am – 1:00pm

[Walter A. Buehler Alumni Center](#), Founder's Board Room, UC Davis

*STEPS Advisory Board members will discuss STEPS 2016 projects with STEPS leadership.*

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**Thursday, December 10, 2015**  
**[The ARC \(Activities and Recreation Center\)](#) Ballroom, UC Davis**

<b>Wi-Fi:</b> - Connect to wireless network: ucd-guest - Launch a web browser. - Follow the prompts to set up ucd-guest account	<b>Event Files:</b> - Log in at <a href="http://www.steps.ucdavis.edu">www.steps.ucdavis.edu</a> - Password: STEPS2015
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- 8:15 a.m. Continental Breakfast
- 8:45 a.m. **Welcome and Introductory Remarks**  
*Joan Ogden, Director, STEPS Program; Professor, Env. Science and Policy, UC Davis*
- 9:00 a.m. **Keynote: Relevance of COP21 for US/California Regulations and STEPS research**  
*Karl Simon, Director, Transportation and Climate Division, US EPA*
- 9:45 a.m. **Session 1: Current Markets and Consumer Trends**  
Moderator: *Lew Fulton, Director, STEPS Program, ITS-Davis*
- Future Mobility Initiative  
*Lew Fulton*
  - Personal Attitudes and Travel Behavior of Gen Y: Preliminary Results from the California Millennials Survey  
*Giovanni Circella, Researcher, ITS-Davis*
  - How households talk about PEVs and FCEVs  
*Ken Kurani, Associate Researcher, ITS-Davis*
  - *Group Discussion*
- 11:00 a.m. Coffee Break
- 11:15 a.m. **Session 2: Transitions**  
Moderator: *Joan Ogden*
- Initial insights and views from new 2030 scenarios  
*Chris Yang, Research Scientist, ITS-Davis*
  - International EV Project  
*Lew Fulton*
  - Exploring the impact of incentives on the PEV Market  
*Gil Tal, Researcher, ITS-Davis*
  - eVMT's role in determining the right range for PHEVs  
*Mike Nicholas, Researcher, ITS-Davis*
  - *Group Discussion*
- 12:30 p.m. Lunch is served

1:30 p.m. **Session 3: Insights from STEPS 2015**

Moderator: *Amy Jaffe, Executive Director of Energy and Sustainability, UC Davis*

- Global Scenarios for Peak Oil Demand  
*Amy Jaffe*
- STEPS lookback analysis  
*Julie Witcover, Assistant Project Scientist, ITS-Davis*
- Alternative fuels in trucks  
*Marshall Miller, Senior Development Engineer, ITS-Davis*
- Modelling and Analysis of Plug-in Series-Parallel Hybrid Vehicles  
*Andrew Burke, Research Engineer, ITS-Davis*
- *Group Discussion*

2:45 p.m. **Coffee/Poster Session:** STEPS team members present their research

4:30 p.m. **Session 4: Policy Panel: How Important are Tradable Credits?**

Moderator: *Dan Sperling, Director, ITS-Davis*

- *Karl Simon, Director, Transportation and Climate Division, US EPA*
- *Alberto Ayala, Deputy Executive Officer, California Air Resources Board*
- *Robert Bienenfeld, Assistant Vice President, American Honda Motor Co., Inc.*
- *Simon Mui, Director, California Vehicles and Fuels, Natural Resources Defense Council*
- *Group Discussion*

5:30 p.m. **Wrap Up and Key Insights**

6:00p.m.–  
9:00 p.m. Reception & Dinner at “Our House Restaurant”  
808 2nd St, Davis, CA 95616

**Friday, December 11, 2015**  
**STEPS Advisory Board Members and representatives only**  
Founder's Board Room  
Walter A. Buehler Alumni Center UC Davis  
530 Alumni Lane; Davis, CA 95616

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8:30 a.m. Arrival and Coffee

8:45 a.m. **Introductions and Present STEPS Program Update and 2015 Achievements**  
*Joan Ogden, Director, STEPS Program; Professor, Env. Science and Policy, UC Davis*

9:15 a.m. **Present and Discuss Proposed STEPS 2016 projects**  
Discussions with STEPS team members across 4 tracks; 2016 proposed project list sent to board members in advance

1. Initiating Transitions (Joan Ogden)
2. Future of Fuels and the Oil and Gas Industry (Amy Jaffe)
3. GUSTO: Global Urban Sustainable Transport (Lew Fulton)
4. MAVRIC: Modeling Analysis, Verification, Regulatory and International Comparisons (Lew Fulton, Julie Witcover)

STEPS board member input is important in shaping the 2016 program. We ask that you review this project list with several questions in mind:

1. Which projects are of keen interest to you and your organization?
2. Which projects would you like to closely follow over the next year?
3. For which projects could you offer up expertise, data, or other relevant information?

