

Status Update on ZEV Market Enablers

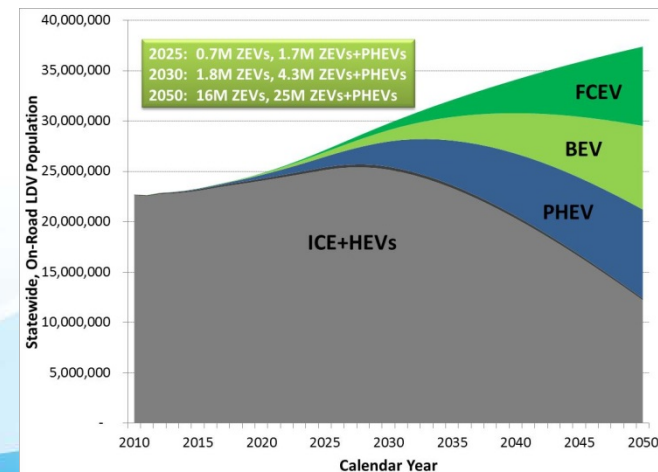
Diamond Bar, CA
October 22, 2015

California Environmental Protection Agency

 **Air Resources Board**

ZEVs Are A Critical Strategy

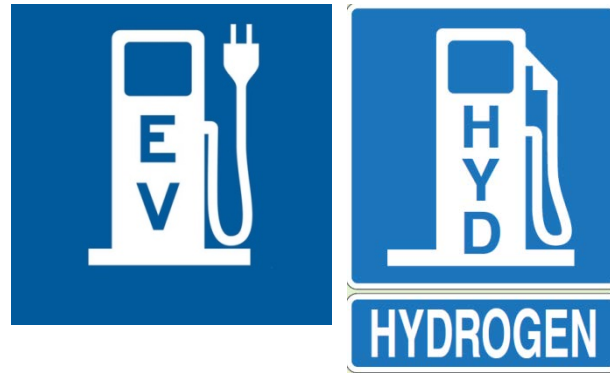
- Current vehicle policies through 2025
 - Advanced Clean Cars ZEV Regulation: ~15% sales in CA
 - Governor’s Office Executive Order: 1.5 million ZEVs+PHEVs
- ZEV Fueling Infrastructure
 - GO Executive Order: Infra. for 1 million ZEVs+PHEVs by 2020
- ZEV Expansion beyond 2025
 - 4.3 million ZEV & PHEVs by 2030
 - 100% ZEV & PHEV sales by 2050



ZEV Market Enablers



Awareness



Infrastructure



Partnerships

Outline

- **ZEV Action Plan**
 - Wade Crowfoot, Governors Office
- **California ZEV Infrastructure**
 - Tyson Eckerle, Governor's Office of Business and Economic Development
- **Public-Private-Partnerships**
 - Christine Kehoe, Plug-In Electric Vehicle Collaborative
 - Bill Elrick, California Fuel Cell Partnership
- **Multi-State ZEV Action Plan**
 - Rob Klee, CT Department of Energy & Environmental Protection
 - Christine Kirby, MA Department of Environmental Protection
 - Dave Nordberg, OR Department of Environmental Quality

2015 National Academies Study¹: Barriers to PEV Adoption

Conclusions

- “The committee emphasizes that the state ZEV requirements have been particularly effective at increasing PEV production and adoption.”
- Consumer awareness of PEVs is low
- No technical barriers to PEV infrastructure, but:
 - Business case is difficult
 - Research needed on how infrastructure network affects PEV adoption

¹ “Overcoming Barriers to Deployment of Plug-In Electric Vehicles” The National Academies Press, 2015

Consumer Outreach and Incentives



Searchable database:

- Technology/fuel type
- Vehicle category (style)
- Vehicle make/model

Tools and Calculators:

- Incentives
- Fuel costs

Consumer rebates for:

- FCEVs
- BEVs
- PHEVs

The Global ZEV Market

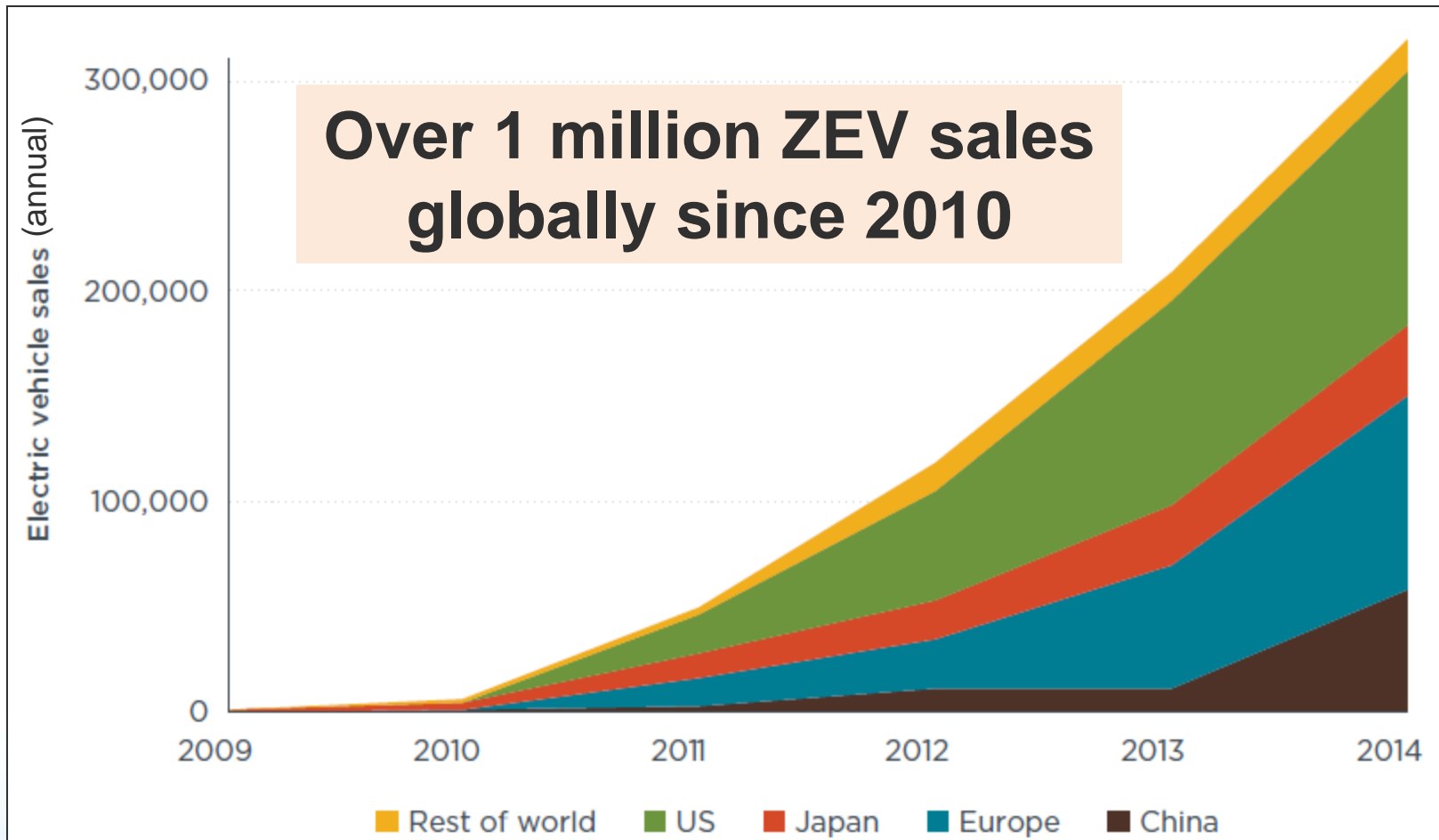
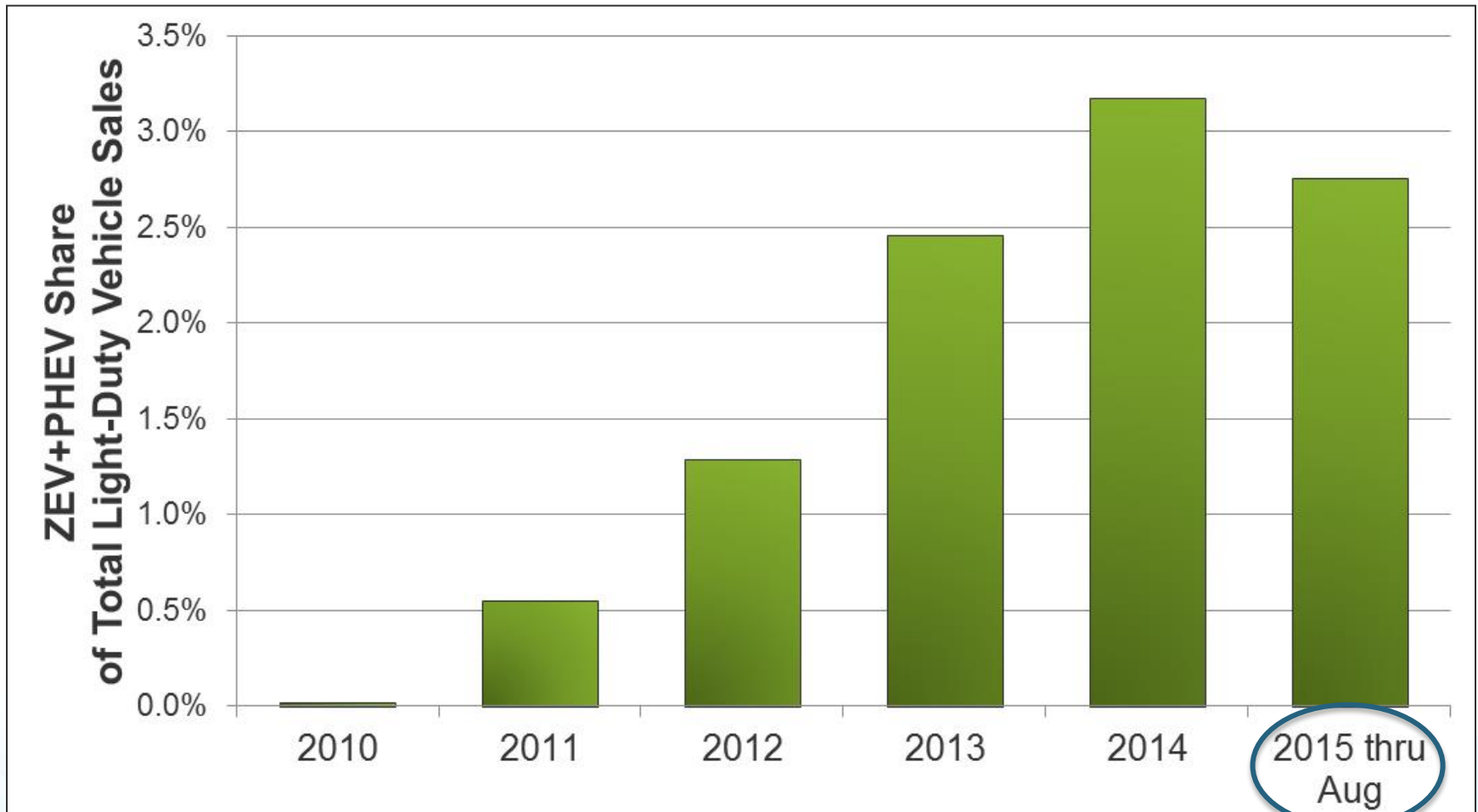


Figure ES-1. Annual global electric vehicle sales

Source: ICCT, "Transition to a Global Zero Emission Vehicle Fleet," Aug 2015

The California ZEV Market



Source: IHS Automotive, Polk new vehicle registrations for CY2010-2015 as of August, 2015.

