California Electric Vehicle Roadmaps for Adoption and Grid Services

Heather Sanders, Director Regulatory Affairs, Distributed Energy Resources

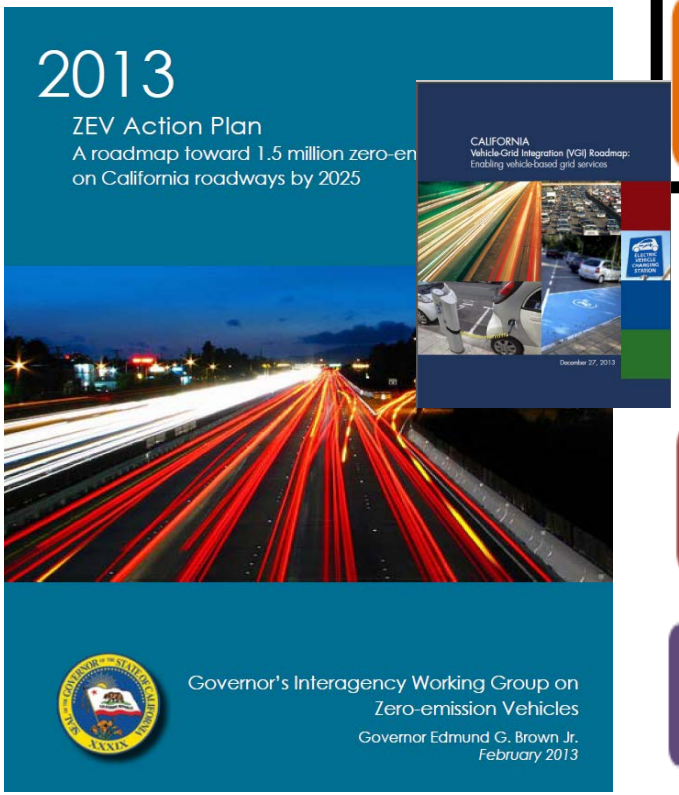
Randall Winston, Special Assistant to the Executive Secretary, Office of Governor Edmund G. Brown, Jr.

Board of Governors Meeting

General Session

February 6, 2014

The vehicle-grid integration roadmap is a component of the larger Governor's Zero Emission Vehicle Action Plan.



http://opr.ca.gov/docs/Governor's_Office_ZEV_Action_Plan_(02-13).pdf

Goal 1: Complete Needed Infrastructure and Planning

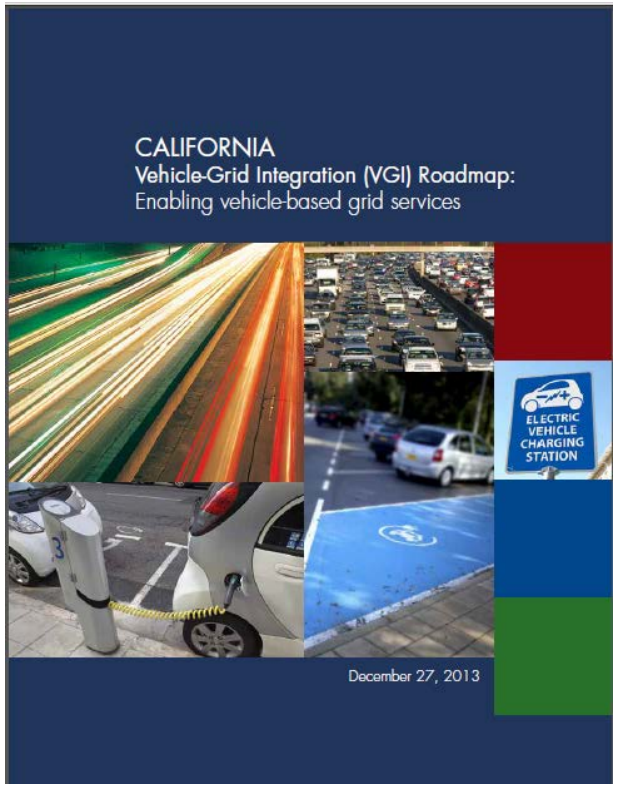
- "Develop roadmap to commercialize vehicle to grid (V2G) services provided by PEV batteries."

