Status Update on ZEV Market Enablers

Diamond Bar, CA

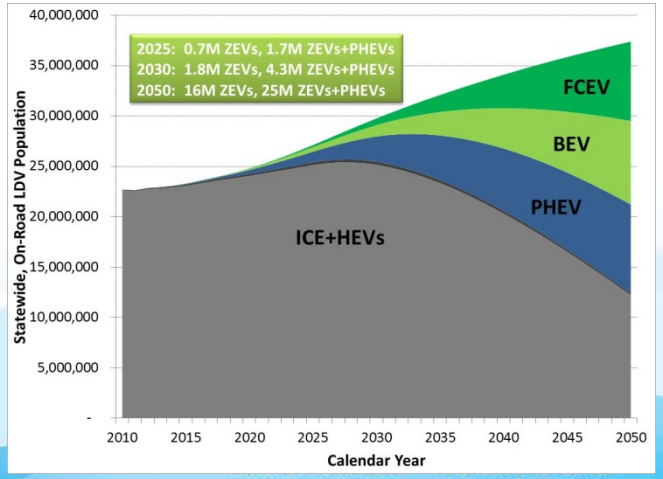
October 22, 2015

California Environmental Protection Agency

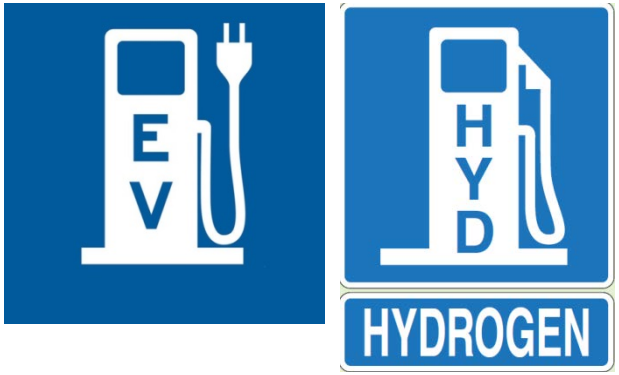
Air Resources Board

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 Study[1]: 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