Governor's Office ZEV Action Plan

***Agency Cooperation to Address Barriers
& Lead by Example***

Wade Crowfoot

Deputy Cabinet Secretary and
Senior Advisor to the Governor

California ZEV Infrastructure

*Progress on Meeting 2020 Goal of
Infrastructure for 1M ZEVs*

Tyson Eckerle

ZEV Infrastructure Project Manager,
Governor's Office of Business and
Economic Development

ZEV Infrastructure

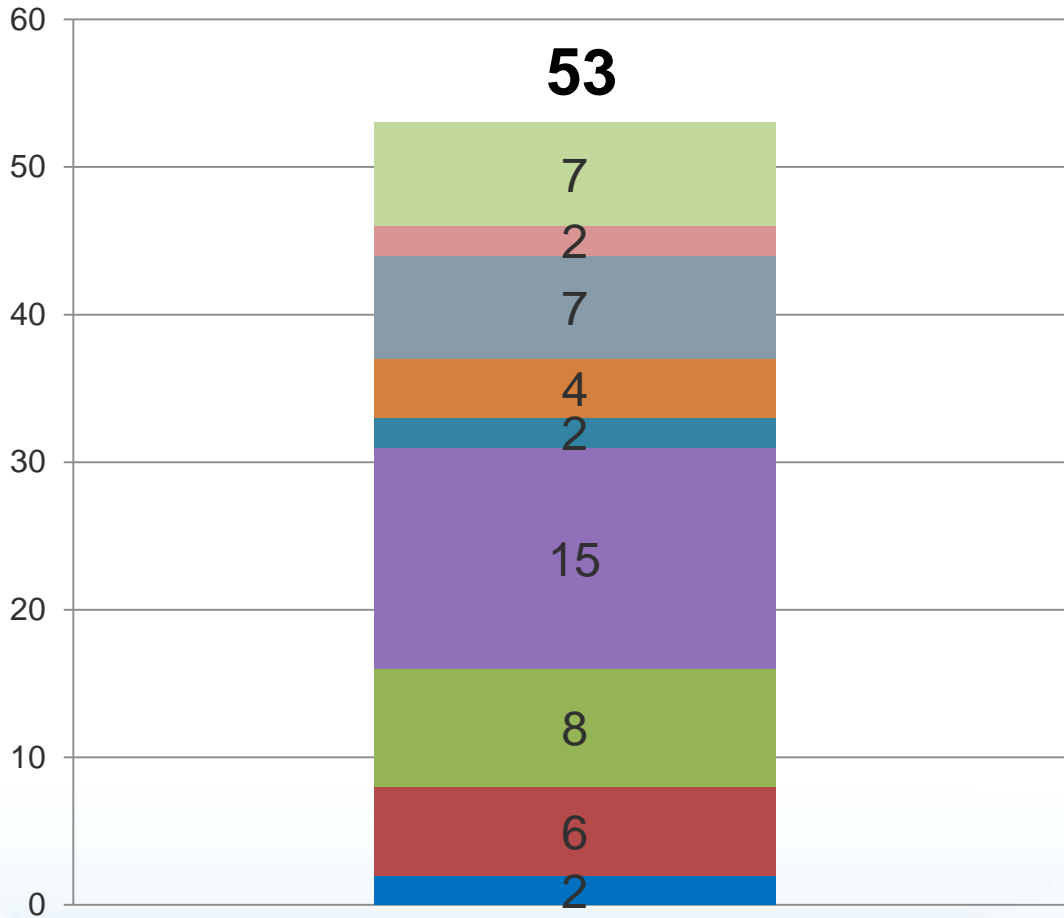
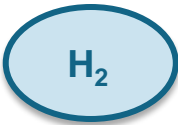
Hydrogen

- Current status
- Projections to 2020 of fuel capacity needs
- Actions to close the gap

Electric Charging

- Current status – workplace & public charging
- Projections to 2020 of charging needs
- Actions to close the gap

CA's Currently Funded Hydrogen Network*: *Accelerating the Network Size*

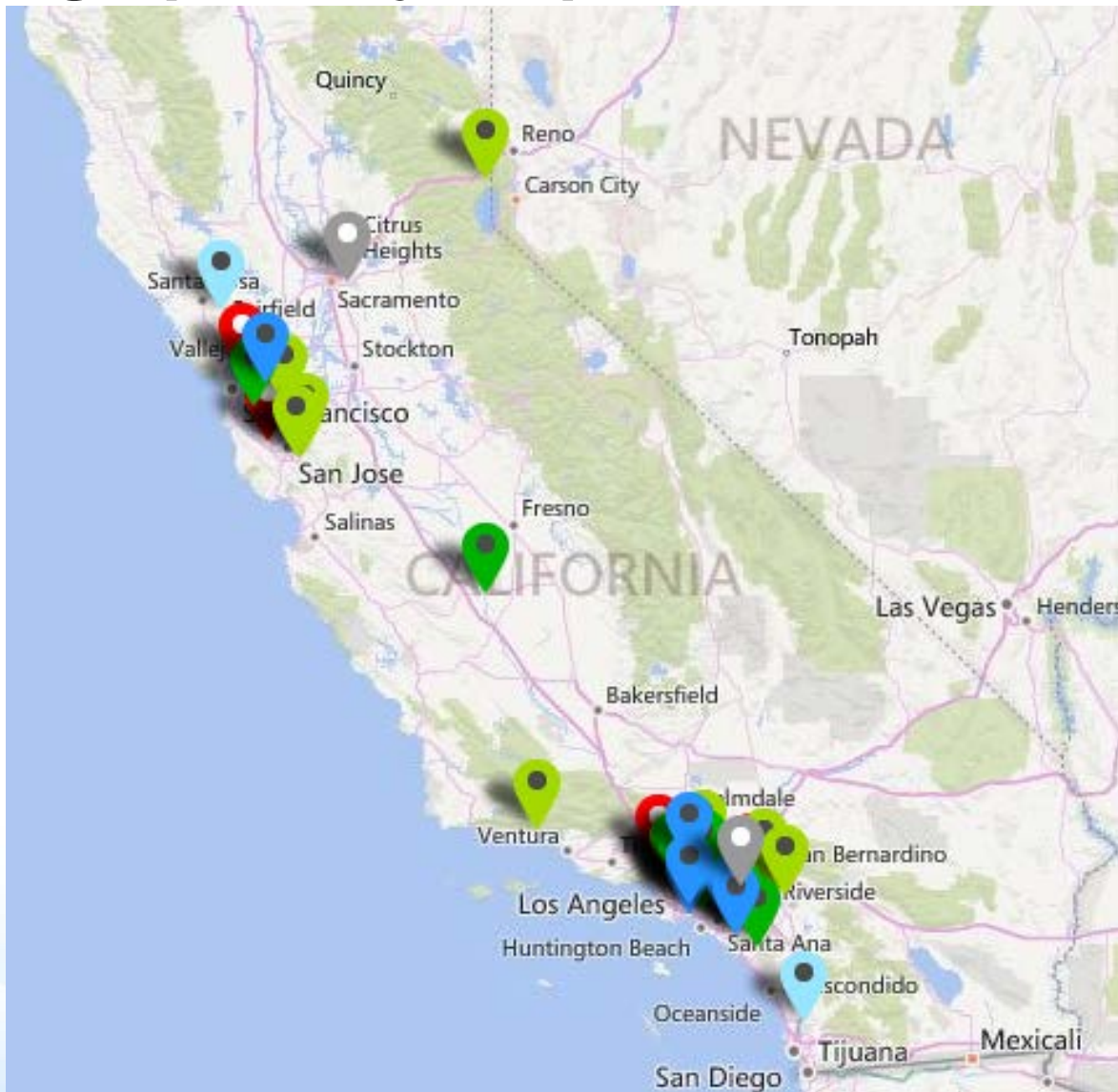
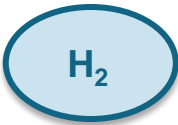


H₂ Stations



- Seeking new site
- Finishing permit apps
- In permitting
- Planning approval
- Approved to build
- Under construction
- Fully constructed
- Open - Non-Retail
- Open - Retail

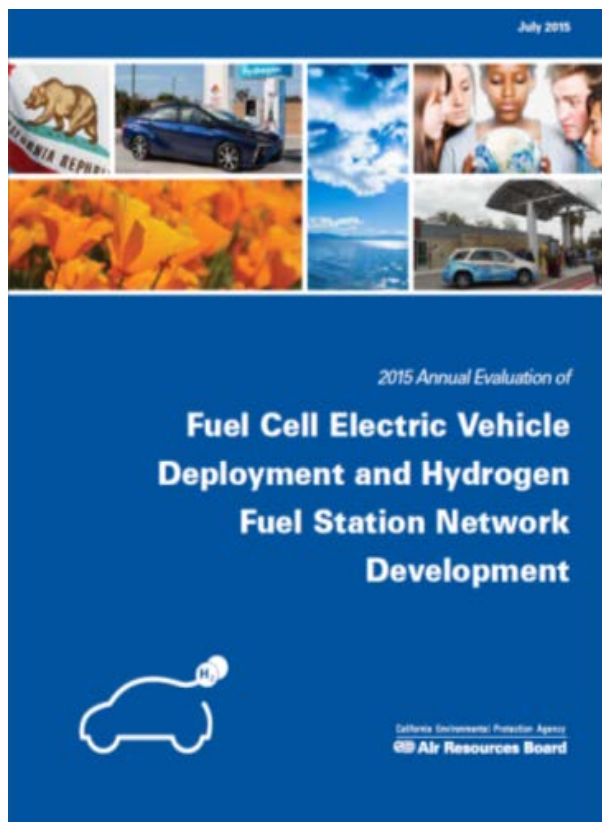
CA's Currently Funded Hydrogen Network*: *Geographically Dispersed*



- 1. Open - Retail (2)
- 1.1 Open - Non-Retail (6)
- 2. Commissioning (8)
- 3. Under Construction (13)
- 4.1. Approval to Build (4)
- 4.2 Planning Approval (4)
- 4.3. Permit In-Process (7)
- 4.4. Pre-Permitting (2)
- 4.5. Site Acquisition (7)
- Upgrade (4)

Need for Continued Hydrogen Station Investments

H₂

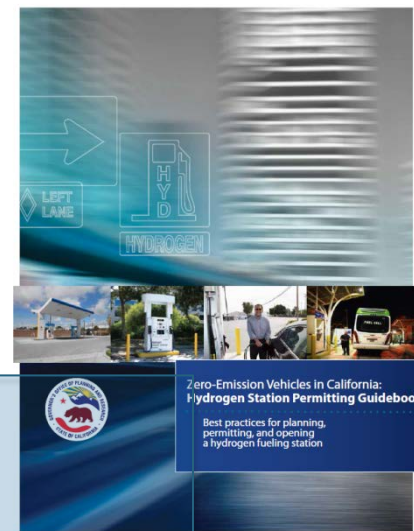


- **Current network development is largely on track**
- **Post-2018, FCEV deployment will accelerate faster than previously projected**
- **86 stations projected by 2021 will be insufficient to meet fuel demand**
- **Need larger stations and innovative funding mechanisms**

