

Speaker Topics

- **Green Vehicle Overview:**
 - Mr. Cliff Nakayama, UCGEC, Mostwell International LLC
- **Enabling Battery & System Technologies:**
 - Professor Andrew A Frank, Efficient Drivetrains Incorporated
- **Mr. Saul Zambrano, PG&E**
- **Market for Electric Vehicles in China:**
 - Dr. Peng Zhou, Electric Vehicle Technologist
- **Policies, Incentives & Regulations:**
 - Mr. Matthew Crosby, California Public Utilities Commission



Electric Recharging Infrastructure & Business Models

Saul Zambrano

Director – Clean Air Transportation
Pacific Gas and Electric Company

June 22, 2009

PEV Sustainable Demand Scenario – What’s Changed



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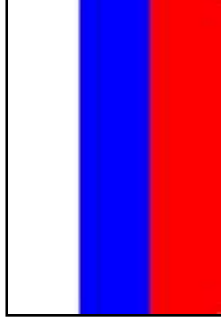


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- Consumers ✓
- Batteries ✓
- Oil Companies ?
- Car Companies ✓
- Government ✓
- Hydrogen ✓

- Consumers ✓
- Government ✓
- Oil Companies ?

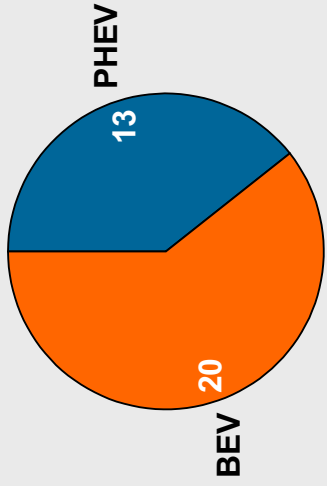


The electric vehicle is really coming



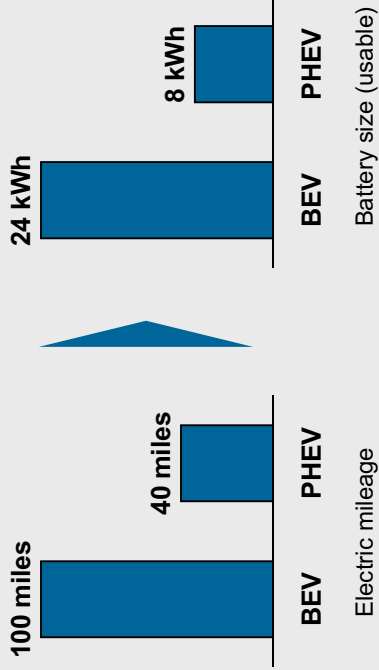
Electric vehicles will have a larger impact on utility operations than people expect