DriveClean.ca.gov
A buying guide for clean and efficient vehicles

CLEAN VEHICLE REBATE PROJECT℠

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

Consumer rebates for:
- FCEVs
- BEVs
- PHEVs

Tools and Calculators:
- Incentives
- Fuel costs

The Global ZEV Market

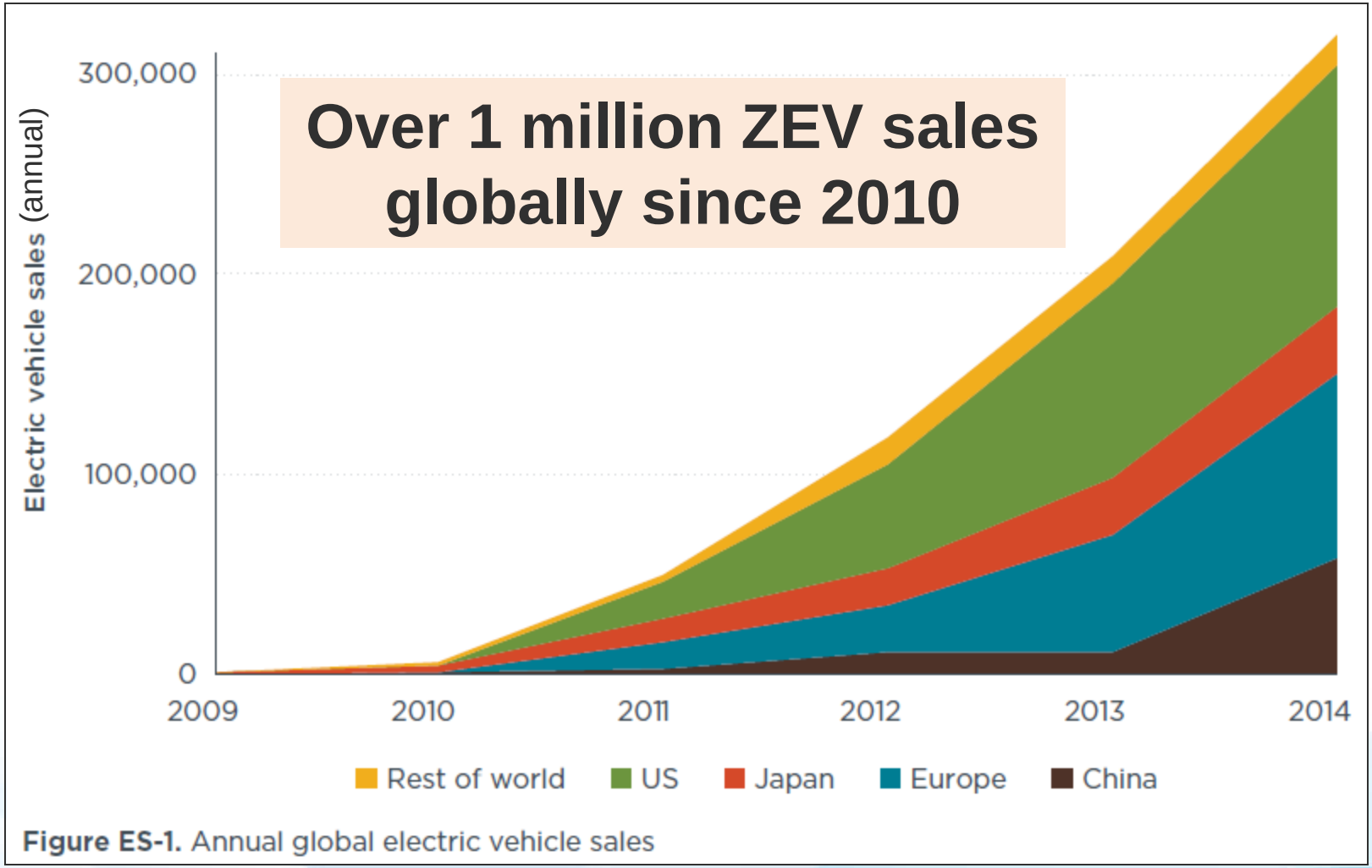
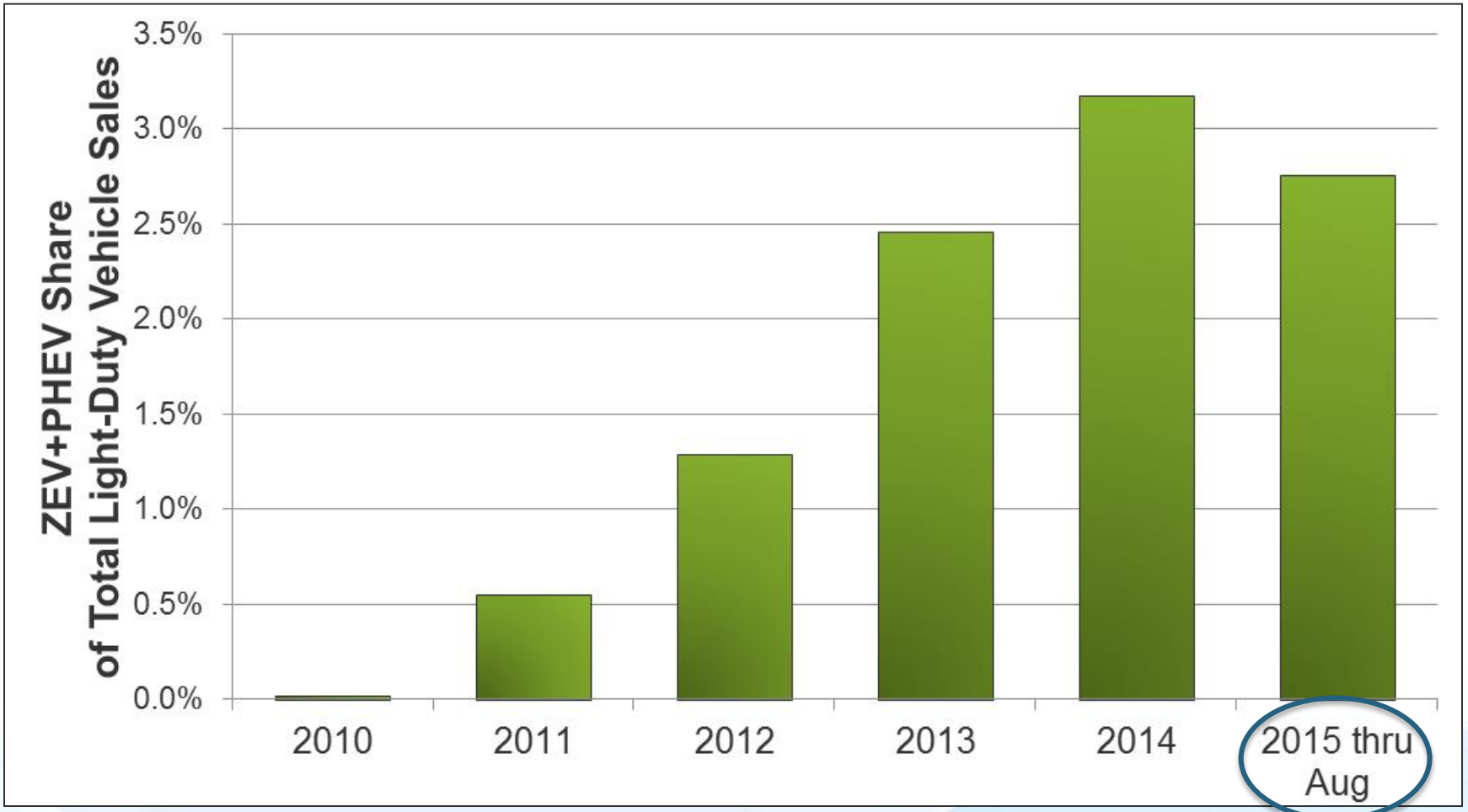