11:30am-12:30pm Lunch available, continue discussions with STEPS team members

Posters

#	Title	Team	Description
1	Understanding the role of transportation in meeting California's greenhouse gas emissions reduction target: a focus on technology forcing policies, interactions with the electric sector and mitigation costs	Saleh Zakerinia, Christopher Yang, Sonia Yeh, Joan Ogden	This research improves the representation of technology forcing policies in CA-TIMES and better understanding the interactions between the transportation sector and the renewable intensive electricity grid. I am also improving the current framework of CA-TIMES to show how different mitigation options are portrayed across different sectors (e.g. transportation sector) and end-uses (e.g. light duty vehicles). These model improvements will enable the development of better scenarios for understanding the role of transportation in deep decarbonization scenarios for the state, and enable detailed analyses of the interactions between transportation and other energy sectors.
2	Air Quality and Health Implications from Low Carbon CA-TIMES Energy Scenarios	Christina Zapata, Mike Kleeman, Christopher Yang, Sonia Yeh, Joan Ogden, Nathan Parker, Jimmy Nelson	I have analyzed the criteria pollutant emission changes associated from decarbonizing the grid from the CA-TIMES energy-economic energy scenarios. Air quality simulations indicate interesting findings including which sectors provide the biggest pollution benefit, PM2.5 decreases and ozone concentration decreases, and substantial mortality and cost benefits.
3	COCHIN: Consumer Choice Integration in TIMES and its Implications on Climate Policy Analysis	Kalai Ramea, David Bunch, Christopher Yang, Sonia Yeh, Joan Ogden	Large scale energy systems models have been historically developed to design policies on the supply side, which resulted in having a very detailed supply sector, at the same time, behavioral details are represented much more simply on the demand side. On the other hand, consumer choice models have very detailed demand-side representation but very little supply sector details. This project combines both the approaches to develop a novel modeling framework for robust consumer specific policy analysis.
4	Modeling and analyzing near term transitions to alternative fueled vehicles using a spatial regional consumer choice and fueling infrastructure model	Kalai Ramea, Christopher Yang, Mike Nicholas, Joan Ogden	The research project focuses on developing a spatially detailed analysis of consumer choice, with an emphasis on linking consumer utility with geographic specification of the locations of alternative fuel stations and electric vehicle charging availability in specific high-interest geographic areas.
5	Proposal, methodology and research plan for the transportation energy forecasting in China	Rosa Dominguez-Faus, Xiuli Zhang, Yunshi Wang, etc.	

<b>6</b>	Peak Oil Demand	Dan Scheitrum, Amy Jaffe, Lew Fulton	
<b>7</b>	Systems Analysis and Techno-economic Assessment of Hydrogen Energy Storage via Electrolysis from Curtailed Renewables: A California Case Study.	Christopher Yang, Zane McDonald, Alan Jenn, Joan Ogden	The project focuses on the development of a set of modeling tools to analyze the use of flexible hydrogen production via electrolysis of excess renewables as a strategy to deal with daily and seasonal variability of electricity generation in a system with high renewable penetration.
<b>8</b>	Biofuel Innovation Tracker	Jeff Kessler, Julie Witcover	We are looking to expand the data available for tracking and capturing biofuel innovation.
<b>9</b>	Life Cycle Performance of Renewable Diesel Production from Microalgae	Yizhen Zhang, Alissa Kendall	This study evaluated two production systems for algae-based biofuels. Recommendations of conversion technology and co-product utilization preferences based on lowest environmental performance are provided.
<b>10</b>	Effects of battery chemistry on the life cycle greenhouse-gas intensity of electric mobility	Hanjiro Ambrose, Alissa Kendall	
<b>11</b>	Electric Vehicle Innovation -- how do systemic effects impact deployment?	Jeff Kessler, Gustavo Collantes	Building on innovation theory foundations, we have held in-person meetings with over 30 individuals across three different states to better establish what factors are contributing to or detracting from electric vehicle innovation. We find that knowledge and information barriers act as key deterrents to electric vehicle adoption, and that "champion" dealers help facilitate electric vehicle deployment.
<b>12</b>	Quantifying the Economic Value of Vehicle-Grid Integration: A Case Study of Dynamic Pricing in the Sacramento Municipal Utility District	Kadir Bedir, Joan Ogden	This study develops a stochastic-systems approach in modeling vehicle-grid integration (VGI), where the economic value is evaluated for the consumers and their local utility companies. The proposed methodology is demonstrated in an assessment of VGI for the Sacramento Municipal Utility District (SMUD) in California. The preliminary results show that, considering today's grid system, the deployment of 60,000 PEVs in Sacramento Region will have significant but manageable impacts. These impacts included increasing annual peak demand by 86MWs (%5), and overloading up to 101 neighborhood transformers in the distribution system. On the other hand, adopting proper TOU rates presents a high potential for minimizing these negative impacts of widespread PEV deployment on the grid.