Goal 2: Expand Consumer Awareness and Demand

Goal 3: Transform Fleets

Goal 4: Grow Jobs and Investments in the Sector

The roadmap focuses on developing solutions that enable electric vehicles to provide grid services while still meeting consumer driving needs



http://www.caiso.com/Documents/Vehicle-GridIntegrationRoadmap.pdf

- Managed or smart charging strategies
  - vehicle charging is coordinated with grid conditions to ensure that EVs do not increase peak load, requiring additional generation or capacity expansions.
- Vehicle-to-grid
  - communication and power flow is two way between EVs and the power grid with aggregations of EVs responding to grid operator signals.

The roadmap identifies three activity tracks to enable electric vehicles to provide grid services.

Determine VGI Value

- Model grid impact of EVs and contribution of EV managed charging and vehicle-to grid capabilities.
- Develop models and perform analysis to determine value of different EV use cases

Develop Enabling Policy

- Develop and refine products & programs to enable EVs to provide services
- Define requirements to provide services including measurement and verification

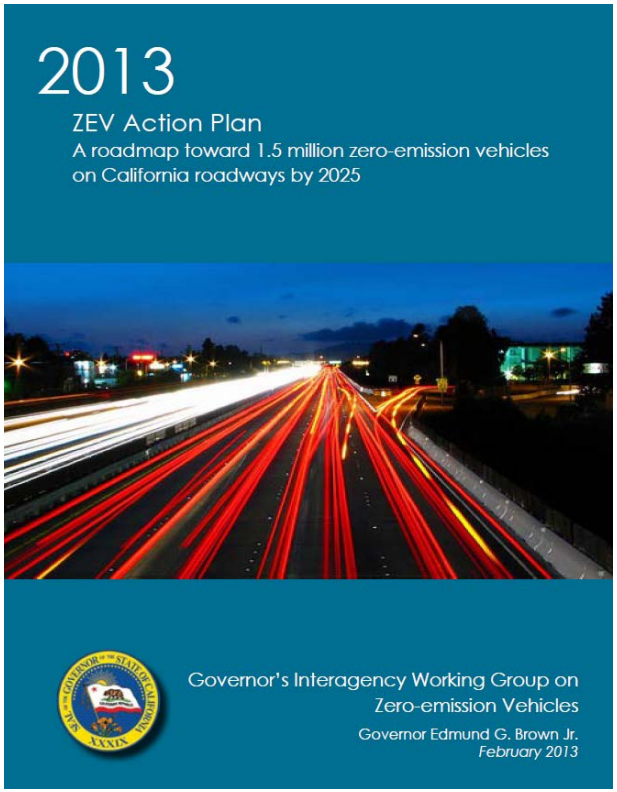
Support Enabling Technology Development

- Identify needed technology capability for EVs to provide grid services
- Pilot and measure performance to promote technology development

The Governor's March 2012 Executive Order on Zero Emission Vehicles:

- By 2015: major metropolitan areas ZEV ready, investment growing, and building on research
- By 2020: infrastructure to support 1 million ZEVs, costs competitive, and widespread ZEVs for public transit and freight
- By 2025: over 1.5 million ZEVs, easy access to infrastructure, and displace 1.5 billion gallons of petroleum annually