Figure ES-1. Annual global electric vehicle sales

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

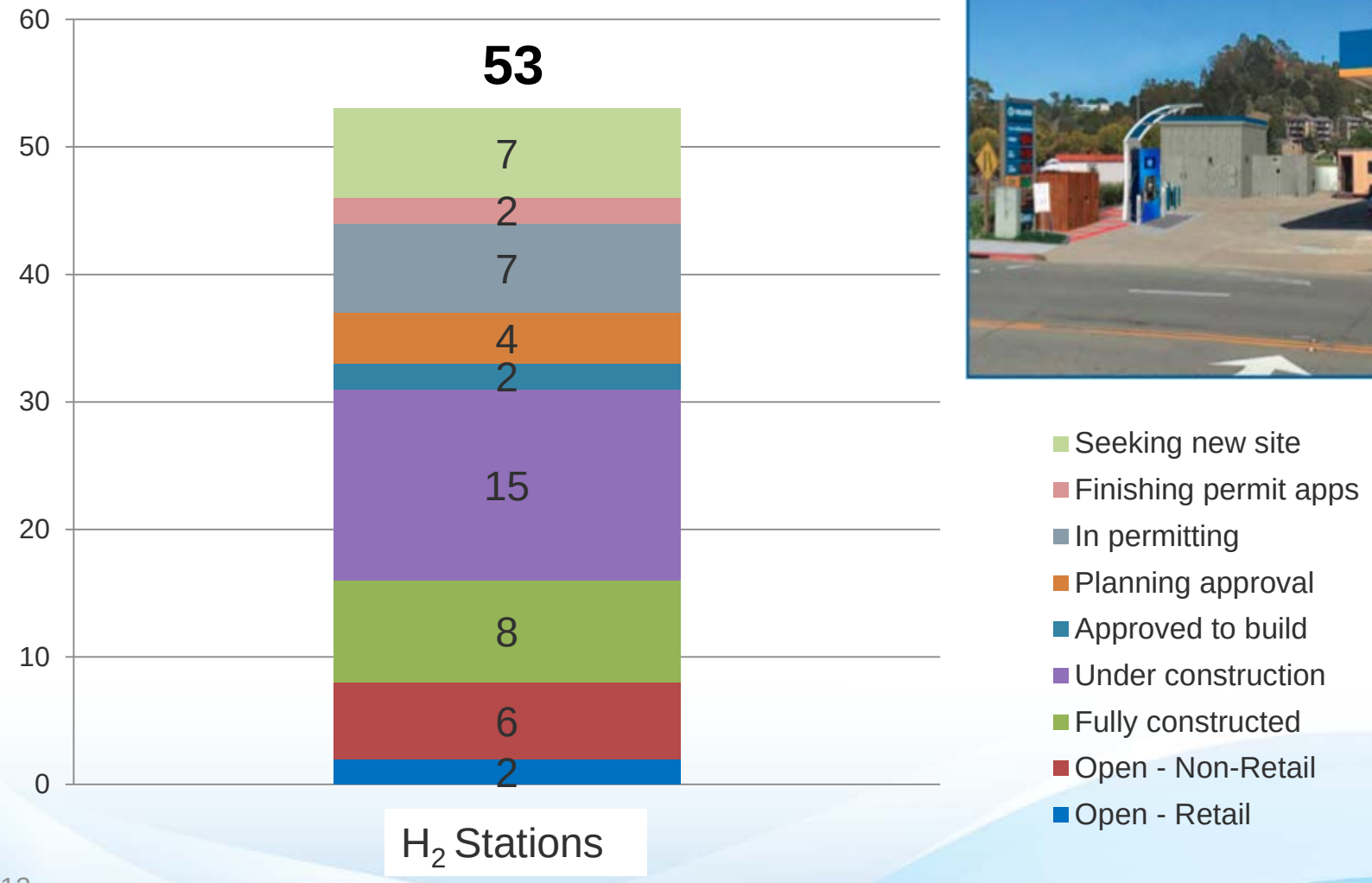
Hydrogen

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

Electric Charging

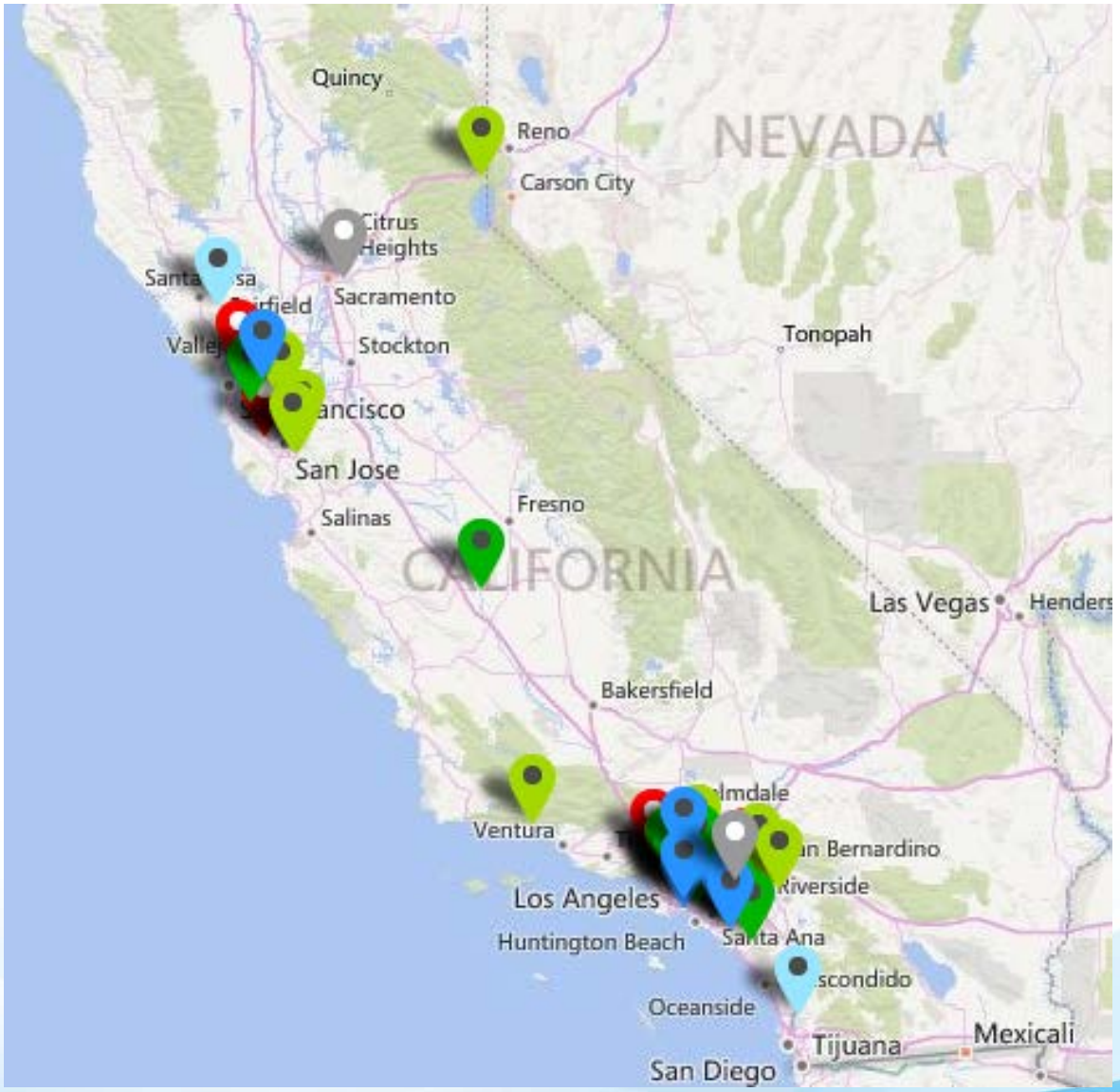
- Current status – workplace & public charging
- Projections to 2020 of charging needs
- Actions to close the gap