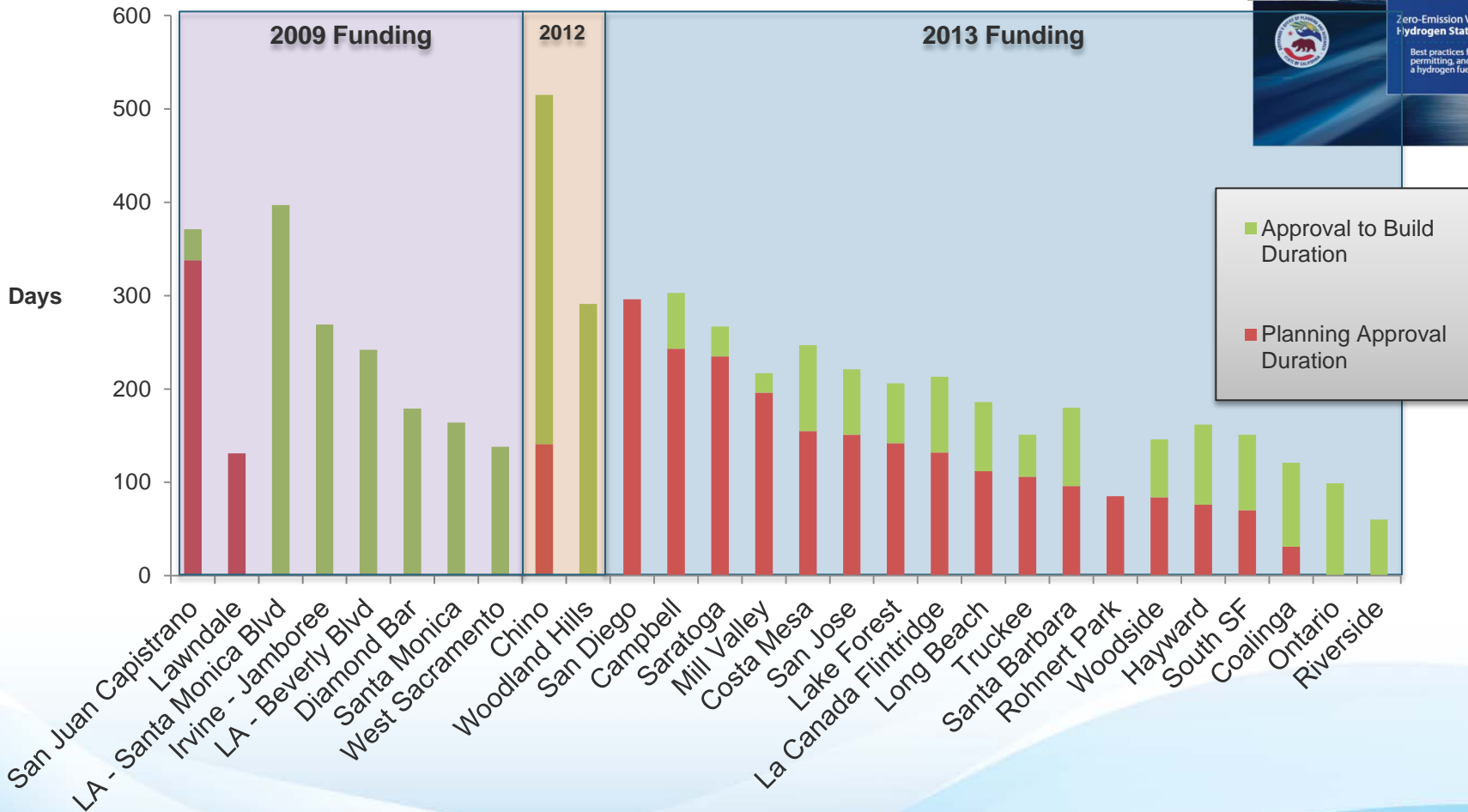
http://www.arb.ca.gov/msprog/zevprog/ab8/ab8_report_2015.pdf

Hydrogen Network Lessons Learned

Implementation Time is Declining



H2 Station Permit Timelines



Electric Charging Station Types

**Level 1:
Standard
Outlet**



**Level 2:
Dedicated
220V**



**DC Fast Charging:
High voltage public
charging**



CHAdeMO



SAE



Electric Charging Infrastructure in California

Current and Projected 2020 Need

CURRENTLY INSTALLED	Installed Chargers *
Workplace, Level 2 (L2)	1,775
Public charging, Level 2 (L2)	5,998
DC Fast Chargers	618

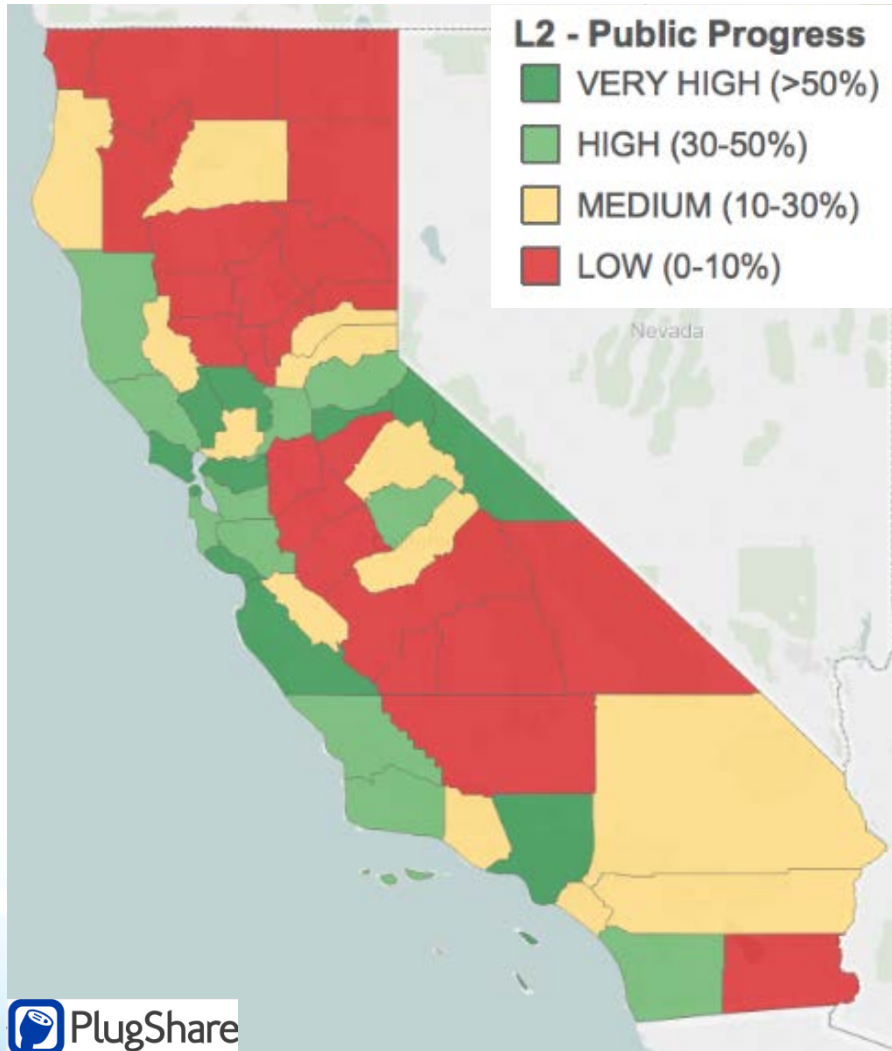
** As of September 2015. Note: a Station can have multiple chargers.*

PROJECTED NEED	High Scenario	Low Scenario
Workplace chargers (L2)	144,000	82,000
Public chargers (L2)	46,500	20,100
Public DC Fast Chargers	1,550	551

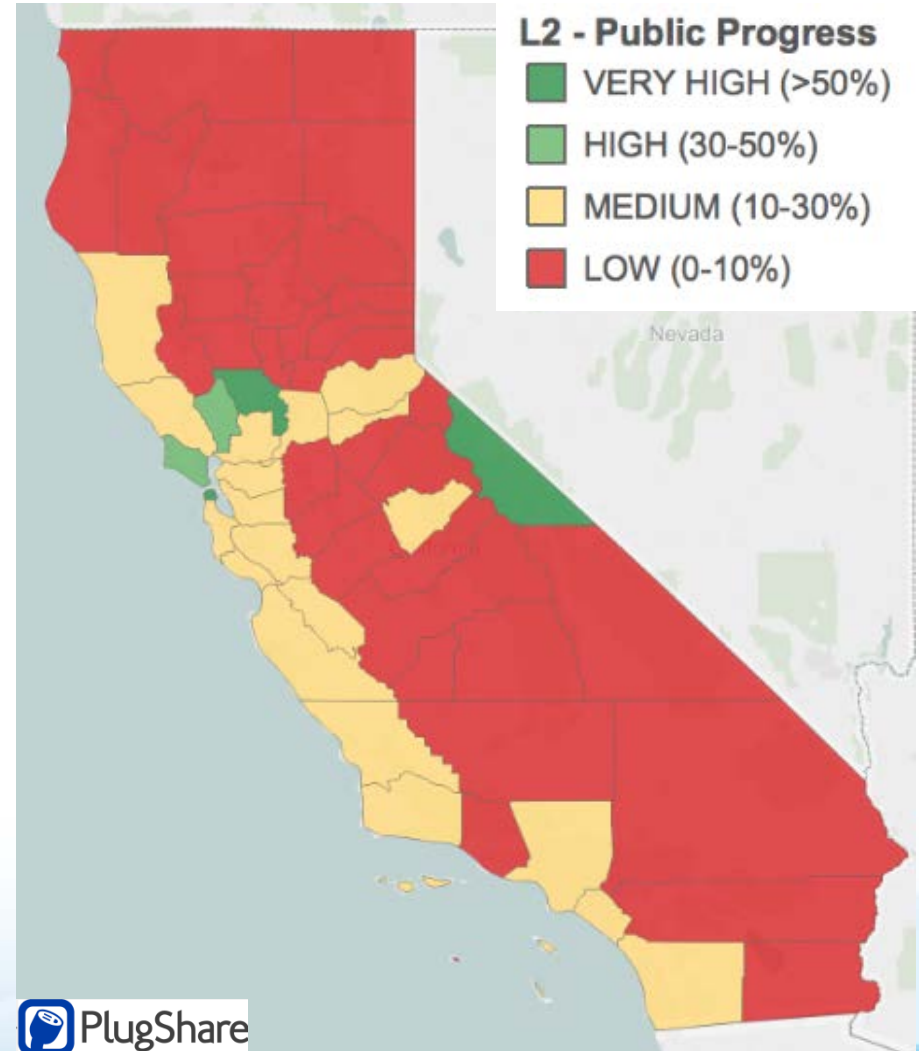
Low and high range from NREL/CEC #600-2014-003

Distribution of Today's Level 2 Chargers, and Where the Gaps are Towards 2020 Needs

