EVs, Climate, & Smart Grid: The View from California

Richard Schorske

Executive Director, EV Communities Alliance

June 30, 2010 | richards@dsnetwork.org

EV Communities Alliance Overview

- **A Public/Private Collaborative** formed in Fall, 2009 to Prepare California's Metro Regions for the EV transition
- **Initial Focus is the Bay Area EV Corridor** – Bringing 1000+ EV Charge Stations to SF Area (pop. 7 M)
- **Developing LA – SF Fast Charge** Corridor
- **Key Partners** -- Association of Bay Area Governments (105 cities), Coulomb Tech, Better Place, City of SF
- **Launching *Ready, Set, Charge California!*** to Address:
  - EV installation streamlining
  - EVs in building codes and public works
  - GO EV marketing campaign
  - Partners include the Electric Power Research Institute, Clean Fuel Connection, GM, & CA Utilities

California and EVs

- **CHALLENGE: Vehicle emissions are 39% of GHGs** in state (~ 50% in Bay Area), 28% for electricity generation
- **STATE RESPONSES:**
- **State's "Global Warming Solutions Act" (AB 32)** calls for 80% cut in GHGs by 2050 – return to 1990 levels (~20% below current levels by 2010)
- **CA investing $1.6 billion over 6 years for alternative fuel vehicles**, including biofuels, CNG, hydrogen, electricity. EV strategic plan likely in 2011.
- **State goal = 78% EVs** & Fuel Cell market share by 2050
- **Zero Emissions Vehicle mandate** requires manufacturers to sell specific #'s of near-zero emissions vehicles each year, including FCVs, Plug-in Hybrids (PHEVs), or Battery-Electric Vehicles (BEVs)

Federal Gov't as Key Policy Driver

- **Obama "stimulus"** included $4+ billion for EV infrastructure, vehicle and battery R&D and manufacturing, tax incentives of $7500/ car
- **Pending EV bill in Congress** would add $4 – 8B more for EV infrastructure, incl. $10K per vehicle tax credits – $800M each for ~ 8 metro regions as "proof of concept." 500 mile battery prize. Loan guarantees for stationery use of batteries.
- **Right-to-left "Electrification Coalition"** pushing EVs as a key to energy security, balance of trade ($200-400B/yr. for oil imports), & climate
- **Federal renewable portfolio standard**, carbon tax, or cap & trade could greatly reduce C02/mile for EVs in 2015-2030 period. (CA already has 30% RPS already by 2020)

V2G Benefits

- V2G revenue to owner offsets EV cost, accelerates deployment
- Dual use for clean transport and grid power support = shared capital cost
- Provides energy storage for grid and integration of renewable sources
- Complementary to wind storage needs
- Could transition wind to “dispatchable” resource

Smart Grid Interface for EVs in Calif.

- **V2G Studies** for Calif. Air Resources Board found:
- **Regulation ancillary services best suited to EVs** (balancing generation & load). Shallow cycling = less battery degradation.
- **Up to 174,000 vehicles needed** to saturate reg. services market (after this, EV should be cost-competitive.)
- **Vehicles available for V2G 92% of time**, even @ 3-6 pm
- **EVs retrofittable with bi-directional interface** & software
- **Regulation services valued at $1K - $5K per vehicle** per year. PG&E estimates $3500/yr. for Northern California
- **V2G vehicle testing ongoing** since 2002. Current project at Google, with PG&E and EPRI.
- **Key issues remaining:** interconnect standards, market integration, regulatory issues, metering & settlements

Recommendations for V2G in CA

- State PUC is considering "rate base" for EV investment, TOU prices. Ruling in 2010/11.
- Equal access by regulation service suppliers Include vehicle standards & tech for bi-directional V2G capability (in ZEV mandate?)
- Ensure EV chargers have "smart" controls for potential V2G operation (a la Coulomb, BP)
- Promote expanded pilot-testing with utility fleets
- Create a funded V2G champion entity
- Complete studies on grid protection re. reverse power flow (similar to stationary source integration)
- Initiate long-term battery testing of V2G cycling

V2G at Large Scale

- EPRI – Power from electric drive vehicles could reduce global central generation by 20% by 2050
- DOE - US has adequate generating capacity at night to power 75% of LDV fleet – if charging is off-peak
- Wind resource in US much greater than fossil fuel consumption – key is storage and dispatchibility
- Wind limit without storage is 10 – 20%
- US power generation is 811 GW
- US 176M cars x 15 KW = 2,640 GW!! (10-12 year fleet turnover)
- Avg. time car is parked = 23 hours/day
- Key is standards, incentives, regulations, V2G institutional drivers, collaborative planning of V2G