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



* As of 10/16/2015

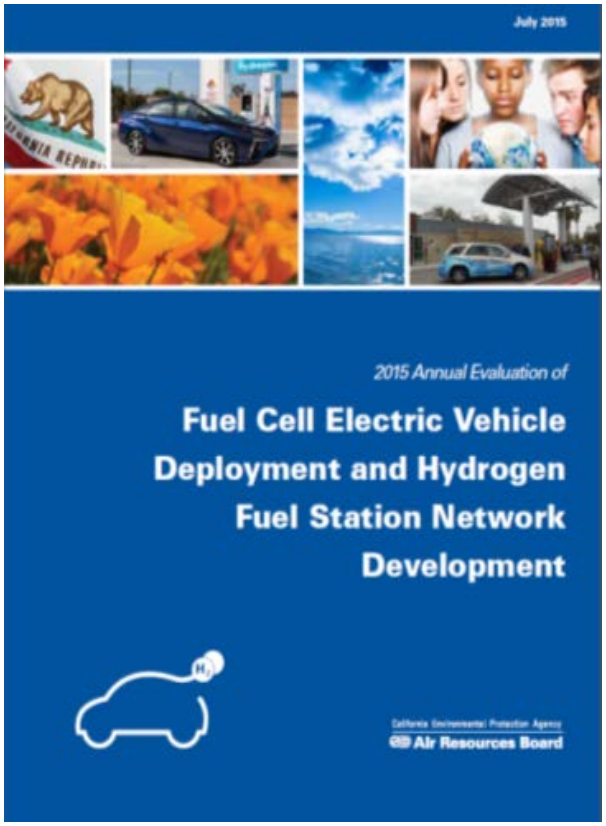
CA's Currently Funded Hydrogen Network*: *Geographically Dispersed*



- 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)

* As of 10/16/2015

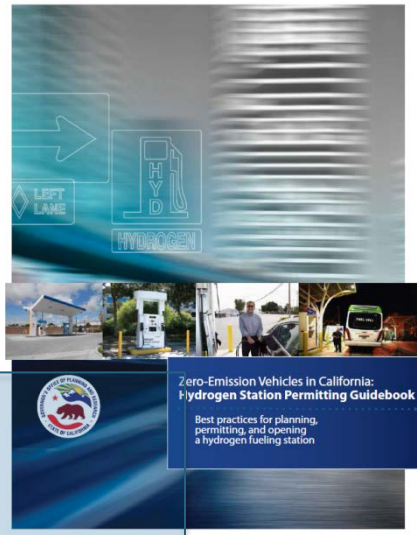
Need for Continued Hydrogen Station Investments