<p><b>13</b> New Concepts for Electric Vehicle Development, from Optimization to Controls and System Architecture</p>	<p>Francis Assadian, Andrew Burke, Ehsan Araste</p>	<p>In this study, we investigate the impact of battery aging, efficiency and performance of EV/HEVs by considering all possible combinations of hardware components, such as energy/power storage devices, such as ultra-capacitors and PV (Photovoltaic Panels), and control software, and functional architectures.</p>
<p><b>14</b> Lithium Titanate Oxide (LTO) and Supercapacitors as an Option for Hybrid Vehicles</p>	<p>Andrew Burke, Jingyuan Zhao, Hengbing Zhao</p>	<p>The use of Lithium Titanate Oxide (LTO) batteries with supercapacitors in micro- and mild hybrid vehicles has been studied. Cycle testing of the LTO cells/module on a cycle to simulate their use with supercapacitors indicated that their charge acceptance was excellent even at a charging power of 2000W (500W/cell). The test data indicated that the LTO battery would be an excellent choice for micro-hybrid applications.</p>
<p><b>15</b> Modelling and Analysis of Plug-in Series-Parallel Hybrid Medium-Duty Vehicles</p>	<p>Hengbing Zhao, Andrew Burke</p>	<p>This research studies various powertrain architectures for MD vehicles. Series-parallel hybrid powertrains for the PHEV delivery trucks were modelled and compared with a conventional diesel and a mild/full parallel hybrid to explore the fuel economy potential of each technology over a wide range of duty cycles.</p>
<p><b>16</b> Electrification of Drayage Trucks: On track for sustainable freight</p>	<p>Hanjiro Ambrose, Miguel Jaller</p>	<p>California, given its status as the largest gateway for international trade and domestic commerce in the nation, has identified the need to reduce the negative impacts of freight activity, especially near ports, railroads, highways, and other key facilities. As part of a comprehensive approach, the State has initiated demonstration projects to improve short-haul trucking at maritime Ports, and evaluate alternative fuels for drayage trucks. The purpose of this paper is to: one, examine the results from a pilot of electric drayage trucks at the Port of Los Angeles using secondary and publically reported data; and two, to assess emissions reductions with increased electrification of port truck operations through the implementation of potential drayage policies.</p>
<p><b>17</b> Understanding the transition to alternative-fueled medium- and heavy-duty trucks: Modeling emissions, costs, fuel infrastructure, and decision-making into future truck scenarios</p>	<p>Lew Fulton, Marshall Miller, Christopher Yang, Dominique Meroux (GSR)</p>	<p>This research focuses on quantifying factors that truck fleet buyers consider when selecting fuel type, and associated implications, e.g. what does this mean for emissions, what kind of incentives or infrastructure density is needed to support levels of adoption needed to meet CA climate goals?</p>

<b>18</b>	Improving Freight Efficiency in California	Miguel Jaller, Leticia Pineda, Laura Cackette	This poster shows the preliminary results from the stakeholder engagement and literature review conducted by the team to identify a set of sustainable freight strategies to improve freight efficiency in the State of California.
<b>19</b>	The need to develop a demand management system that considers both passenger and freight traffic	Miguel Jaller, Farzad Alemi	This poster shows the simulation results of the potential implementation of freight and passenger demand management strategies in a Metropolitan Area. The preliminary research concentrates on travel activity and delays. The future work during the new project will estimate the environmental and energy benefits of such a demand management framework.
<b>20</b>	Rail Propulsion Technologies for Passenger and Freight Rail: Updated Scenarios	Raphael Isaac, Lew Fulton	The team has refined a freight rail scenario updating costs for hydrogen. Emissions shows low-to-high ranges. With current costs, cleanest fuels are not particularly cost effective; similarly, cheapest fuels do not offer much of an environmental benefit.
<b>21</b>	Introduction to STEPS 2016 Aviation Project	Guozhen Li, Lew Fulton	Part of the STEPS 2016 Rail & Aviation Project. The aviation part of the project will review the existing air travel and energy use literature, and utilize the AIM (Aviation Integrated Modeling) tool to create new baseline projections for air travel in North America. Additionally, at least one low-carbon scenario will be developed based on adjustments in travel patterns, savings from air traffic control improvements, technology uptake, and alternative fuel potential.
<b>22</b>	The potential for dramatically increasing bicycle and e-bike use in cities around the world, with estimated energy, CO2 and cost impacts	Lew Fulton, Zane McDonald	This report presents a new look at the future of cycling for urban transportation on a global scale and the potential contribution it could make to mobility, accessibility, and sustainability.
<b>23</b>	An analysis of funding mechanisms for the CVRP through 2025	Julie Schiffman, Lew Fulton	This research looked at initial assessments of different fee systems based on the sales of new (non-plug-in) light-duty vehicles in California that would be sufficient to fund incentives for ZEVs under the CVRP program in the near term. Through various fee designs and structures, we compare them in terms of their effects on fees paid by different household types and income levels. We found that even restricting fees to purchases by wealthier households, the CVRP could be fully funded today with an average new LDV fee of under \$250.



