California Clean Mobility Partnership

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California Clean Mobility Partnership

Team

- University of California (Berkeley and Irvine)
- California Air Resources Board
- Toyota
  - Toyota Engineering and Manufacturing North America
  - Toyota Motor Sales
- South Coast Air Quality Management District
- Bay Area Air Quality Management District
- Southern California Edison
- Horiba, Ltd.
Presentation Overview

- CCMP Overview
- Household Placements
  - Vehicle Usage Data Collection
  - Focus Groups
  - Surveys
  - Exit Interviews
- Technical Analysis Informed by Household Placements
CCMP Overview

- Assess Technical and Market Barriers and Opportunities for:
  - Plug-In Hybrid Electric Vehicles (PHEV)
  - Fuel Cell Hybrid Vehicles (FCHV)
  - Conventional Prius as “control”

- Drivers’ Comparative Responses to HEV (Prius), PHEV, and FCHV

- Trade-off Between Vehicle Characteristics, Environmental Impact and Vehicle Cost
Program Elements

- Household Placements (HEV, PHEV, FCHV)
- Energy Use and Cost Analysis
- Air Quality and GHG Emissions Analysis
- PHEV/Utility Grid Interaction
- PHEV Testing and Certification
- PHEV Technical Evaluation
- Education and Outreach Messages
Vehicle Characteristics and Fuels

**HEV:** Prius as Control Vehicle

**PHEV:**
- 500 + Mile Combined Electric and Gasoline Range
- Approx. 7 Mile Range and 4 Hour Charge Time (110v)
- Charge at Home and at Work

**FCHV:**
- Approx. 150 Mile Range With 3.5 kg of Hydrogen Fuel Storage (at 5,000 psi)
- Next Generation Vehicles with 10,000 psi Storage Will Have Double the Range
- Fuel at One Central Location
Household Placements

Screening and Placement

- Northern and Southern California
- Company and Individual Participation
- Consecutive exposure (4 weeks/vehicle)
  - HEV (Prius)
  - PHEV (Toyota modified Prius)
  - FCHV (Toyota Highlander)
- Drive as Normal Personal Car
Research Methodology

- Vehicles Equipped with ITS Technologies to Track Usage Patterns
- Focus Groups Before Exposure to Vehicles
- Longitudinal Survey at Two Week Intervals
- Exit Interviews
Participant Response to Vehicles

- Vehicle Attributes (Range, Performance, Drivability, Acceleration/Braking, Fueling)
- Specific to technology
- Comparative Among Technologies
- Ownership and Fueling Perceptions (Cost, New Fueling Arrangements)
- Attitudes Towards Environment
- Willingness to Consider Innovative Technologies
- Fueling patterns & perceptions
Energy Use and Economic Analysis

- Analyze Potential Energy Use, Environmental Impacts and Economics of Vehicle Types Based on Household Usage Patterns:
  - Criteria Pollutant Emission Analysis
  - GHG Emission Analysis (fuel cycle basis)
  - Assess Economics of Vehicle Operation
  - Understand Impacts of Economics on Driving Behavior
- Probe “Willingness-to-Pay” for Different Vehicle Types
Urban Air Quality Analysis

- Leverage the Experience and Capability from CEC/ARB/AQMD UCI Research on Assessment of the Impacts of Distributed Generation, Vehicle, and Fueling Scenarios on Urban Air Quality

- Establish PHEV and Distributed Generation Scenarios for the Selected Years of Analysis

- Collaborate with Local AQMDs to Assess Potential Emissions/AQ Impacts of PHEV Use
PHEV/Utility Grid Interaction

- Characterize Impact on Grid Capacity, Diurnal Demands
- Establish the Grid Emissions Associated with PHEV Charging
- Critically Analyze Scenarios for Grid Support through PHEV Connectivity
- Develop Grid Connection Scenarios and Draft Protocols for Managing and Controlling PHEV Charging and Storage Resources
PHEV Certification

- Evaluate Challenges of PHEV Certification Considering All Electric Range
- Identify Gaps Between Current Certification and Requirements for PHEV Certification
  - Define Appropriate Duty Cycles for PHEVs
  - Define All Electric Range for PHEVs
  - Evaluate Impacts Between All-Electric and “Blended” Hybrid Architecture
- Delineate Instrumentation and Testing Protocols
- Establish Factors that Influence Transient Bursts of Criteria Pollutant Emissions During Extended All-Electric Driving Mode
Technical Evaluation

Evaluate Technical Attributes of PHEVs:

- Battery Performance and “Health” Issues Related to Capacity, State of Charge, and Duty Cycles
- Benefits and Differences in Maximized All Electric Range Versus “Blended” Power
- Influence of Extended Electric-Mode Driving on the Release of Criteria Pollutants

Collect and Evaluate Data On:

- End-User Charging Behavior
- Driving Behavior
- Level 1, 2, and 3 Charging on PHEV Battery Life, PHEV Architecture Costs, and PHEV End-User Utility
- Sourcing of System Battery Components to Tier One or Third-Party Suppliers
Education and Outreach

Provide materials for future education and outreach campaigns that target key questions and issues that the public may have about advanced technology.
Project Team

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