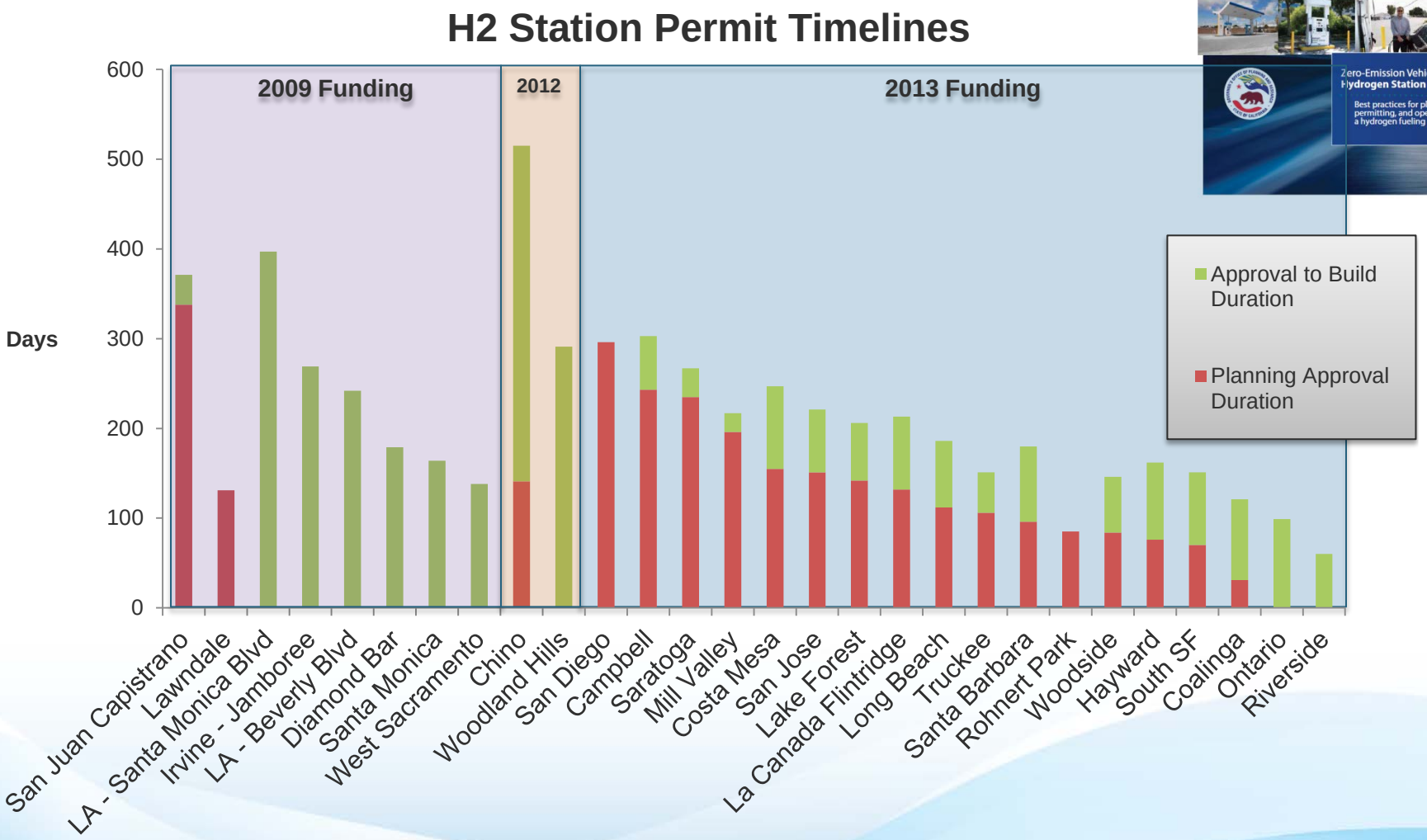


- **Current network development is largely on track**
- **Post-2018, FCEV deployment will accelerate faster than previously projected**
- **86 stations projected by 2021 will be insufficient to meet fuel demand**
- **Need larger stations and innovative funding mechanisms**

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

Hydrogen Network Lessons Learned
Implementation Time is Declining





Electric Charging Station Types

Plug-in

Level 1: Standard Outlet

Level 2: Dedicated 220V

DC Fast Charging: High voltage public charging

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

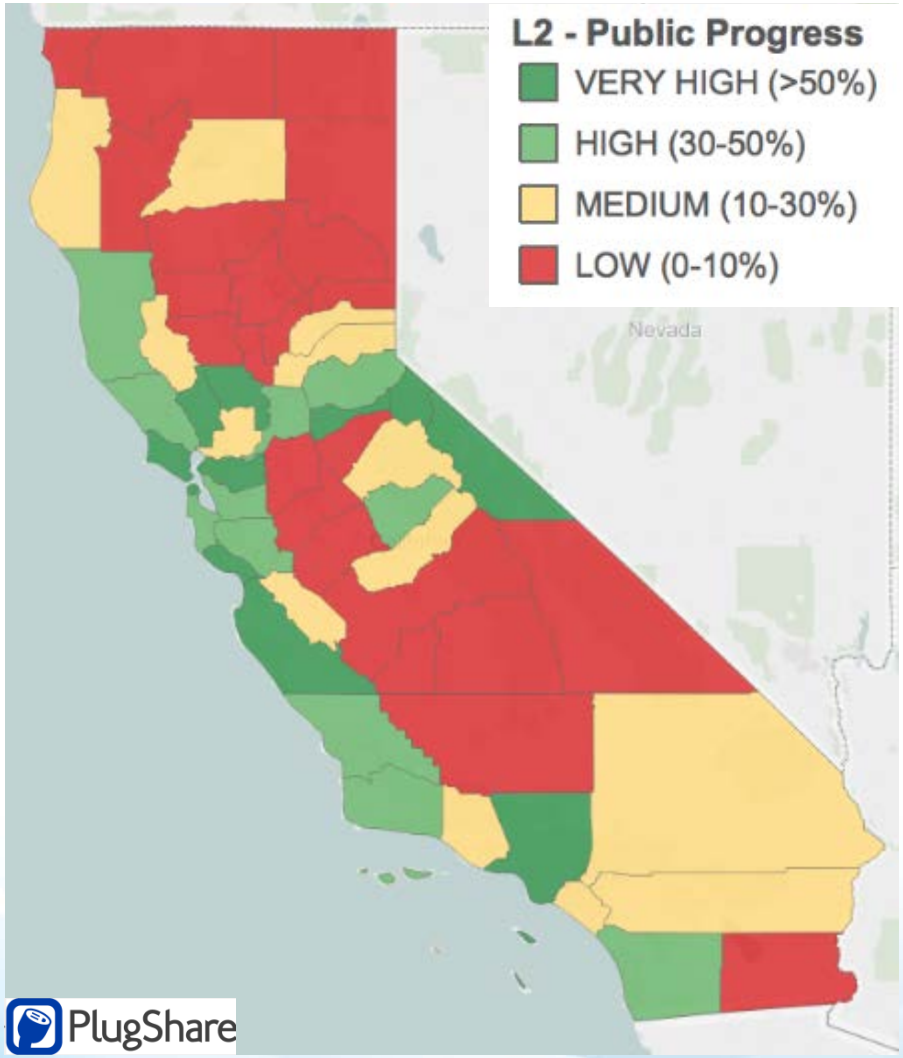
** As of September 2015. Note: a Station can have multiple chargers.*