STEPS 2015 Projects			
No.	Title	Team	Description
1	<b>STEPS Scenario Model for Alternative Fuel Adoption in the U.S.</b>	Joan Ogden (PI), Lew Fulton (co-PI), Dan Sperling, Julie Schiffman	To explore transition issues, we have developed a simplified scenario model (“STEPS scenario”), for alternative fuel adoption in the United States that is broadly consistent with results from more complex energy/economic optimization (IEA 2012) and consumer choice models (NRC 2013). The STEPS scenario is used as a basis for estimating transition costs for “launching” various types of new vehicles and fuels, e.g. bringing them to lifecycle cost competitiveness with incumbent technologies.
2	<b>COMPLETED: Workshop on AFVs 2025 (May 12, 2015)</b>	Lew Fulton (PI), Sonia Yeh, Joan Ogden	This STEPS one-day workshop (day 1 of 2) will explore transportation in the United States and California 5, 10, and 15 years from now in terms of baseline trends and targets. We will also provide commentary and discussion on those targets, explore the prospects for achieving targets and policy implications, and help set a research agenda for the STEPS 2015-2018 Program. The workshop will consider what types of methods and analysis techniques are needed and could be developed under the STEPS 2015-2018 Program to better analyze these questions, helping us set specific research projects and goals for the STEPS Initiating Transitions project.
3	<b>Hydrogen Infrastructure for LDVs</b>	Amy Jaffe (PI), Joan Ogden, Rosa Dominguez, Guozhen Lee (GSR), Daniel Scheitrum (GSR)	Apply modification of the STEPS NG model to case of hydrogen infrastructure for light duty vehicles. Look at how much subsidy would be required to launch the H2 infrastructure, scale it up to profitability.
4	<b>PEV Transitions: "What is required for early alternative fuel/vehicle transitions to succeed?"</b>	Tom Turrentine (PI), Dahlia Garas	Are we in the middle of a transition to plug in electric vehicles? The world market for PEV began in December 2010. In 2015, the number PEVs worldwide will reach 1 million. This project tracks basic statistics on the development of this market, including policies, product rollout, consumer response and infrastructure development on a world basis. Dr. Turrentine will also work on a new effort with Lew Fulton to characterize the evolution of this market for market projections. The PH&EV Center investigates the transition to electricity as a fuel, funded by State and Federal Agencies, as well as some support from automakers, conducting around \$1-2 million in PEV transition research each year. The Center has developed three major data streams for the next 3 years, annual survey of the US auto market across 12 states (Dr. Kurani), surveys of PEV buyers across 14 states (Dr. Gil Tal) PEV infrastructure studies, used PEV markets (Dr. Turrentine and Gil Tal) and a major data collection (Dr. Mike Nicholas) from 250 PEV households. In the coming years, this data stream will be one of the primary and best sources of understanding of the transition to electricity in the world. Dr. Turrentine will provide a detailed description of this work and results highlights from this data collection effort at STEPS symposia.

5	<p><b>Lifecycle Cost Models (1. Advanced Liquid Fuel Vehicles and Hybrids, 2. Transitions to gaseous fuels-natural gas and hydrogen, 3. Transitions to Plug-in vehicles - EVs and PHEVs)</b></p>	<p>Andrew Burke (PI), Marshall Miller, Hengbing Zhao, Gustavo Collantes, GSRs</p>	<p>The purpose of this project is to develop a lifecycle cost of ownership model to support the deployment of electrified gaseous fueled vehicles. By tracking the new models/ technologies that will be introduced by the auto companies from 2015-2030 these projections will form present and future baselines, which will be compared with more advanced transition vehicles in terms of performance, cost, and fuel availability requirements. Research will include an assessment of how the markets for gaseous fueled vehicles of various classes will likely develop, how markets for hydrogen and natural gas vehicles may be related, and whether an increase in the market for natural gas vehicles could be a bridge to the more rapid expansion of hydrogen fuel cell vehicles. The success of the future mass marketing of electrified vehicles will be dependent on the battery technologies developed and the economics/costs/durability of the batteries.</p>
6	<p><b>Modeling and analyzing near term transitions to alternative fueled vehicles using a spatial regional consumer choice and fueling infrastructure model</b></p>	<p>Christopher Yang (PI), Michael Nicholas, Kalai Ramea (GSR)</p>	<p>The research will combine two approaches into a spatially detailed analysis of consumer choice with geographic specification of refueling stations and charging availability in specific geographic areas (Southern California, San Francisco Bay Area, and others). 1) We will analyze consumer purchase decisions at an appropriately fine level of detail as they relate to demographic features such as income, population density, fuel availability, average travel distances and others. 2) A Geographic Information System (GIS) will be used as a tool for simulating a NMNL vehicle choice function with varying demographic and utility parameters across each population "node", and thus different choice probabilities and market shares for specific vehicle technologies (gasoline, hybrids, diesels, plug-in hybrids, battery electric vehicles, fuel cell vehicles, and natural gas vehicles).</p>
7	<p><b>PEV Consumer Studies</b></p>	<p>Ken Kurani (PI), Nicolette Caperello</p>	<p>Specific topic TBD. Potentially: <i>"Leveraging Social Network Connections to Drive Alternative Fuel Transitions."</i> After the introduction of PEVs to the California market (and other markets), our survey research in 2014 shows that most car owning households in the state are unaware PEVs are for sale, have no knowledge of incentives such as the (CVR) or any other potential benefits and costs of owning and driving PEVs. Research has shown that PEV drivers and ICEV drivers who are aware of PEVs, initially heard about PEVs from coworkers, friends, or family, i.e., their social networks. The anticipated results are a description of whether and how personal social networks of PEV drivers diffuse PEV information and assist to translate this information into personally relevant assessments of PEVs for those people in the network who are not PEV owners. These data may prove essential to leveraging the experience of PEV buyers to promote PEV sales.</p>