Larger number of BEVs coming to market

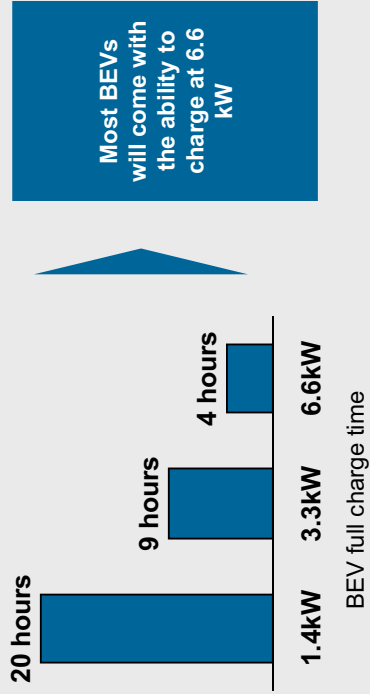


of models announced

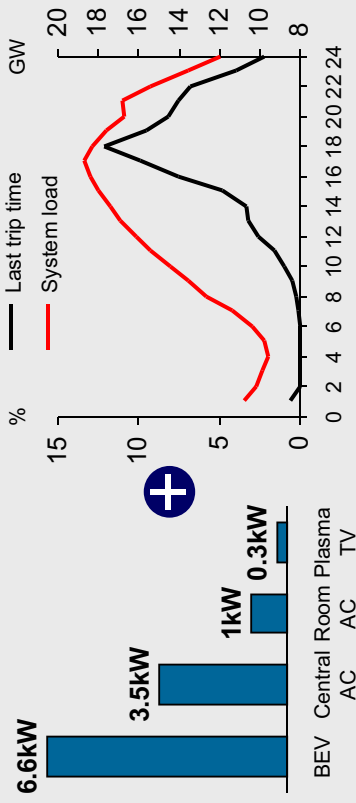
These BEVs have extended range



They require higher charging capability



They represent substantial impact on the grid





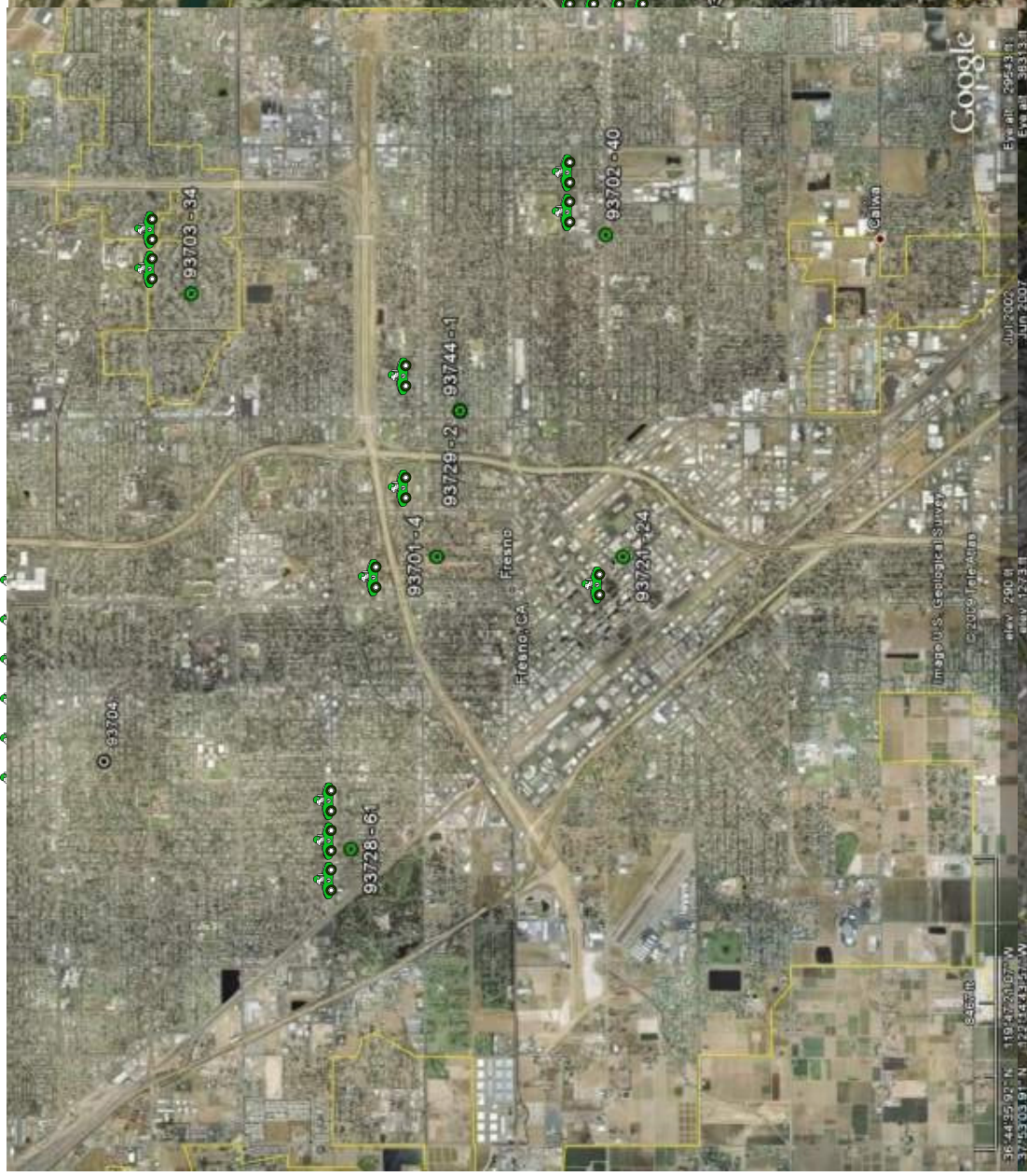
HEV Density “2004-08” – A Tale of Two Cities

Fresno CA:

- New Registrations: 83K
- HEV Registrations: 2K
- 2.4% of light duty purchases HEVs
- HEV zip code median: 11

Berkeley CA:

- New registrations: 14K
- HEV registrations: 2.5K
- 18% of light duty purchases HEVs
- HEV zip code median: 212