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

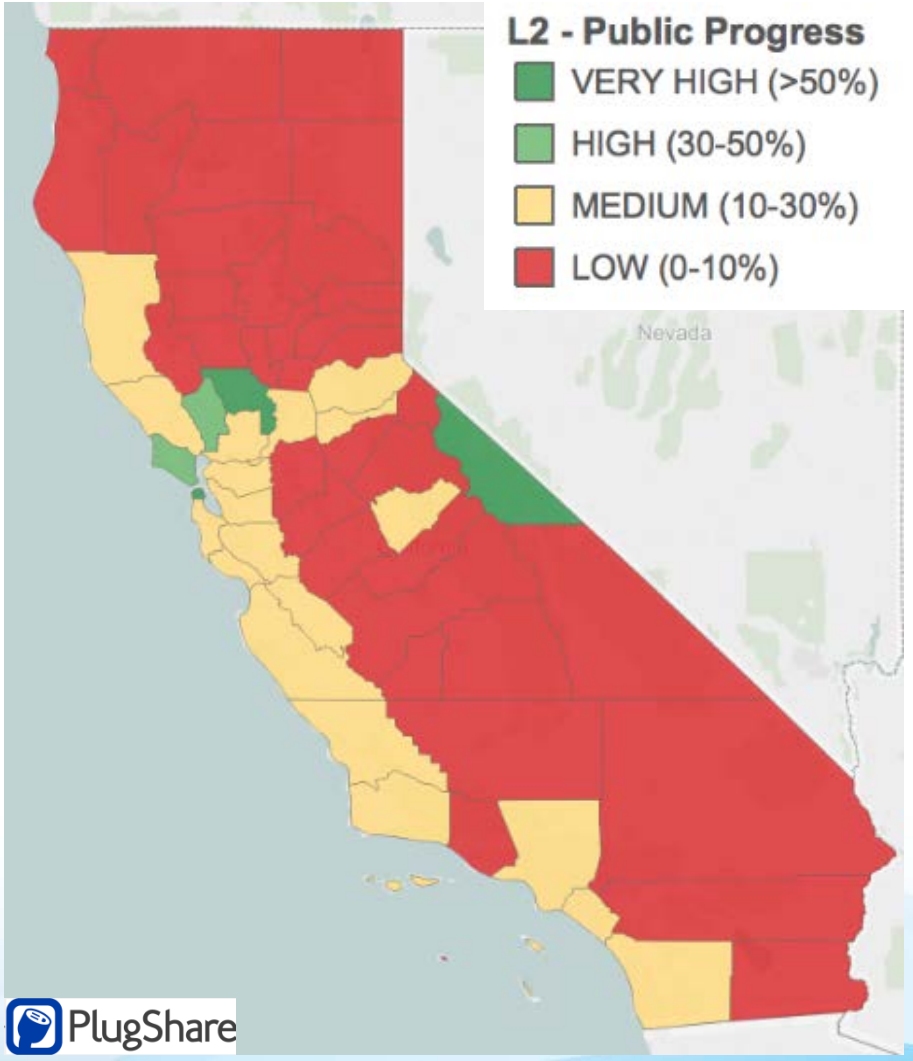
Low and high range from NREL/CEC #600-2014-003