8	<b>Changing Impact of Technological Changes and Urbanization on Efficiency and Global Oil Demand</b>	Amy Jaffe (PI), Rosa Dominquez-Faus (co-PI), Lew Fulton, Sonia Yeh, Yunshi Wang, Daniel Schreitung (GSR), additional GSRs	In this study, we seek to quantify the impact of digital resource productivity and advanced automotive technologies on future oil demand trends through a set of sector specific global energy demand modeling exercises, with detailed scenario analysis of possible trends in the global transportation sector. Efforts will include comparative global energy market modeling studies tapping tools such as GCAM and Arrowhead models as well as focused optimization case studies on 1) the potential for alternative fuels in the US and China's freight and China's light duty vehicle sector, 2) on the impact of urbanization in major cities on oil demand trends, and 3) on evidence of changes in demand patterns through the advent of digital internet of things software management on sector specific patterns of energy use in the United States.
9	<b>Database and Analysis of Emerging Fuel Pathways in Key Policies (CA LCFS, RFS)</b>	Julie Witcover (PI), Lewis Fulton, Mounir Fellahi (GSR)	What can basic information about emerging fuel pathways in the main fuel policies (fuel type/CI, location of production, timing of application or approval) tell us about how alternative fuel markets are responding to the policy landscape? The research will use simple descriptive and exploratory data analysis to examine characteristics of new fuel pathways (frequencies, crosstabs, cluster analysis) as well as indicators of agency performance (e.g., pathway petition processing time).
10	<b>Screening for Sustainable Fuels - Towards a Workable Tool (pending 2016 project)</b>	Julie Witcover (PI), Lewis Fulton	How to identify and sustainably source feedstocks has emerged as a key challenge for biofuels. The research will compare different sustainability schemes developed by NGOs, policymakers, and industry, building on efforts to inform policy in Europe and developed by industry: do they identify a 'minimum dataset' of accessible indicators to flag fuel/feedstock sustainability issues or tradeoffs? How much do they need to be customized for particular feedstocks or locations (especially for California)? The research may also explore issues related to sustainability monitoring for existing pathways.
11	<b>The Potential for Low-carbon Vehicles in Cities Around the World</b>	Lewis Fulton (PI), Gil Tal, Aria Berliner (GSR), Anqi Zhao (GSR)	"Urban MoMo" has been used to create a baseline and one alternative scenario of future urban travel around the world, with a focus on travel by different modes and the potential impacts of a high modal shift scenario versus a baseline projection. This proposal will extend the work of the previous project to create a "Low-carbon Vehicle" (LCV) scenario that could be linked to the modal shift scenario, kept separate, or both. The approach will focus on improving vehicle technology and fuel efficiency. The results of this project will provide the first ever set of estimates of the potential for LCVs in cities around the world, barriers in specific parts of the world that must be overcome, realistic market penetration rates, and maximum market share rates by different milestone years such as 2030 and 2050. This project will also explore use of big data to understand mobility in Indian cities.