Home Dominant Scenario



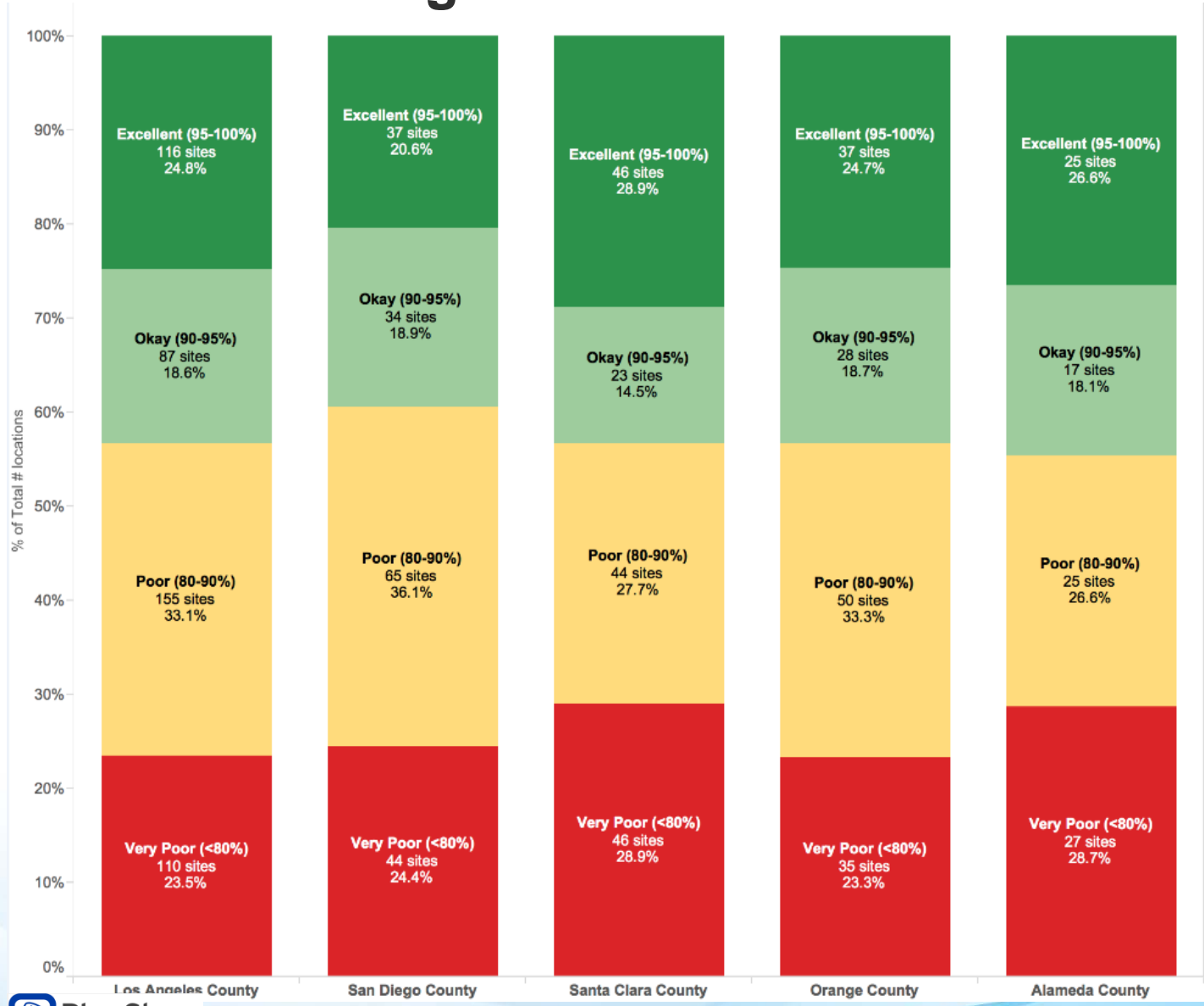
High Public Access Scenario



Performance Reviews of Today's Level 2 Public Chargers



Public



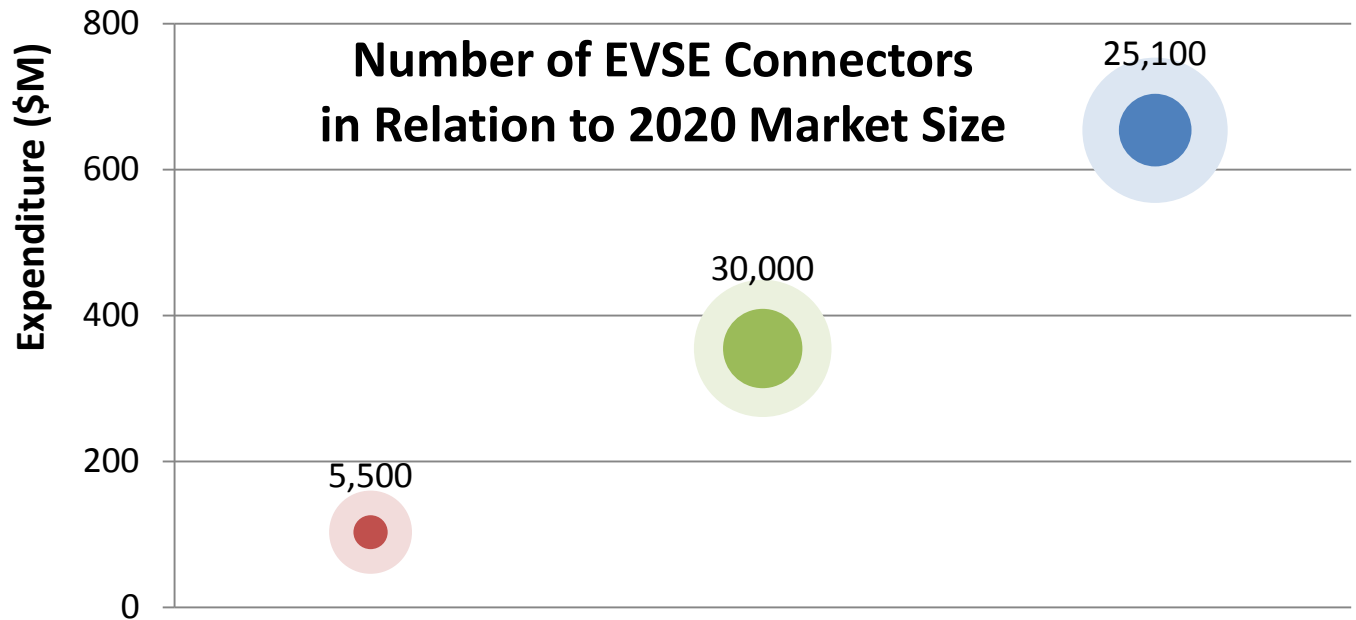
State Agency Actions to Close the Gap

- PUC Actions with Electric Utility Investments and NRG Settlement
- BSC/ARB Actions with infrastructure in new building construction
- CEC Actions with public infrastructure grants and load loss reserve
- Private investments by charging companies, automotive manufacturers, and NEDO

PUC Action with Electric Utilities



\$1.1 Billion Utility Infrastructure Proposals



	SDG&E	SCE	PG&E
Make Ready + EVSE	L1 & L2	L1 & L2	L2 & DC FC
Locations	MUD & Work	MUD, Work, Public	MUD, Work, Public
Charging Prices	Hourly CAISO & Circuit	Time-Of Use Rates + TBD by Host / EVSP	Time-Of-Use Rates
Vehicle-Grid Integration	Renewables Following, Distribution Management	Demand Response	Smart Charging

PUC Action with an Infrastructure Provider

NRG Energy Crisis Settlement



	Freedom Stations	Make-Ready
Commitment	200	10,000 stubs for EVSE
Status*	127 at 92 sites (20 in low-income areas)	1,188 at 187 sites (Contracted total: 2,049 stubs at 240 sites)



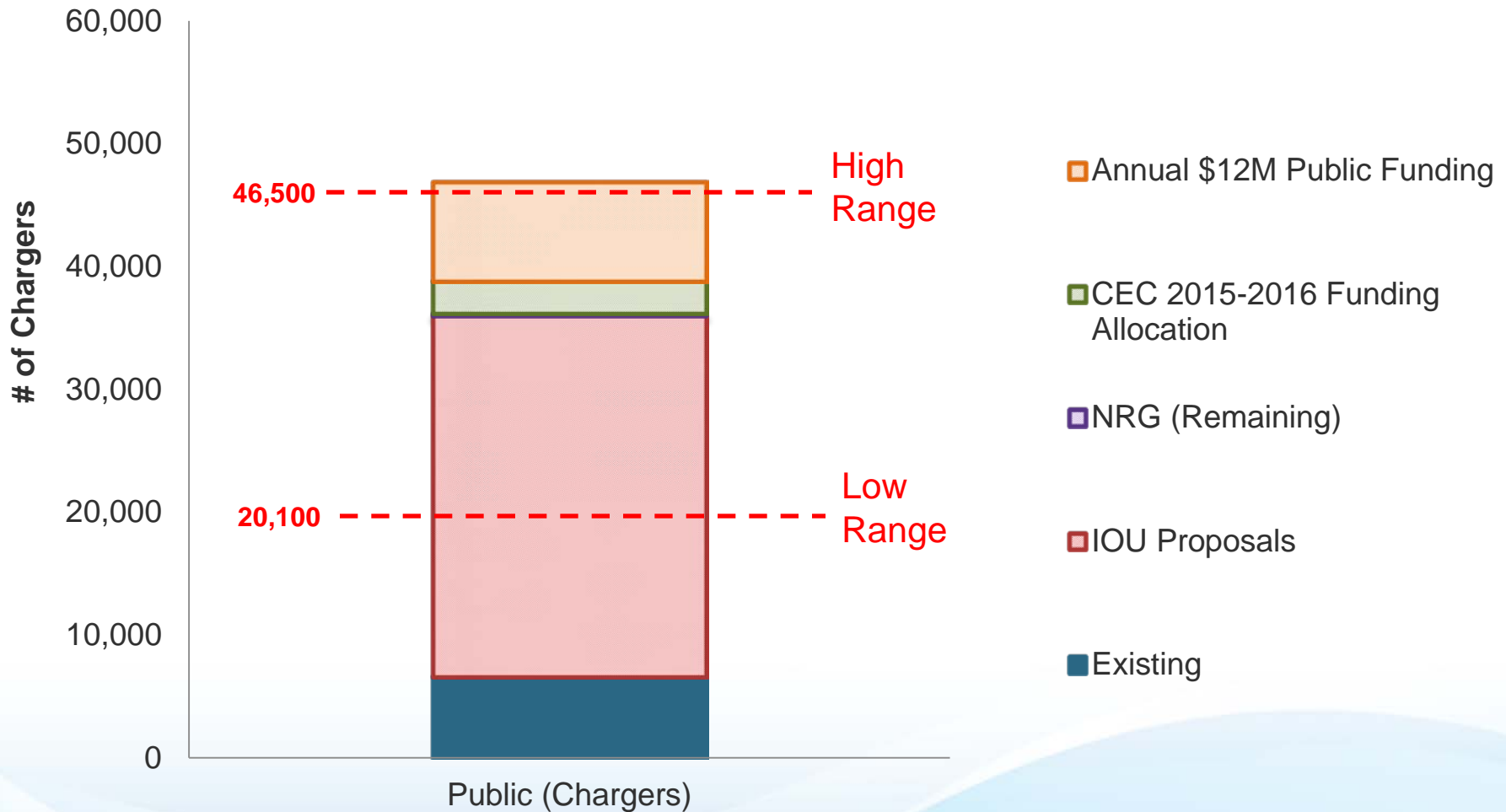
Photo: Nrg Freedom Station, Businesswire.com

CEC & PUC: Public Level 2 Charge Points

Existing and Proposed Actions



Public



Building Standards Commission (BSC) & ARB: *Expanding EV Infrastructure in CALGreen Code*