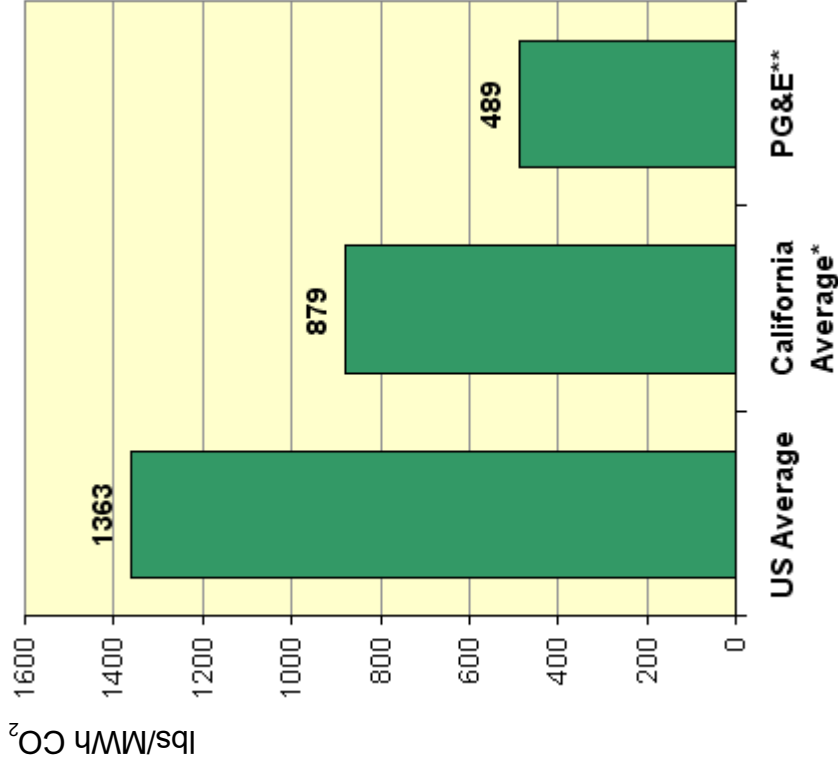


= 25 HEVs



Greenhouse Gas Emissions and the Electric Utility Sector

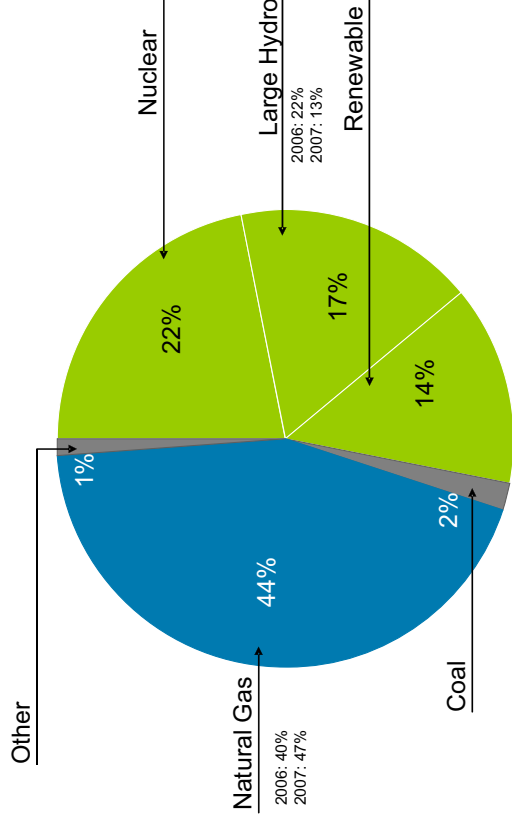
GHG Emissions for Delivered Electricity



* Source: U.S. Environmental Protection Agency eGRID Version 2.1 (updated April 2007 and based on 2004 data)

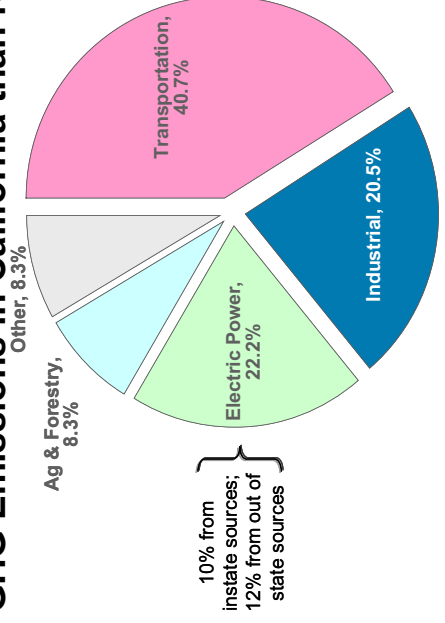
**PG&E's 2006 emissions rate has been certified in accordance with California Climate Action Registry protocols