12	<b>Generation Y Travel Survey: An International Investigation of Mobility Patterns and Vehicle-Related Aspirations of Millennials</b>	Lewis Fulton (PI), Giovanni Circella	<p>This project builds on research efforts currently underway at UC Davis to better understand personal attitudes, lifestyles, residential location and travel patterns of young adults (“Millennials”, or “Generation Y”). The project includes the design of a detailed online survey, and the relative data collection and data analysis for a sample representative of the population of young adults (between 18 and 34) in California. This study will provide important insights into millennials' travel behavior and aspirations to purchase and use a private vehicle (vs. the use of other modes), and will investigate the motivations behind these trends. It will have an international and urban aspect while also including a US and some non-urban component as part of a broad comparison of the factors affecting young adults' mobility-related decisions. The results from this study will be of interest for the scientific community, state agencies, environmental organizations, car-manufacturers and a vast audience of policymakers.</p>
13	<b>Donate Your Travel Data: Building an International Travel Dataset One Android User at a Time</b>	Gil Tal (PI), Michael Nicholas, Anqi Zhao (GSR)	<p>Researchers are struggling to collect better data on actual travel behavior in different locations over long time periods study travel behavior, changes in miles travel, mode choice, commute patterns and more by using the data collected by Google and is available to the android phone users. The study will include three tasks. (1) Exploring google data to evaluate travel mode, travel distance, average speed and other variables based on researchers personal data. (2) Developing tools to anonymize donated data by randomizing origins and destinations. (3) Developing a website to guide android users on the steps needed to download their data anonymize it and upload it to our website. (4) Collecting data in Davis and validating the tool accuracy.</p>
14	<b>Deep New Mobility Services: Greenhouse Gas and Vehicle Travel Reductions from Future New Mobility Services</b>	Caroline Rodier (PI), Farzad Alemi, MS TTP student; Dylan Smith, Senior, computer Science	<p>Very little research has explored how new mobility options (e.g., dynamic ridesharing, smart jitney services, vehicle-sharing, and transportation network companies) may interact synergistically with one another and with land use, transit, and auto pricing policies. It is important to understand what the magnitude of those interactions might be with respect to VMT and/or GHG reductions. The study uses the Bay Area and the Sacramento ABMs to examine the potential magnitude of markets for and VMT and/or GHG reductions from new mobility services in different combinations with and without land use, transit, and auto pricing policies. New mobility services will be combined with the region's sustainable community strategies and auto pricing scenarios to understand potential synergies for reductions in vehicle travel and greenhouse gas emissions.</p>

15	<b>Energy Economic System Modeling to Support Policy Analysis: Modeling Analysis, Verification, Regulatory and International Comparisons (MAVRIC)</b>	Sonia Yeh (PI), Lew Fulton, Chris Yang, Alan Jenn, David Bunch, Yueyue Fan, Amy Jaffe, Andy Burke, Gouri Shankar Mishra, Kalai Ramea	<p>The paper will contain the continued developments of a wide range of modeling tools for energy assessment and developing forecast, and evaluating alternative policies when evaluating policy scenarios. The research will also engage in modeling comparison efforts to improve the state of knowledge of plausible pathways/scenarios for future technology adoption, energy use, air quality and greenhouse gas (GHG) emissions, and policy impacts across a range of modeling tools to extract robust policy insights. Modeling tools will be used to identify barriers and progress toward meeting climate policy, energy, and sustainability (which include, but not limited to, air quality, air quality, water, and land use) goals. These efforts will serve as an independent effort to improve modeling practices in the area of sustainable transport with a geographic scope that includes California, the US and the world.</p>
16	<b>Trucks Modeling: Modeling and Analysis of Emissions and Costs of Sustainable Truck Futures - Incorporating Spatiality and Decision Making into Future Scenarios</b>	Christopher Yang (PI), Marshall Miller, Lew Fulton, Andy Burke, Hengbing Zhao, Dominique Meroux (GSR)	<p>The research will develop a detailed truck model that can be used to analyze scenarios for the future deployment of trucks in the United States and in the state of California. The model will focus on analysis of low-carbon, low criteria pollutant truck technologies such as hybrid, natural gas, fuel cell and electric trucks across trucking sectors. It will incorporate a detailed representation of various truck classes and service demands, detailed estimate of truck efficiencies as a function of driveline, fuel, and sector, a representation of truck purchase decision making in a discrete choice framework, a stock-turnover model to account for truck purchase, vehicle scrappage, and resulting fleet energy and emissions performance. These elements will also be brought together in a specific regional framework to assess impacts of criteria pollutants on non-attainment areas.</p>
17	<b>Exploring Alternative Fuels for Non-highway Modes</b>	Lew Fulton (PI), Marshall Miller, Raphael Isaac, Guozhen (Allen) Li (GSR)	<p>This project will investigate advanced technology and fuel options for non-highway transportation modes (including rail, air and marine/ports). The focus during 2015 is on finishing studies on fuel options and refueling infrastructure requirements for these options for aviation and rail systems, Side-by-side comparisons are being developed of a range of fuels for commercial aircraft and passenger and freight train systems that take into account vehicle costs, fuel production costs, and fuel infrastructure costs in the near and longer term. Other issues around the viability of different fuels are also being considered (such as aircraft refueling time, fuel storage requirements, etc.). The results of this project will set the stage for an analysis in 2016 of the potential for the co-development of refueling infrastructure for multiple transport modes such as road/rail/airport in specific locations such as California, using a spatial model.</p>