Governor Brown's Zero Emission Vehicle (ZEV) Action Plan



http://opr.ca.gov/docs/Governor's_Office_ZEV_Action_Plan_(02-13).pdf

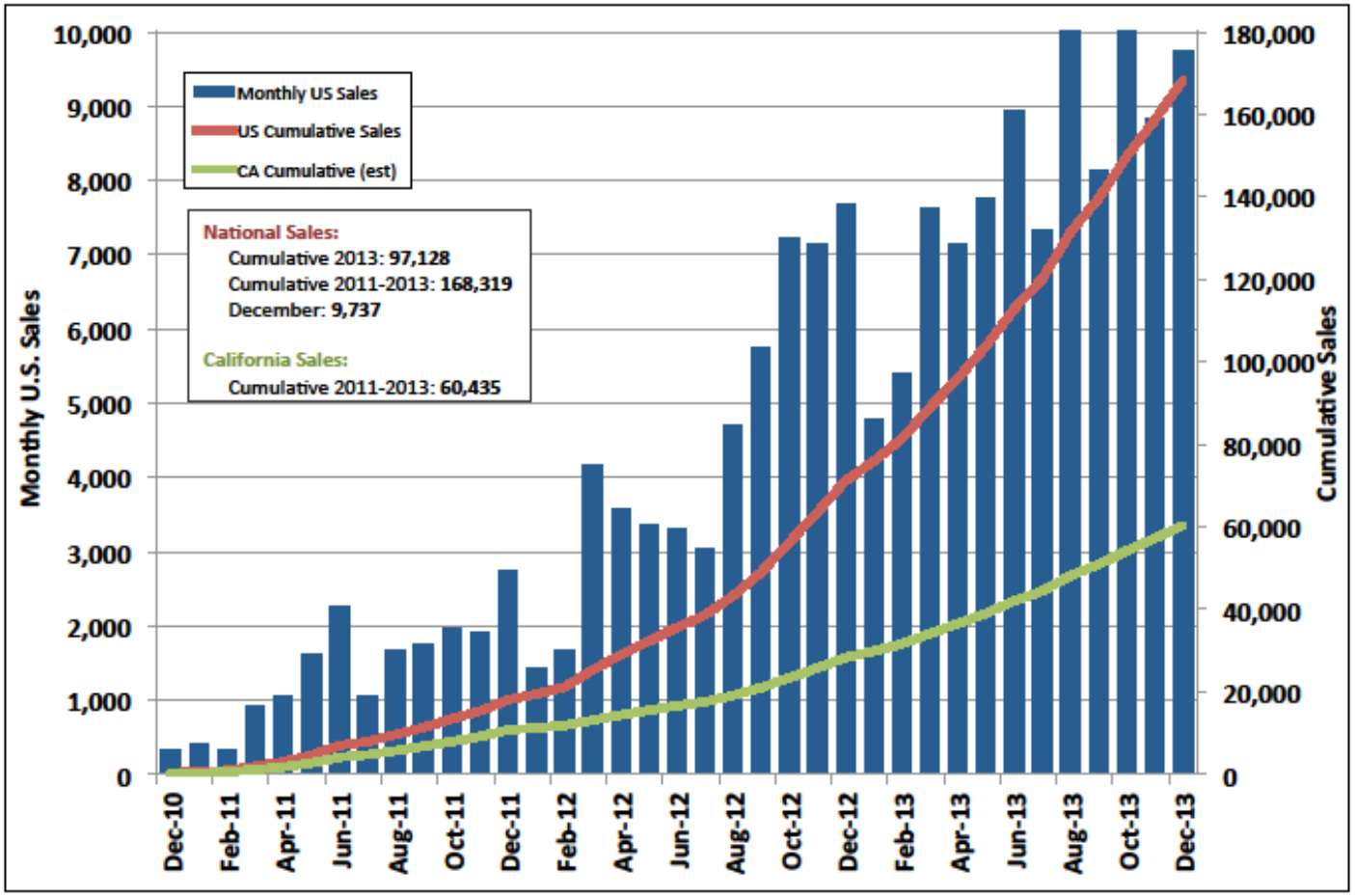
Goal 1: Complete Needed Infrastructure and Planning

Goal 2: Expand Consumer Awareness and Demand

Goal 3: Transform Fleets

Goal 4: Grow Jobs and Investments in the Sector

EV Adoption is increasing and California continues to lead the way



Note: Approximation assumes CA sales were 60% of U.S. sales in 2011 and 33% in 2012 and 2013.
Reference: www.hybridcars.com

1/06/2014

http://www.evcollaborative.org/sites/all/themes/pev/files/docs/2013_CPEV_annual_report4web.pdf

Looking ahead…

- The future of incentive and rebate programs
- Making ZEVs more accessible to disadvantaged communities
- Streamlining the infrastructure permitting process and accelerating workplace charging
- Launching the fuel cell market

http://opr.ca.gov/docs/ZEV_Guidebook.pdf

California ISO
Shaping a Renewed Future

Thank you