Transition Strategy*

- Small demo fleets: 100 car V2G fleet = 1 MW
- Launch demos in several regions with high wind & hydro resources (e.g., Pacific Northwest, Texas, California)
- Develop tech, drive down component costs
- Develop standards for V2G (e.g. response time, metering, software)
- Begin low-cost production at 50,000 cars/year

*Courtesy of Willard Kempton, U. of Delaware

Summary of Key Drivers of EV Transition

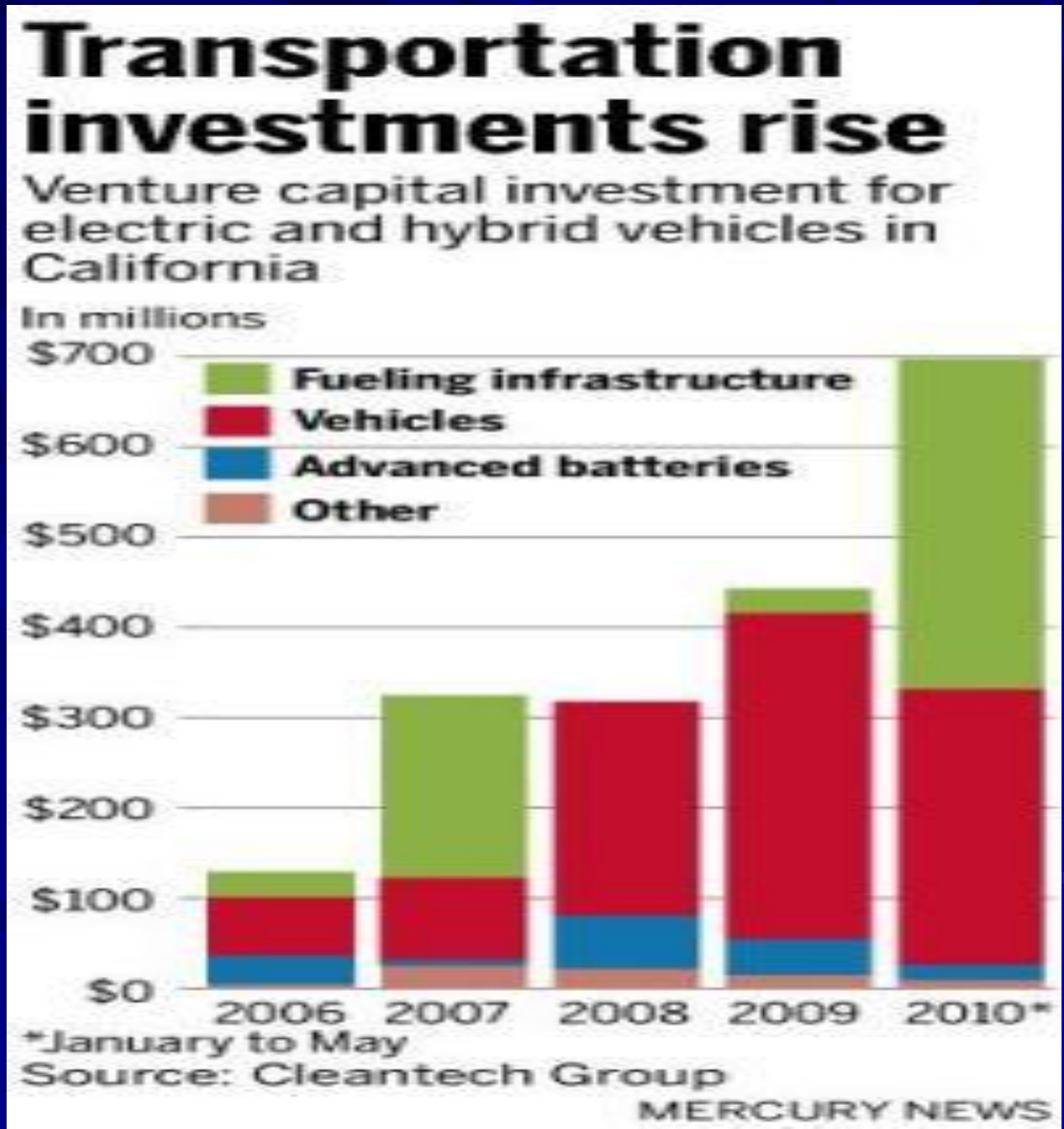
- Gas Prices & availability
- Financial Investment
- Vehicle Innovation
- Regulatory Frameworks

Gas Price & Availability

Peak Oil, Gas Price, & EV Outlook

- Supply peak estimate: 2012 – 2015
- High prices ($140/bbl) drives demand destruction = bumpy peak
- Financial crisis and price volatility are depressing adequate investment in oil
- Iran & Israel = wild cards for supply disruption
- US Joint Ops Command acknowledges imminent peak & projects energy conflicts following peak
- When gas crosses US $4/gal. threshold, EVs, PHEVs, AND retrofits are highly competitive

