



MSTRS – may 10, 2011



# EV DEPLOYMENT

# EVs Are Coming

## Plug-in Hybrids



Fiskar Karma



Chevy Volt



Ford Escape



Prius



Audi A1



BYD F3DM



Volvo V70



Fiskar Nina

## All-electric



Audi e-Tron



Nissan Leaf



BMW Megacity



BYD E6



Coda



Ford Focus



Mitsu. iMEV



Smart



Tesla S

## Fuel Cell Electric (2015-16 Intro.)



Honda Clarity



Mercedes



GM



Toyota



Ford  
Transit



Toyota IQ



# California's ZEV Regulation

- First adopted in 1990 (LEVI)
  - Production requirements for OEMs
- Demonstrated ZEVs technically viable
  - > 5,000 vehicles: demos, leases, ownership
  - Accelerated battery and fuel cell development
  - Initial public charging infrastructure
  - ZEVs now on threshold of early commercialization
- Hybrids commercialized
- Next regulation update Nov. 2011
  - 2018-2025 model years
  - Planning increase in # of ZEVs

# ZEV Incentives in California

Program	Max Rebate Amount	Years	Appropriated Funding	Legislation	Number of Vehicles Incentivized
ZIP I	\$9,000	2000-2004	\$18 Million	AB 2061	1,069
ZIP II, Fleet ZIP	\$5,000/ \$11,000		\$20 Million	AB 1390	
Fueling Alternatives	\$5,000	2008-2009	\$2.8 Million <sup>1</sup>	AB 1811	69
Clean Vehicle Rebate Project	\$5,000 <sup>2</sup>	2009-2015	\$11.1 Million <sup>3</sup>	AB 118	725

1. Funding for CNG vehicles as well
2. Current rebate amount, may be lowered in subsequent years
3. Represents 2009-2010 & 2010-11 FY; expected 2011-2012 FY funding is \$15-21 Million

# 2001 Infrastructure Example: CalEPA Parking Garage

- ~15 EVSEs, 50-50 mix of Inductive and Conductive
  - Key challenge:
    - Garage owned by City of Sacramento
    - Charging equipment owned by State
- Cost: ~\$7,000/ space
- Soon to be upgraded to new SAE



# California Public Charging Station Retrofit

- California also had ~3,000+ public charging stations that were installed in the late 1990's...many were removed, and the rest are now obsolete.
- State-funded retrofit program underway to upgrade to SAE J1772 by Dec 2011

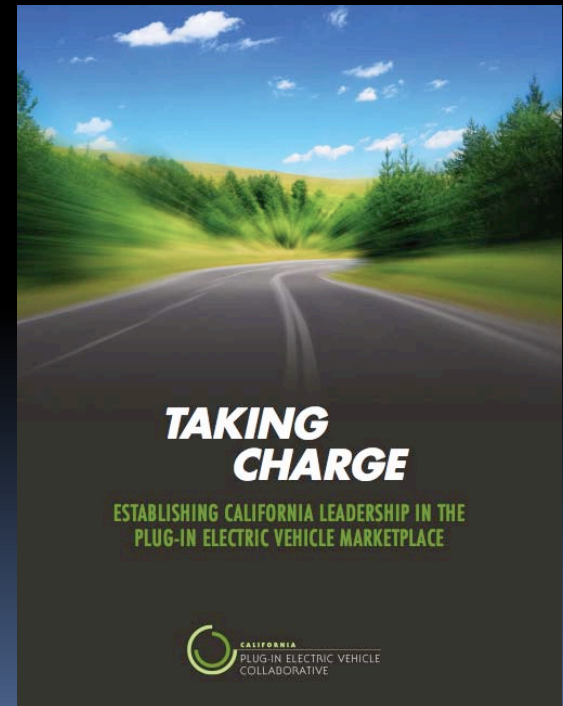


# Preparing for EV Deployment:



## Plug-In Electric Vehicle Collaborative

- Multi-stakeholder group (OEMs, utilities, NGOs, state agencies) initiated in 2010
- Developed strategic plan for deployment of PEVs in CA, released Dec 2010