Plug-in



Requirements:

- Install infrastructure (raceway and panel capacity) to support future installation of Level 2 charging stations

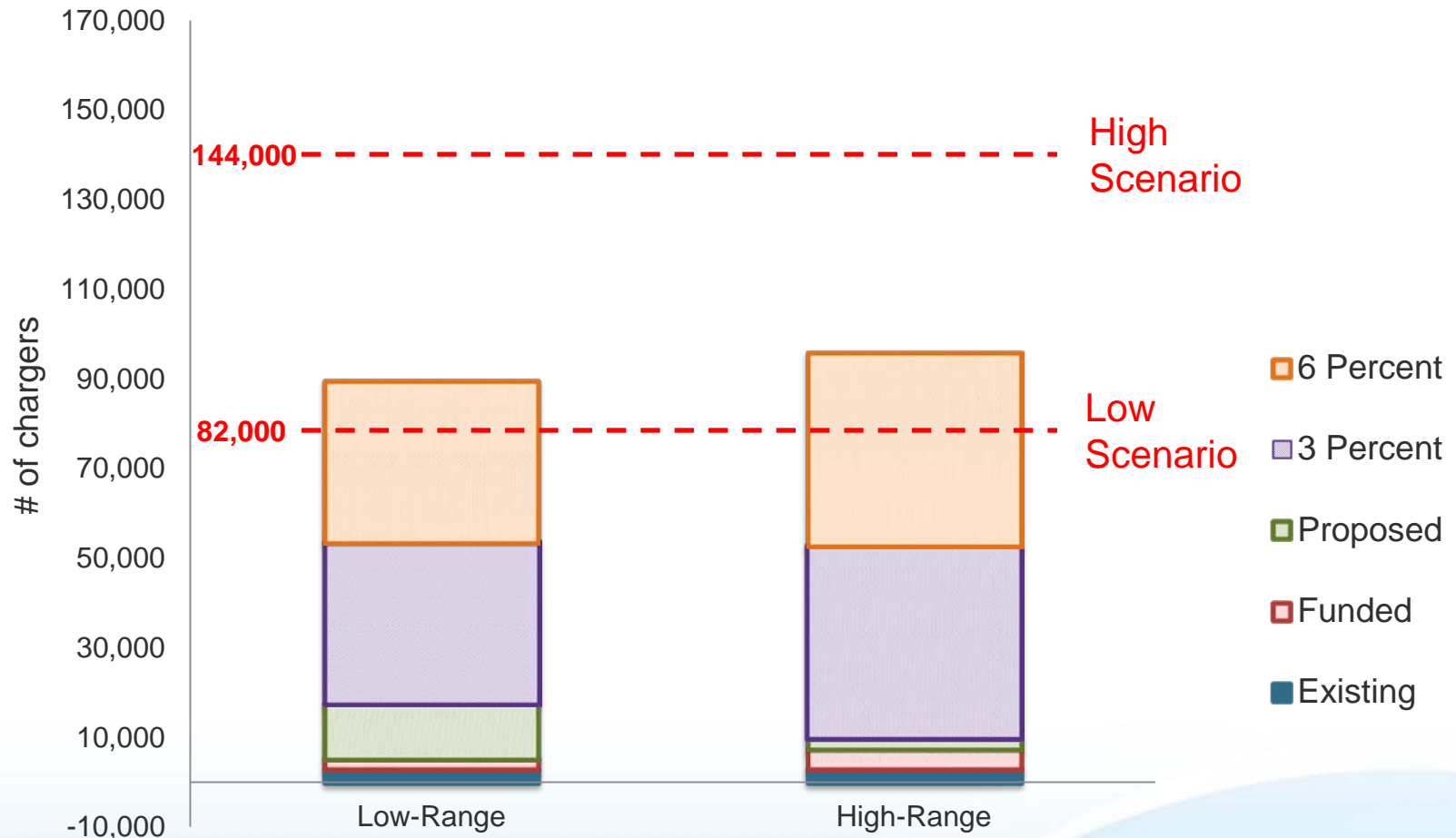
Voluntary “Reach” Standards:

- Tiers are more progressive than requirements
- Cities and counties can adopt as mandatory

Workplace Chargers: Level 2 Charge Points *Existing and Proposed Actions*



Workplace



Summary and Next Steps

- Hydrogen - big year ahead
- EVSE – need to make sure opportunities = stations
- Hydrogen and EVSE
- Reliability is central to both sets of infrastructure
- Need to make sure consumers aware (of incentives, vehicles, stations, etc.)
- Focus on building confidence

Public-Private-Partnerships

Multi-Stakeholder Cooperation to Address Barriers

Christine Kehoe
Executive Director,
Plug-In Electric
Vehicle Collaborative

Bill Elrick
Executive Director,
California Fuel Cell
Partnership

Plug-In Electric Vehicle Collaborative

Growing the PEV market through
public / private partnerships

Christine Kehoe
Executive Director

PEVC Members

Automakers

- BMW
- Daimler
- Ford
- GM
- Honda
- Kia
- Nissan
- Subaru
- Tesla
- Toyota

State Government

- Air Resources Board
- CA Energy Commission
- CA ISO
- CA Public Utilities Commission
- Caltrans
- Legislature members
- Governor's office

Local Government

- Bay Area AQMD
- South Coast AQMD
- Northern Sonoma APCD

Utilities

- LADWP
- PG&E
- SCE
- SDG&E
- SMUD

Education/Research

- Advanced Energy Economy
- Center for Sustainable Energy
- CalETC
- CALSTART
- EPRI
- Plug In America
- UC Davis – ITS
- UCLA – Luskin Center

Environmental NGOs

- American Lung Association
- Center For Energy Efficiency And Renewable Technologies
- International Council for Clean Transportation
- National Resources Defense Council
- Union of Concerned Scientists

EVSE/Network Providers

- AeroVironment
- Clean Fuel Connection
- ChargePoint
- Greenlots
- NRG Energy
- PlugShare

PEV Sales Numbers



PEV Collaborative Priorities

- Charging at Work, Apartments & Condos
- Public Education
- Corporate Commitments
- International Partnership



Charging at Work, Apartments & Condos

- Reaching Out to Property Owners
- Developing Case Studies
- Producing Workplace Charging Guidance



Best. Ride. Ever!

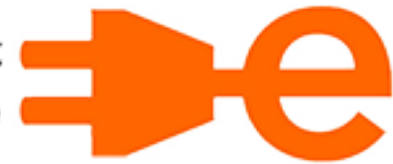
- Targeting Underserved and Geographically Diverse Areas
- Assessing Drive-to-Purchase Metrics



Coast to Coast e-Mobility

- International Partnership With the Netherlands
- Signed MOU in 2013

Coast to Coast
EV Connection



DRIVE THE DREAM 2015

- October 15, 2015 at the Creative Artists Agency in Los Angeles
- Governor Brown in Attendance
- Expanding Corporate Investments:
 - Workplace charging
 - Employee incentives
 - PEVs in fleet



More Information & Questions

Find our resources and
sign up for eBlasts at:

www.PEVCollaborative.org

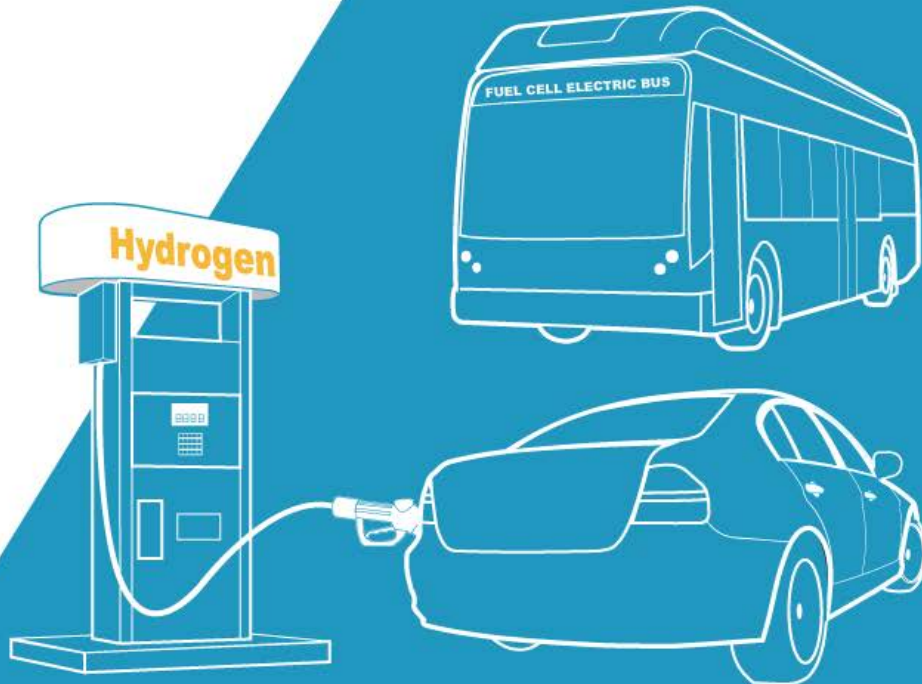
Christine Kehoe
Executive Director

ckehoe@pevcollaborative.org

Fuel Cell Electric Vehicles and Hydrogen Fueling Stations

Bill Elrick

Executive Director





Here come the FCEVs....



**BE PART OF THE
NEXT BIG THING**

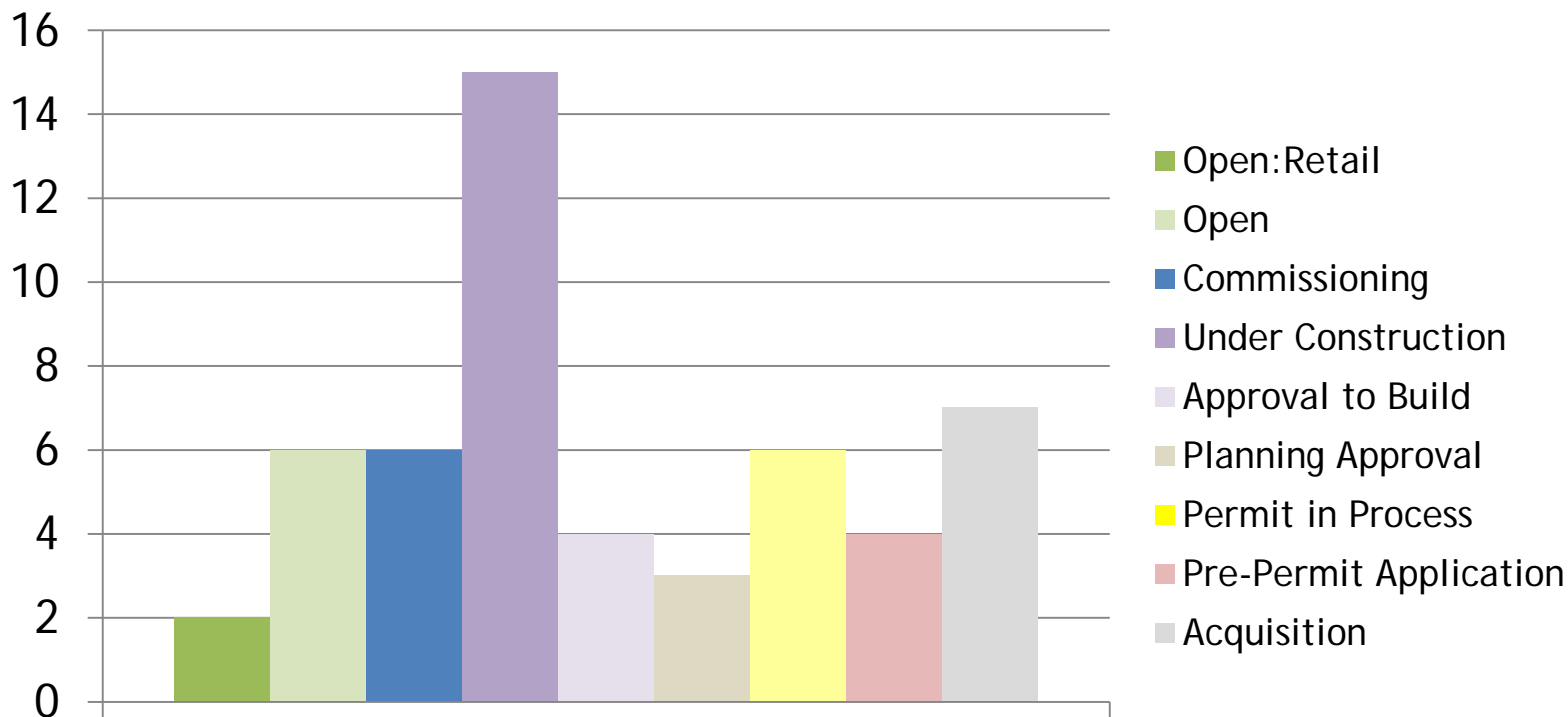
Because of your interest in our Fuel Cell Vehicle, we'd like to invite you to an exclusive research event. Your feedback will help researchers understand what customers expect from alternative fuel vehicles.