Financial Outlook

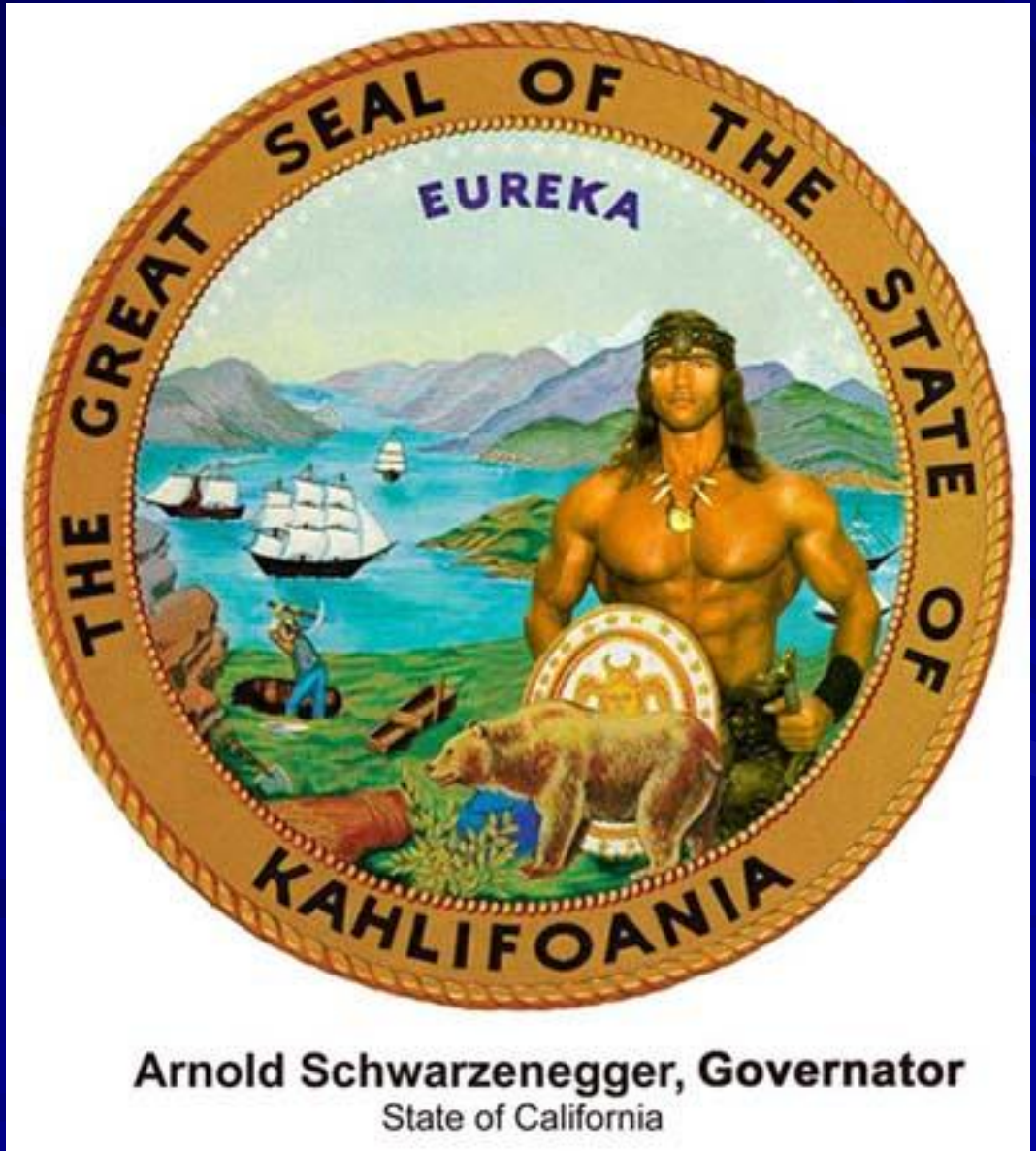


Vehicle Outlook: Tesla Model S

300 mile range, FastCharge, $49K, 2012 delivery

Vehicle Outlook: Fisker Karma (PHEV)

Regulatory Outlook: Post-Arnold



Best Case Policy Outlook for California

Climate-friendly "Go EV" Scenario

- Re-affirmation of 80% GHG reduction goal
- Completed State EV Plan
- State alternative fuel investments emphasizes EV
- Utility Commission promotes rate-basing of infrastructure
- Energy Commission strongly guides V2G standards
- State & Federal tax incentives for EV continue
- Feds invest $1billion + in CA EV readiness
- Gas prices climb to near $4/gallon
- Consumers respond with high adoption
- Public Level 2 and Fast Charge expands quickly

Thank you IVM,
Samy Souami
Marc Scherer;
and Bob Hayden
of City of San Francisco!