18	<b>Incorporating Strategic Business Behaviors in Infrastructure System Modeling</b>	Yueyue Fan (PI), Zhaomiao Guo (GSR)	The main research goal of this project is to develop a modeling method for incorporating different interests and behaviors of multiple stakeholders in alternative energy infrastructure system modeling. The first model will look at the strategic investment planning of renewable energy considering infrastructure interdependence, uncertain supply and demand, and industrial competition in an oligopolistic power market. The second will focus on the competition among alternative liquid transportation fuel industries under various environmental policies. The anticipated research results include; A general SMPEC modeling & computing method that can be shared among STEPS researchers; A strategic energy infrastructure investment planning model in an oligopolistic power market; A transportation fuel portfolio model considering industrial competition under various environmental policies and programs; Engineering design insights and policy implications drawn from the two application studies.
19	<b>Modeling Vehicle Grid Integration (VGI): Value Assessment of Plug-in Electric Vehicle Deployment on the Grid</b>	Dr. Joan Ogden (PI), Mark Lubell (PI), and Kadir Bedir (GSR)	Numerous studies have studied impacts of PEV deployment on the grid, however, the economic and environmental benefits of PEV-based grid services have not been studied extensively, and most analyses are underdeveloped, inconsistent or have not been validated by the vehicle-grid stakeholders. In this research, we propose a comprehensive analysis of PEV impacts considering both, distribution infrastructure and electricity generation, for a mid-size utility region. The results will help addressing the questions of; how can the existing VGI solutions be evaluated with considering electric utilities' individual grid operations; and what is the economic implications of enabling these VGI solutions to the PEV consumers modeling methodology will provide a roadmap for energy planners on how to evaluate technical and economic implications of major VGI solutions for two major agents; electric utility company and the PEV buyer.
20	<b>Improving Transportation Fuel Policy Design with Robust Decision Making</b>	Richard Plevin (PI), Gouri Shankar Mishra (GSR)	The goals of this project are 1) to improve the efficacy of policies aiming to reduce the global warming intensity (GWI) of transport fuels by 2) improving the analytical methods used to design and analyze these policies. The project incorporates advanced modeling, "robust" decision-making methods, and high-performance computing to identify policy variants that perform well compared to alternatives in the context of uncertainty. Although the case study addresses fuel policies, the modeling framework and methods developed herein are applicable to a broad range of policies. This project will yield both a general software framework and a robustness analysis of alternative policies to mitigate the climate change impacts of transportation fuels, with recommendations for potential improvements to current policies.

21	<b>Vehicle Controls and System Architecture</b>	Francis Assadian (PI), Andy Burke (co-PI), Hengbing Zhao, GSRs	In this project, the optimization of an EV/HEV powertrain using a new physical concept will be addressed to investigate the feasibility of components such as ultra-capacitors. In addition, simultaneous optimization of the control algorithm and the physical model of the powertrain will be investigated. This simultaneous optimization should result in a more energy efficient and lower cost powertrain.
22	<b>Ex-post Analysis of STEPS Scenarios: Lookbacks to Inform Future Modeling</b>	Julie Witcover (PI), Sonia Yeh (co-PI), postdoc TBD, GSR TBD Fall 2015	How does information used in models and scenarios developed during STEPS 2007–2010 and NextSTEPS 2011–2014 programs compare to actual market performance? What lessons can be learned and applied to improve modeling and scenario efforts?