# Preparing for EV deployment:



## Plug-In Electric Vehicle Collaborative

- New mission to facilitate PEV deployment in CA to meet economic, energy, environmental goals
  - Convene working groups
  - Coordinate dialogue between stakeholders
  - Communicate recommendations
    - Best practices
    - Extent of public charging infrastructure needed



# Plug EV Charging Needs

- Home charging (Priority 1)
  - Average gasoline driver ~ 35 miles per day
  - In most plug in cars (Chevy Volt or Nissan Leaf) a 35 mile charge takes less than 4 hours at 220 volts (~ 10 hours on 120 volts).
  - The Ford Focus BEV, future Leafs, and many other EVs will be able to fill up after a 35 mile drive in about 2 hours
  - Some drivers will demand the faster charging 220 volt stations at home, while others will be happy with 120 volts
- Workplace charging (Priority 2)
- Public charging – 220 V (Priority 3)
- Fast charging (30 minutes to achieve 80% range)
  - Emergency, or regional trip extension



# Economics of EV Charging

Today's price of gasoline in California = \$4.259  
Fed and State excise taxes = \$0.537  
Price/gallon without excise taxes= \$3.72

\$/ kW-hr	Charging Scenario	Equivalent Gasoline Price \$/gal* (cost to drive basis***)
0.10	Evening off peak	\$1.15
0.15	Daytime	\$1.73
0.79	\$15 Fast charge**	\$9.13
1.05	\$20 Fast charge**	\$12.14

\* Excludes road tax of \$0.54/gallon, and assumes EPA's 33.7 kWhr/gallon

\*\* Assumes 80% fill of Nissan Leaf, or, 19 kWhr delivered for this "fill"

\*\*\* Assumes EV consumes 0.34 kWhr/mile, and equivalent mid-size car at 34 MPH

# Infrastructure Cost

Charging Type	Typical Installation Cost* (Including Charging Station)
Home garage; adequate panel	\$700 - \$6,300
Home garage; new panel	\$2,300 - \$9,000
Public	\$3,400 - \$11,000
Fast charge	\$50,000+

\* Tax credits, incentives, grants not subtracted

# Infrastructure Use: The EV Project

- DOE funded; Largest deployment of PEV charge infrastructure in history
- Characterize EV use in diverse topographic and climatic conditions
  - ~5700 Leafs; 2600 Volts
- Evaluate effectiveness of charge infrastructure
- Revenue system trials for public charge infrastructure