> 50% of PG&E's Portfolio is Carbon-Free

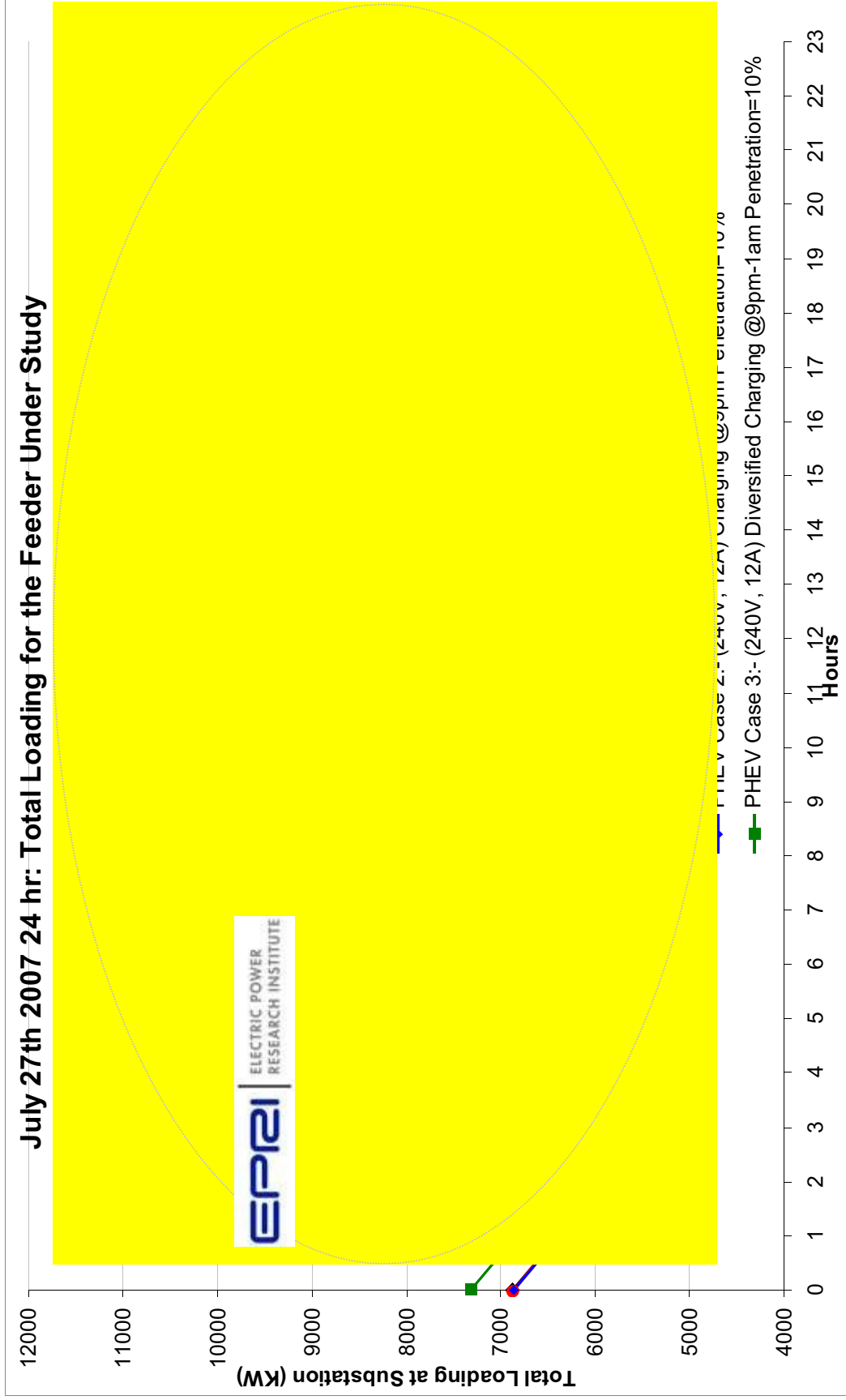


Note: Delivery mix includes all of PG&E's owned generation plus all of PG&E's power purchases.

Electric Utility sector comprises a smaller share of total GHG Emissions in California than Nationwide



Load and T&D TOU Impact Analysis



SmartGarage Network Architecture