**Registrants**

First name	Last Name	Job Title	Company/Organization
Eric	Cahill	President	Adaptiv LLC
Peter	Ward	Principal	Alternative Fuels Advocates
Jamie	Davies	Senior Environmental Affairs Analyst	American Honda Motor Co., Inc
Ryan	Harty	Manager of Environmental Business Development Office	American Honda Motor Co., Inc
Robert	Bienenfeld	Assistant Vice President	American Honda Motor Co., Inc.
Jim	Kliesch	Environmental Regulatory Affairs Manager	American Honda Motor Co., Inc.
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Xin	He	Fuels Technical Specialist	Aramco Services Company
Amy	Jordan Bason	Energy Analyst	Aramco Services Company
Jean-Christophe	Monfort	Research Engineer	Aramco Services Company
Steve	Przesmitzki	Strategic Transport Analysis	Aramco Services Company
Julia	Levin	Executive Director	Bioenergy Association of California
Julia	Sohnen	Advanced Technology Engineer	BMW Group
Jim	Boyd	Owner	Boyd Consulting
Nate	Springer	Manager, Advisory Services	BSR
Tim	Carmichael	President	CA NGV Coalition
Mark	Wenzel	Climate Change Adviser	CalEPA
Alberto	Ayala	Deputy Executive Officer	California Air Resources Board
Marijke	Bekken	Staff Air Pollution Specialist	California Air Resources Board
Analisa	Bevan	Assistant Division Chief, ECARS	California Air Resources Board
Mike	Carter	Asst. Division Chief	California Air Resources Board
James	Duffy	Manager, Alternative Fuels Section	California Air Resources Board
Timothy	Hartigan	Air Pollution Specialist	California Air Resources Board
Jeremy	Herbert	Air Resources Engineer	California Air Resources Board
Sarah	Pittiglio	Research Coordinator	California Air Resources Board
William	Robertson	Vehicle Program Specialist	California Air Resources Board
Adriana	Smith	Air Pollution Specialist	California Air Resources Board
Erik	White	Chief, Mobile Source Control Division	California Air Resources Board
Aniss	Bahreinian	Energy Commission Specialist	California Energy Commission
Kadir	Bedir	Specialist - EV Infrastructure	California Energy Commission
Rhetta	deMesa	Advisor	California Energy Commission
Tim	Olson	Energy Resources Manager	California Energy Commission
Larry	Rillera	Air Pollution Specialist	California Energy Commission
Lindsee	Tanimoto	EV Team Lead	California Energy Commission
Lin	Zhu	Air Pollution Specialist	California Energy Commission
Ryan	Schuchard	Policy Director	CALSTART



Steve	Cliff	Asst. Director for Sustainability	Caltrans
Tracey	Frost	Acting Office Chief, Regional Planning	Caltrans
Lauren	Iacobucci	Transportation Planner	Caltrans
Soheila	Khoii	Research Manager	Caltrans
Ann	Mahaney	Smart Mobility Branch Chief	Caltrans
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Brett	Williams	Senior Project Manager, EV Initiatives / CVRP	Center for Sustainable Energy
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Anthony	Eggert	Director	ClimateWorks
Tim	Frazier	Director of Engineering	Cummins Westport
Karim	Hamza	Senior Research Scientist	DAKO / Toyota Research Institute, North America
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Dean	Kato	Consultant	Toyota
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Lisa	Snapp	Center Director	US EPA
Karen	Hamberg	Vice-President, Strategy	Westport
Patric	Ouellette	CTO	Westport

### Sustainable Transportation Energy Pathways (STEPS) Program

[www.steps.ucdavis.edu](http://www.steps.ucdavis.edu)

STEPS is the major multidisciplinary research consortium within the Institute of Transportation Studies at the University of California, Davis. The consortium is comprised of 40+ PhD-level faculty and researchers and graduate students from UC Davis, 20+ industry and governmental partners, and 20+ outside expert organizations. Our mission encompasses research, outreach, and education:

- Generate new insights and tools to understand the transitions to a sustainable transportation energy future for California, the U.S. and the world
- Disseminate valued knowledge and tools to industry, government, the environmental NGO community, and the general public to enhance societal, investment, and policy decision making
- Train the next generation of transportation and energy leaders and experts

The STEPS 2015–2018 program is generously supported by these sponsors (including pledges and commitments):

- Auto: BMW, Cummins, Daimler, Ford, Fiat Chrysler, GM, Honda, Renault, Toyota, Volkswagen, Westport
- Energy: Aramco, Chevron, Centre for High Technology (India), Shell, San Diego Gas & Electric/ SoCal Gas Co., Sinopec
- Government: California Air Resources Board, Caltrans, South Coast AQMD, U.S. DOE, U.S. DOT, U.S. EPA

STEPS has initiated a 2015–2018 research program. The main program areas and overarching research questions are:

- **Initiating Transitions 2015–2030**  
What is required for early alternative fuel/vehicle transitions to succeed?
- **The Future of the Fuels and the Oil & Gas Industry**  
How will changing geopolitical landscapes and disruptive technology in the oil and gas and clean technology industry impact future business models and the competition of fuels?
- **Global Urban Sustainable Transport (GUSTo)**  
How will a rapidly urbanizing world affect demand for transport and energy? How can we transition to sustainable transportation in a rapidly urbanizing world with ever-growing need for mobility?
- **Modeling Analysis, Verification, Regulatory and International Comparisons (MAVRIC)**  
What do improved and cross-compared economic/environmental/transportation/energy models tell us about the future of sustainable transportation?

## Survey - STEPS Fall 2015 Symposium

*Please complete and return in person or via email to Paul Gruber ([pwgruber@ucdavis.edu](mailto:pwgruber@ucdavis.edu))*

Your Name and/or Organization (optional):

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1. How did today's event help improve your state of knowledge of STEPS issues (i.e., critical transition dynamics for alternative fuels and vehicles)?
2. What were your key insights from this event?
3. Which was the most insightful presentation? Why?
4. Which poster was most insightful? Why?
5. What new research questions should we tackle in 2015 and beyond?
6. How could we improve this event for next time?

Other feedback?