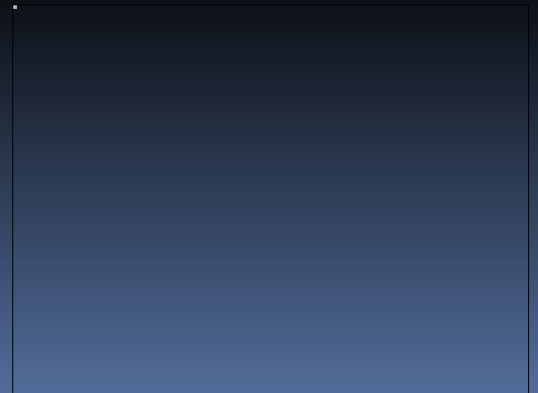
# Infrastructure Use: The EV Project

## California locations

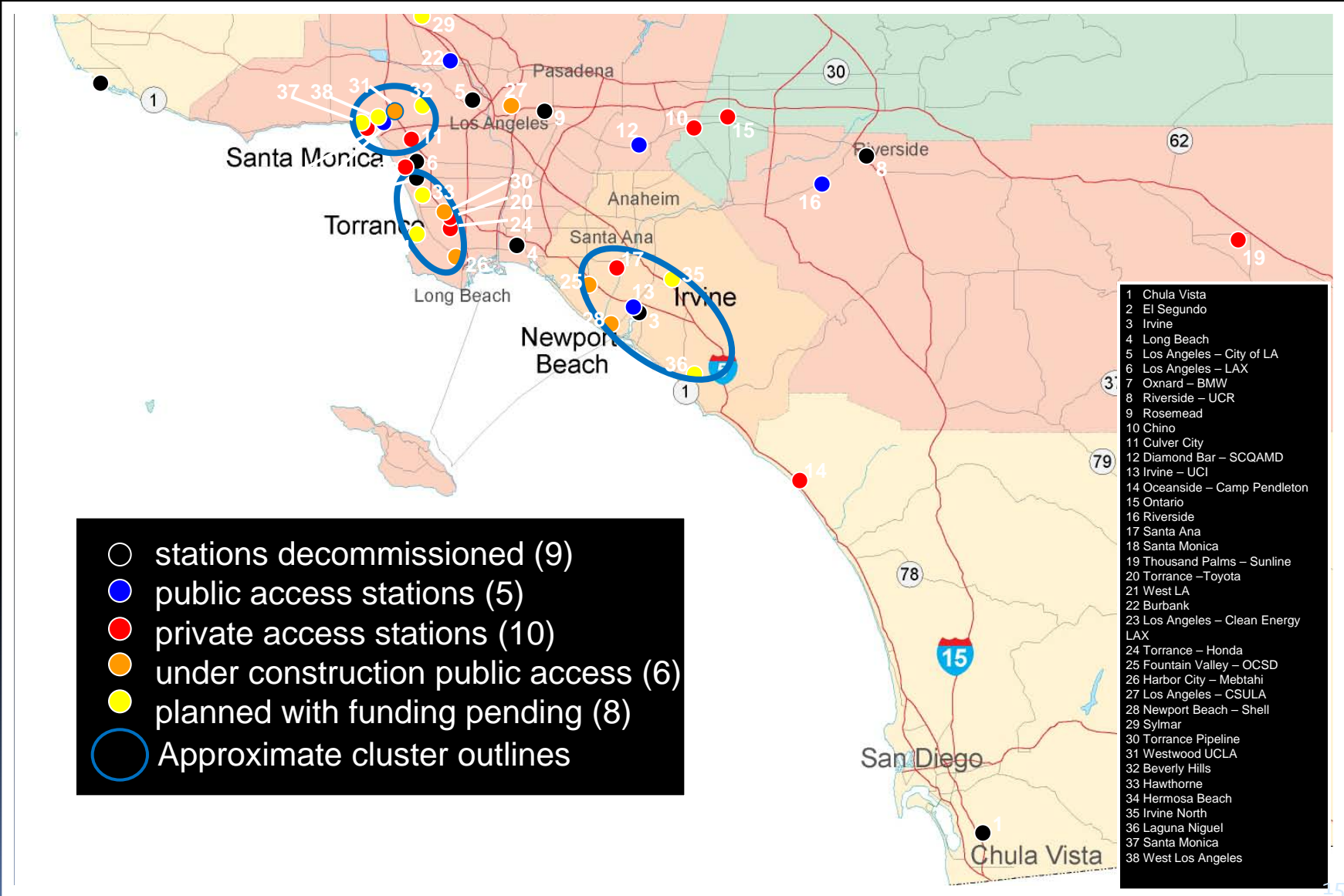
- San Diego: 1,000 residential EVSEs, 1,500 Level II public accessible EVSEs , 60 DC Fast Charge Stations
- Los Angeles region: 3,000 residential EVSEs, 30 DC Fast Charge Stations
- San Francisco Bay Area: 2,750 residential EVSEs, 30 DC Fast Charging Stations

# California's Approach to Hydrogen Infrastructure (the 'other' EV)

- Phase I: Focus on major population centers (LA, Bay Area, Sacramento)
- Phase I objectives
  - Match infrastructure to size of vehicle and bus fleets
  - Meet consumer refueling expectations
  - Outreach to:
    - Permitting officials
    - Trained first responders
    - Public education



# Southern California Hydrogen Fueling Network: Cluster Station Development



# Summary

- EVs are coming
  - BEV and PHEV now
  - FCV by 2015
- Infrastructure preparation necessary
  - Both electric and H<sub>2</sub> underway in CA
  - Optimum fueling infrastructure to be determined through early projects
    - EV Project in San Diego
    - H<sub>2</sub> fueling clusters in coastal LA