Take our survey to find out if you qualify for the in-person event.* If you do qualify and take part, you'll be compensated for your time and participation.

Take survey 

Prototype vehicle shown with optional equipment. Production model may vary.

As of today



H2 Stations



Diamond Bar



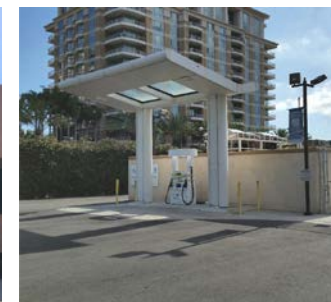
West Sacramento



San Juan Capistrano



Coalinga



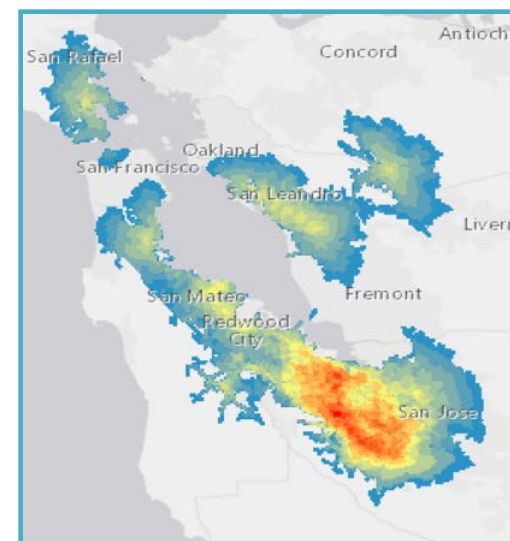
Irvine





Addressing barriers

- Common approach to “Authorities Having Jurisdiction”
- Consensus decision about station operability
- Unified voice for future recommendations
 - Station priority areas
 - O&M funding
- Industry support for codes and standards
- Sharing of information and learnings





Technical deliverables

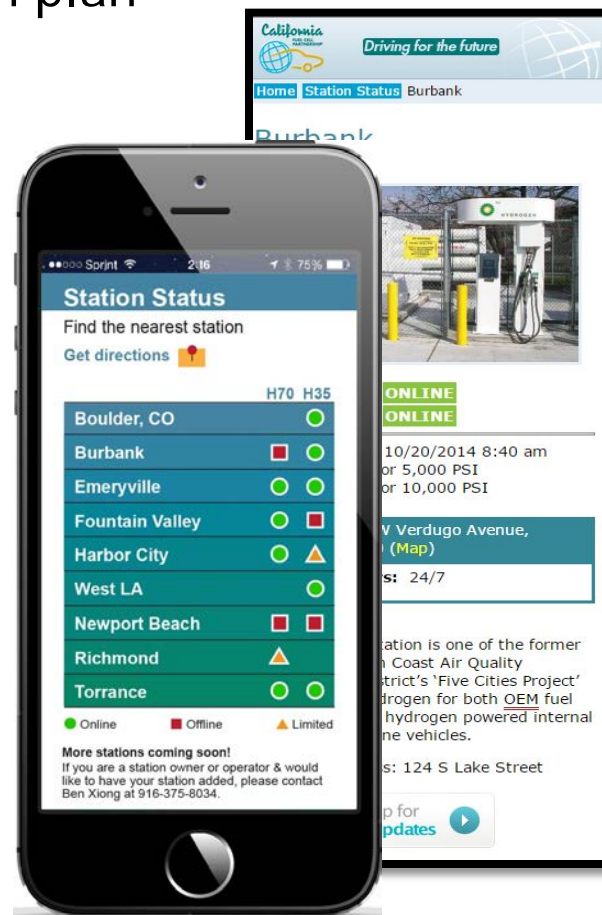
- GO-Biz Hydrogen Permitting Guidebook (pending publication)
- Medium- and heavy-duty vehicle action plan
- SOSS
- Station map
- H2Tools



National Hydrogen and Fuel Cell Emergency Response Training Resource

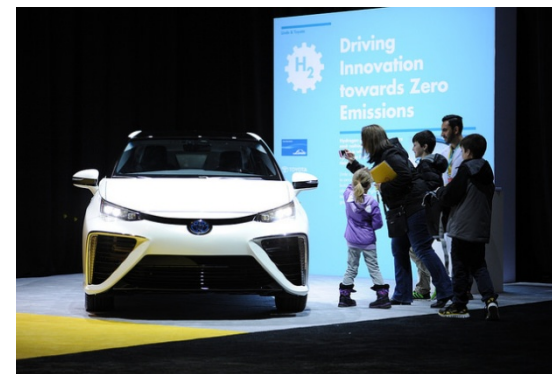
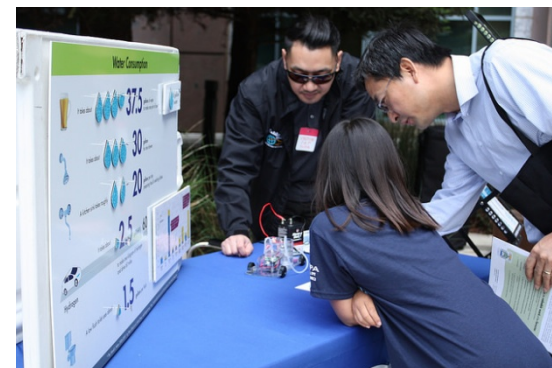
A properly trained first responder community is critical to the successful introduction of hydrogen fuel cell applications and their transformation in how we use energy. We envision that hydrogen and fuel cell-related first responder training will be delivered locally to serve missions to protect life and preserve property, utilizing this national emergency response training resource as a consistent source of accurate information and current knowledge. These training materials are adaptable to the specific needs of first responders and training organizations and are meant to complement the extensive training programs already in place.

DOWNLOAD:
 Training Materials





Outreach





Bill Elrick

belrick@cafcp.org



#HydrogenNow



MULTI-STATE ZEV TASK FORCE

State Partners

Recent Success in Market Enablers

Rob Klee

Commissioner, Connecticut Department of Energy and
Environmental Protection

Christine Kirby

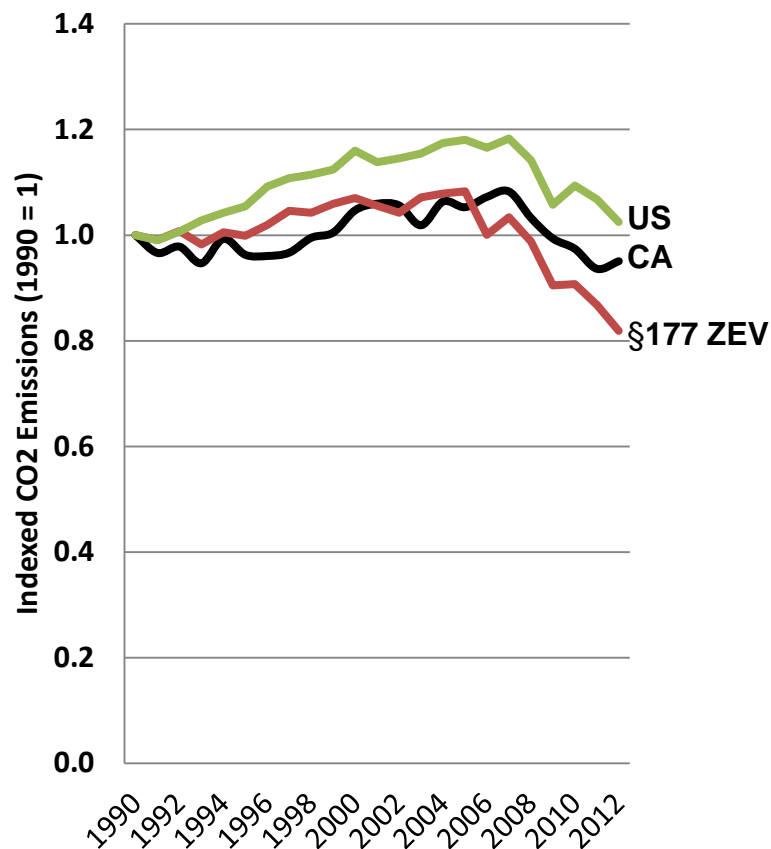
Director, Air and Climate Programs,
Massachusetts Department of Environmental Protection

Dave Nordberg

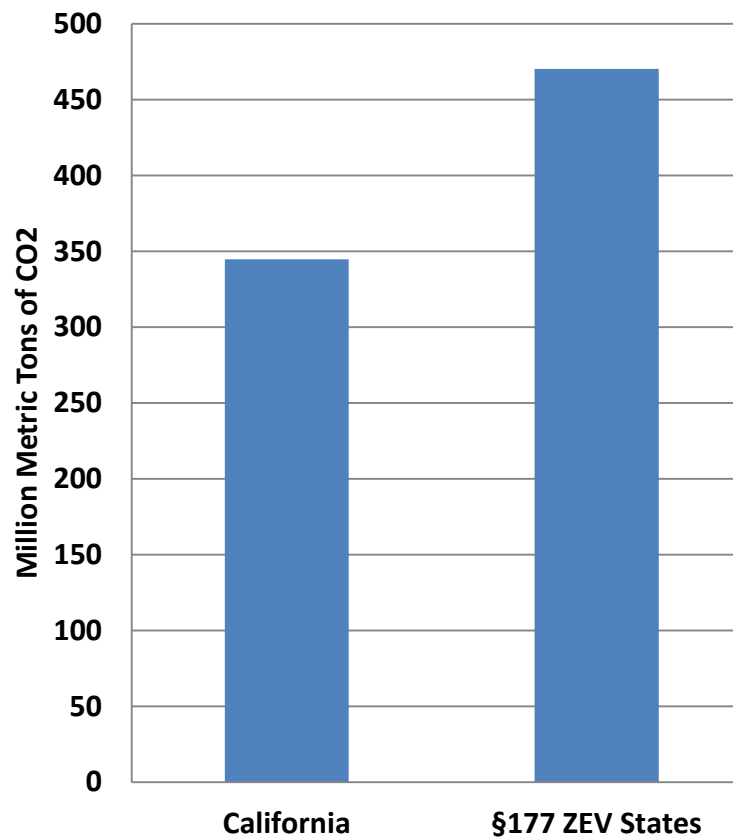
Coordinator, Low and Zero Emission Vehicle Program,
Oregon Department of Environmental Quality