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

Home Dominant Scenario



High Public Access Scenario

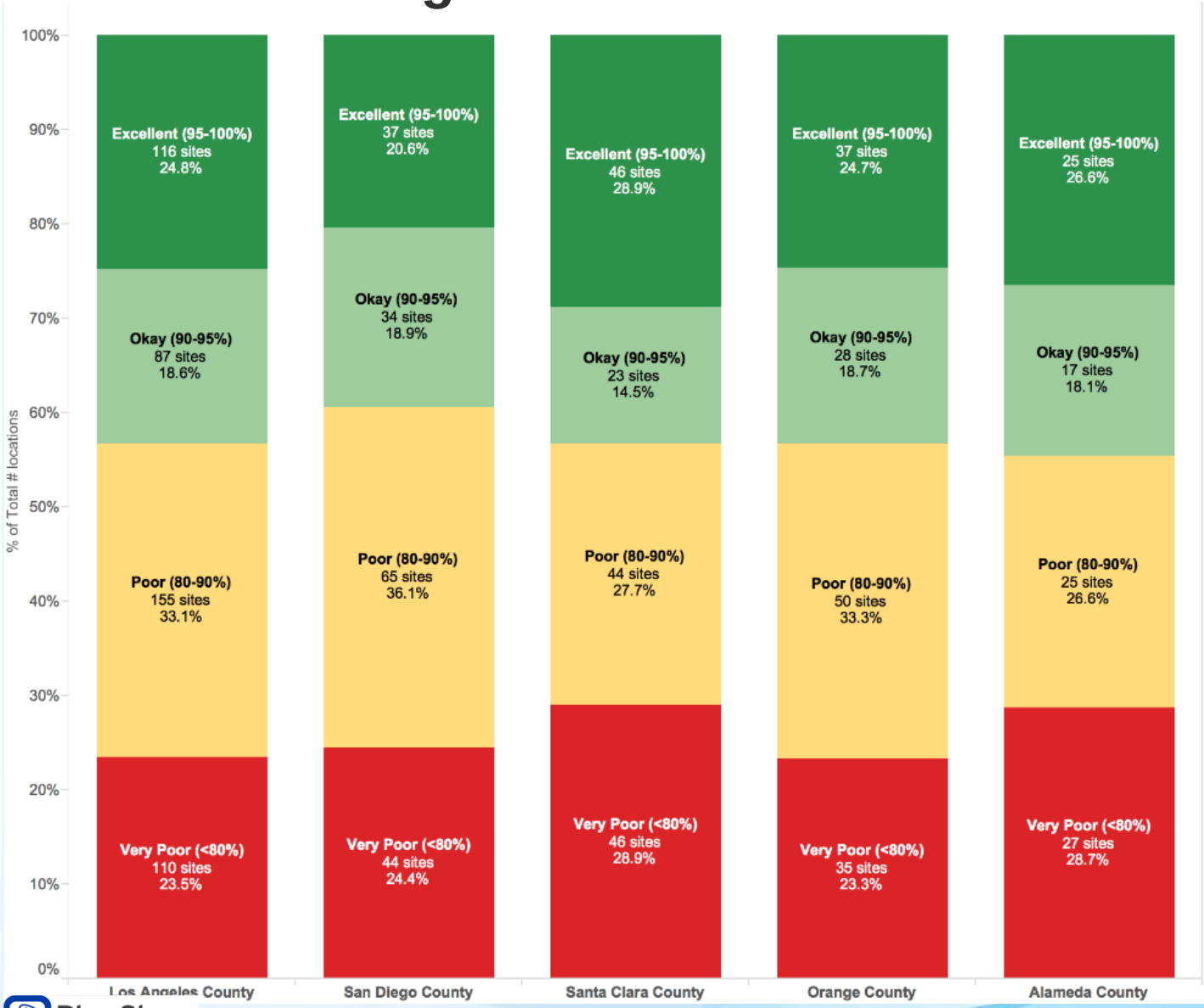


Scenarios developed using gross # of chargers from NREL/CEC #600-2014-003. Data Provided by PlugShare.