CO₂ Emissions in ZEV States

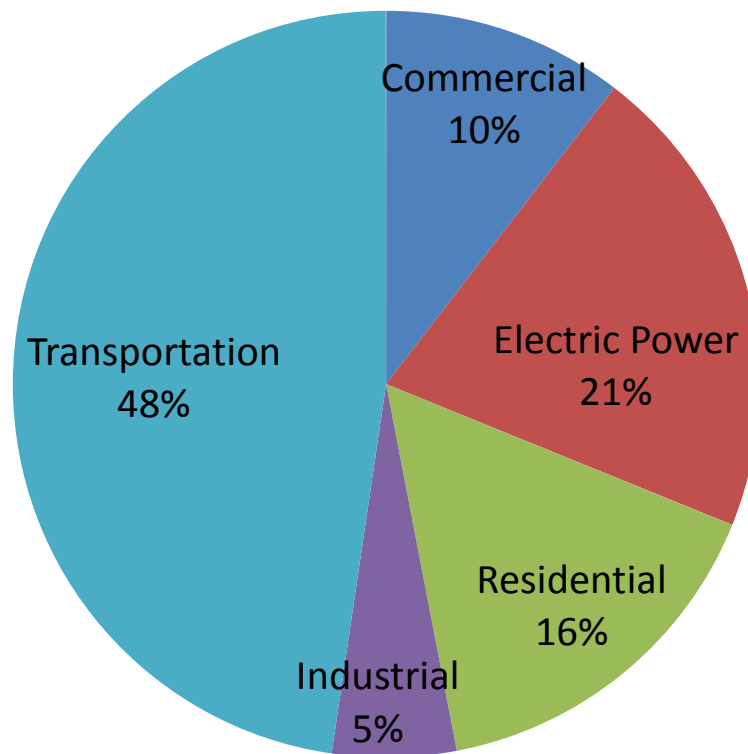
Indexed to 1990



2012 CO₂ Emissions



Transportation Electrification: The Key to Achieving Climate Goals



2012 Section 177 ZEV State CO2 Emissions

State Incentives

ZEV MOU states are:

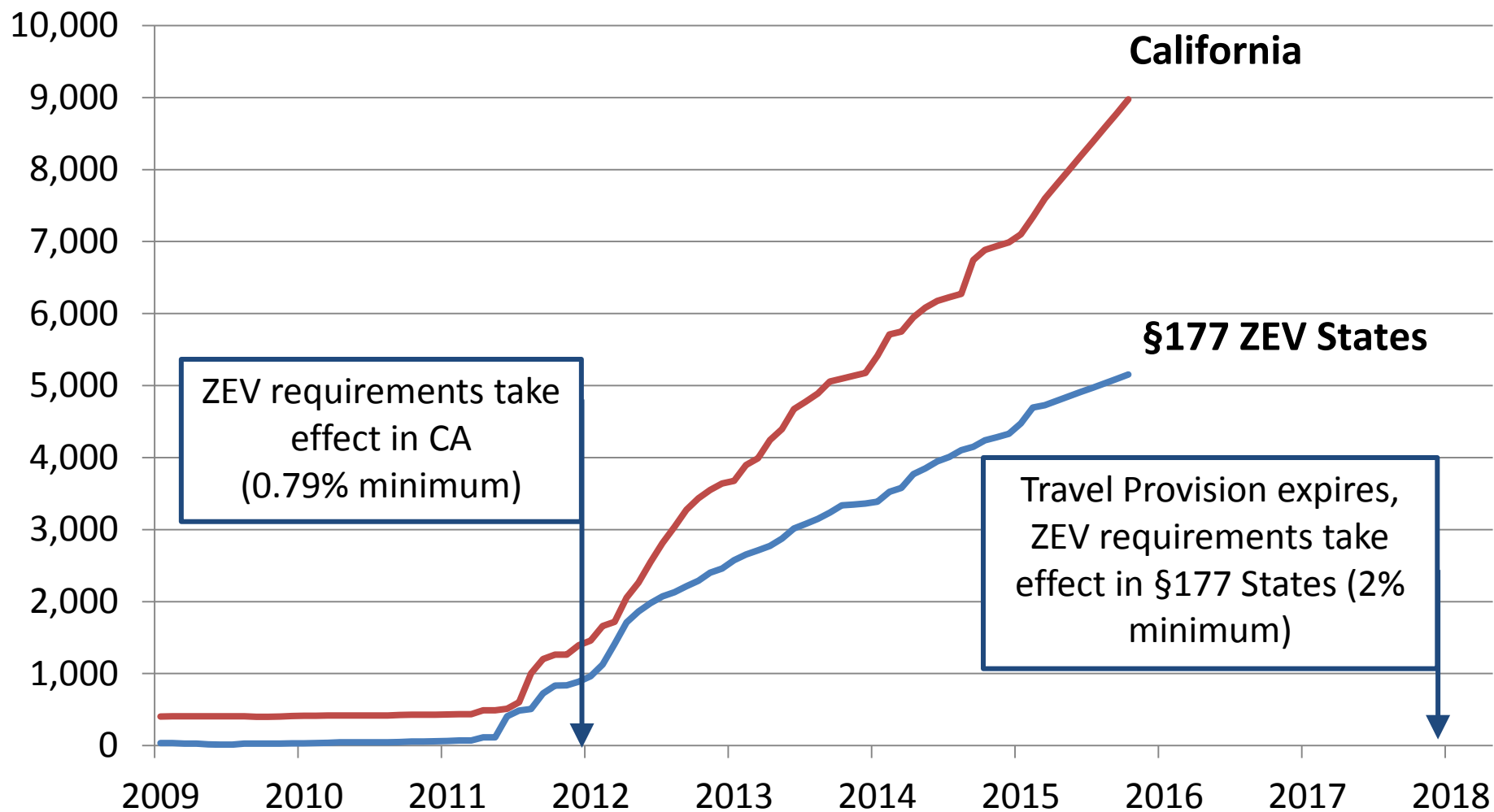
- Offering ZEV purchase incentives
- Providing funding for EVSE
- Evaluating options for offering and improving incentive programs



MOR-EV

Massachusetts Offers Rebates
for Electric Vehicles

Public and Non-Residential Private EV Charging Stations



State Progress on Dealerships

ZEV MOU states are:

- Issuing dealership recognition awards
- Educating dealers on consumer incentives
- Offering incentives to dealers who sell ZEVs



REVolutionary Dealer Award



State Progress on Fleets

ZEV MOU states are:

- Establishing state fleet purchase targets
- Acquiring PEVs
- Installing charging stations
- Offering incentives to add PEVs to fleets

MA Incentives for Fleets:



City of New Bedford adds 10 BEVs to fleet,
June 25, 2015

Workplace Charging

ZEV MOU states are:

DRIVE THE DREAM VERMONT

- Providing grants for workplace charging
- Holding Workplace Charging Challenge workshops with DOE
- Conducting high profile events to promote workplace charging



Gov. Shumlin and CEO of Vermont Teddy Bear Company, Sept. 16, 2016

Partnerships to Promote ZEVs

State-OEM Collaboration for ZEV Success



Tour of ZEVs at New York International Auto Show, April 2015

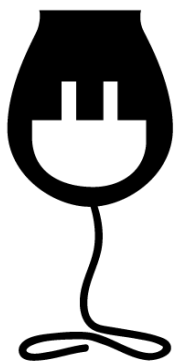
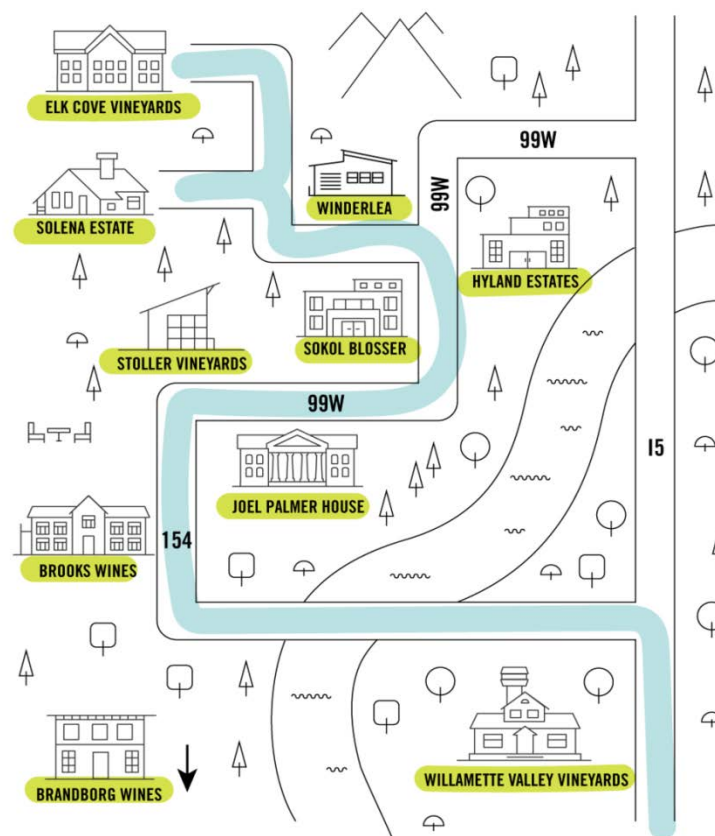
DOE-NESCAUM Partnership

To pursue opportunities for collaborative action between DOE and ZEV MOU states on:

- Workplace Charging
- Economic Benefit Analyses
- Educating Consumers
- Utility Engagement
- Public Fleet Electrification
- Corridor Mapping

Outreach & Education

Electric Vehicle Tourism: Plug & Pinot



THE
OREGON
WINE COUNTRY
EV BYWAY

Additional Action Needed To Raise Consumer Awareness

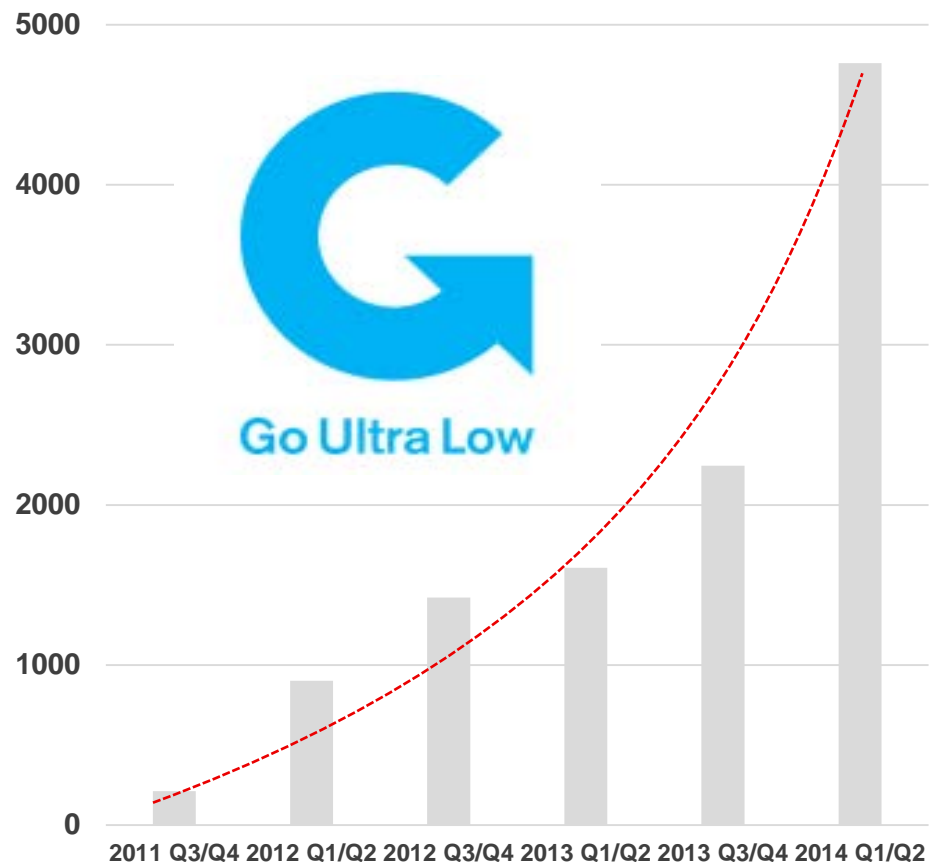
Go Ultra Low Campaign

A **national multi-media campaign** to raise interest and sales of PEVs in the UK

75% of new car buyers have **taken action** as a result of seeing the campaign

50% of campaign recognizers are **thinking about buying an electric vehicle**

2014 Q1/2 UK EV Grant Program uptake is **2.5 times** 2013 Q1/2



Technological Advances Will Expand Consumer Acceptance

(2017) Chevy Bolt: \$30,000* / 200 miles



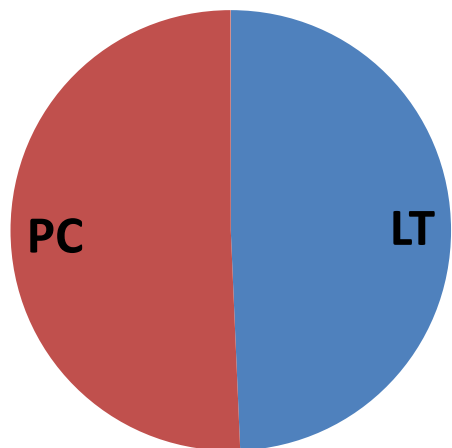
(2017) Tesla Model 3: \$27,500* / 200 miles

(2016) Toyota Mirai \$57,500 / 312 miles



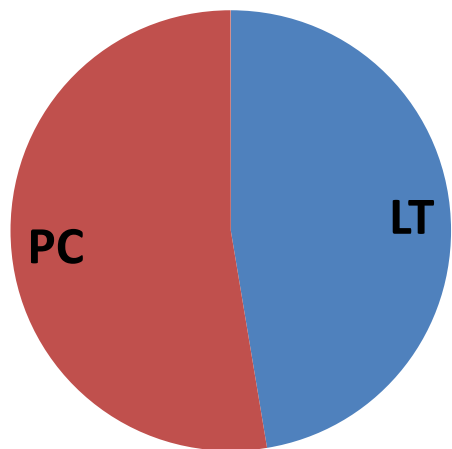
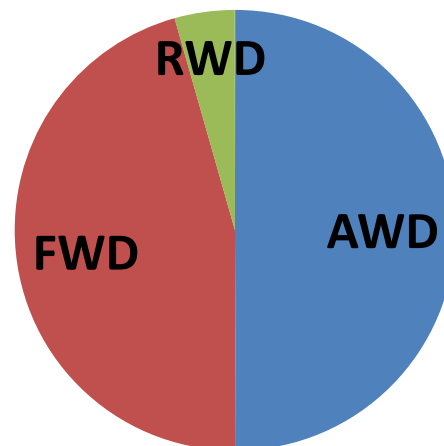
New Market Segments & AWD Options

In-Use Fleet Mix

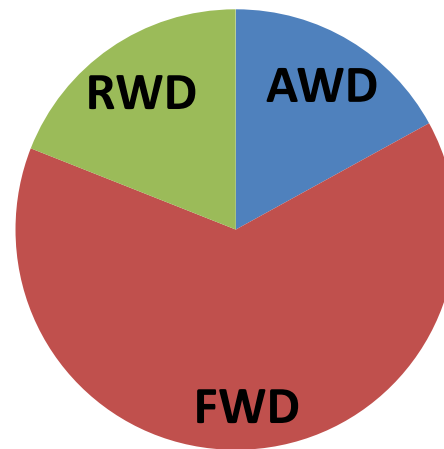


§177 ZEV States

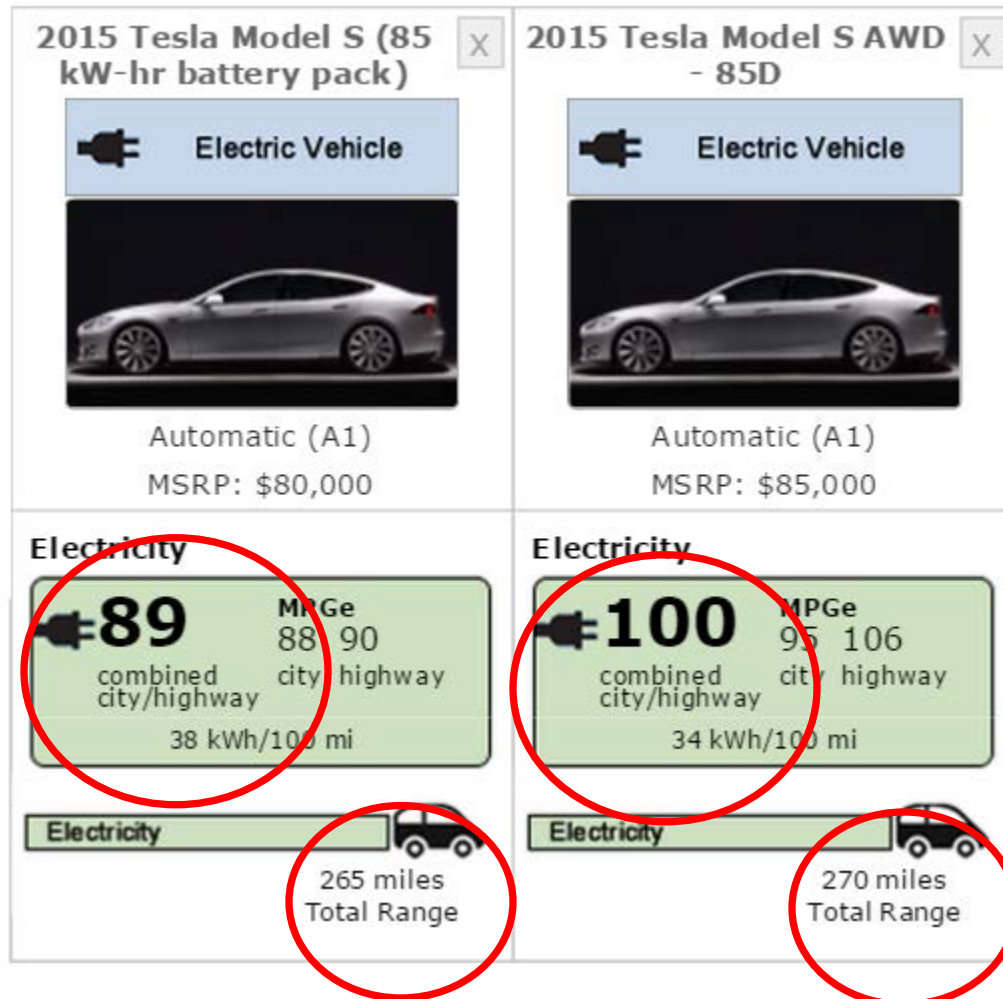
Drivetrain Market Share



California



Electric AWD → Improved Range & Performance



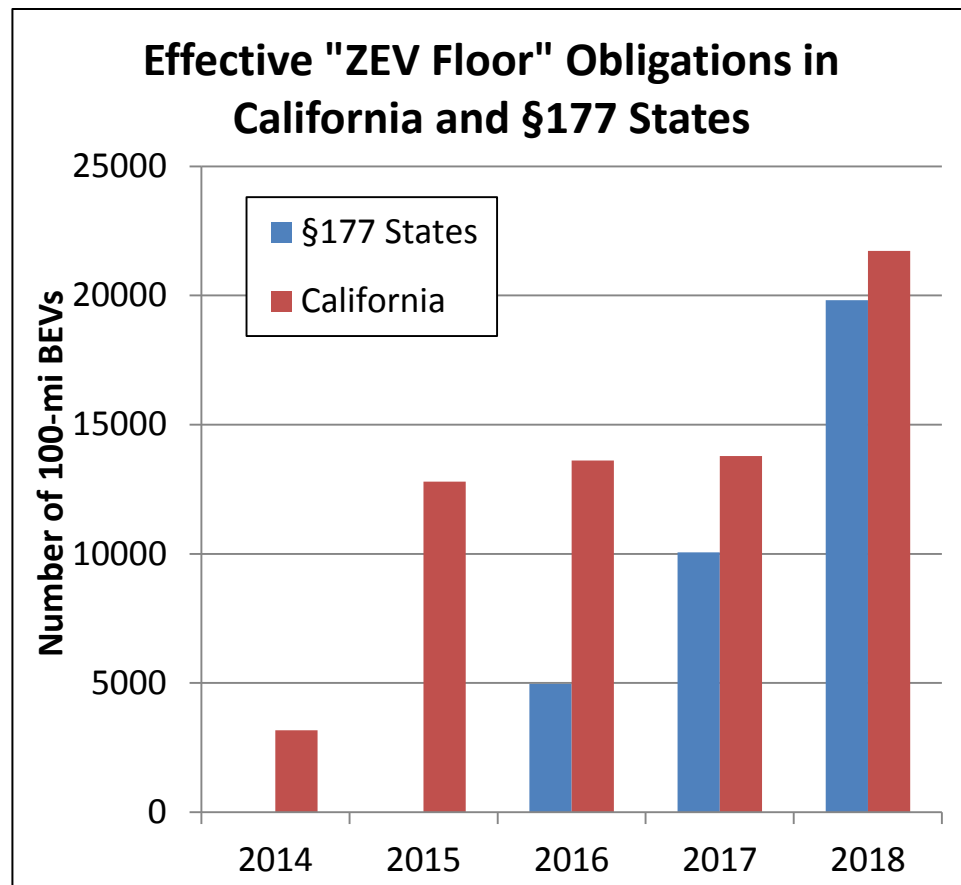
Expiration of Travel Will Enable Market

ISOR for 2012 ZEV Amendments:

Extending travel for BEVs through MY 2017 “will likely result [in] over 40,000 fewer BEVs placed in the Section 177 ZEV states...”

FSOR for 2012 ZEV Amendments:

“Starting in 2018 model year, the travel provision will no longer apply to BEVs, and therefore Section 177 states can expect vehicles to be placed outside of California...”



Source: NESCAUM analysis based on EMFAC sales projections and NADA new vehicle registration data.