Performance Reviews of Today's Level 2 Public Chargers

Plug-in

Public



PlugShare

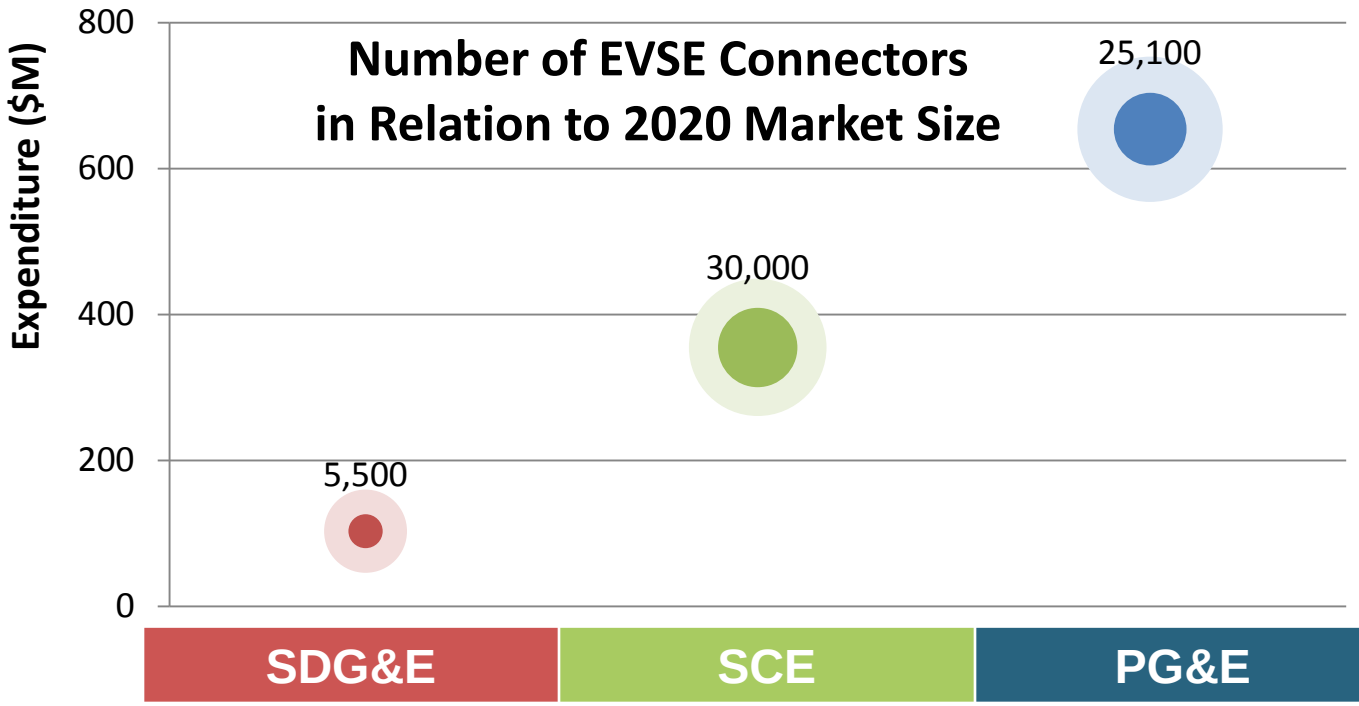
Data Provided by PlugShare

advanced clean cars

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

Plug-in

	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)

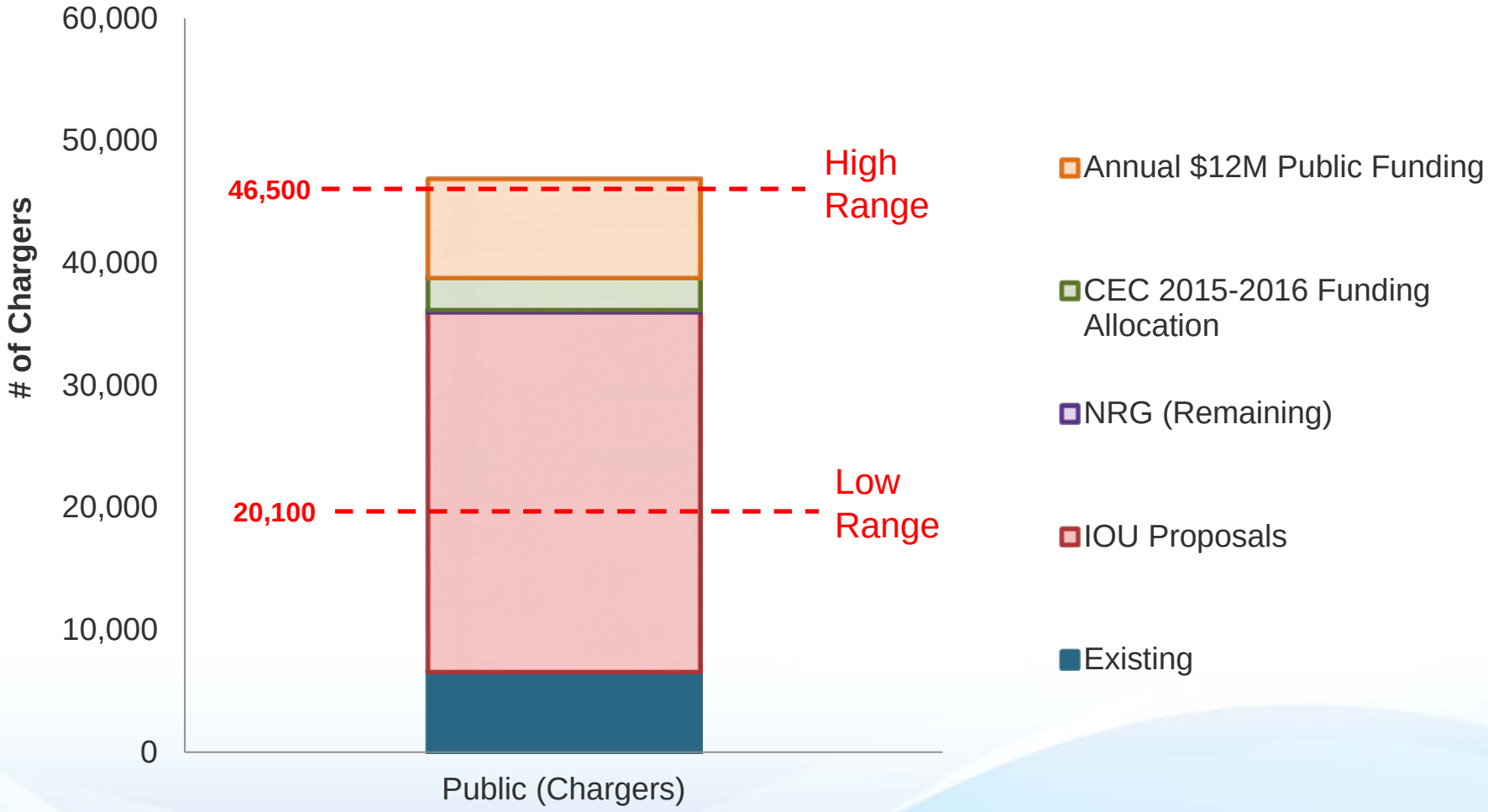
Photo: Nrg Freedom Station, Businesswire.com

* As of 9/5/15

CEC & PUC: Public Level 2 Charge Points
Existing and Proposed Actions

Plug-in

Public



Low and high range from NREL/CEC #600-2014-003
* As of 5/11/15

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

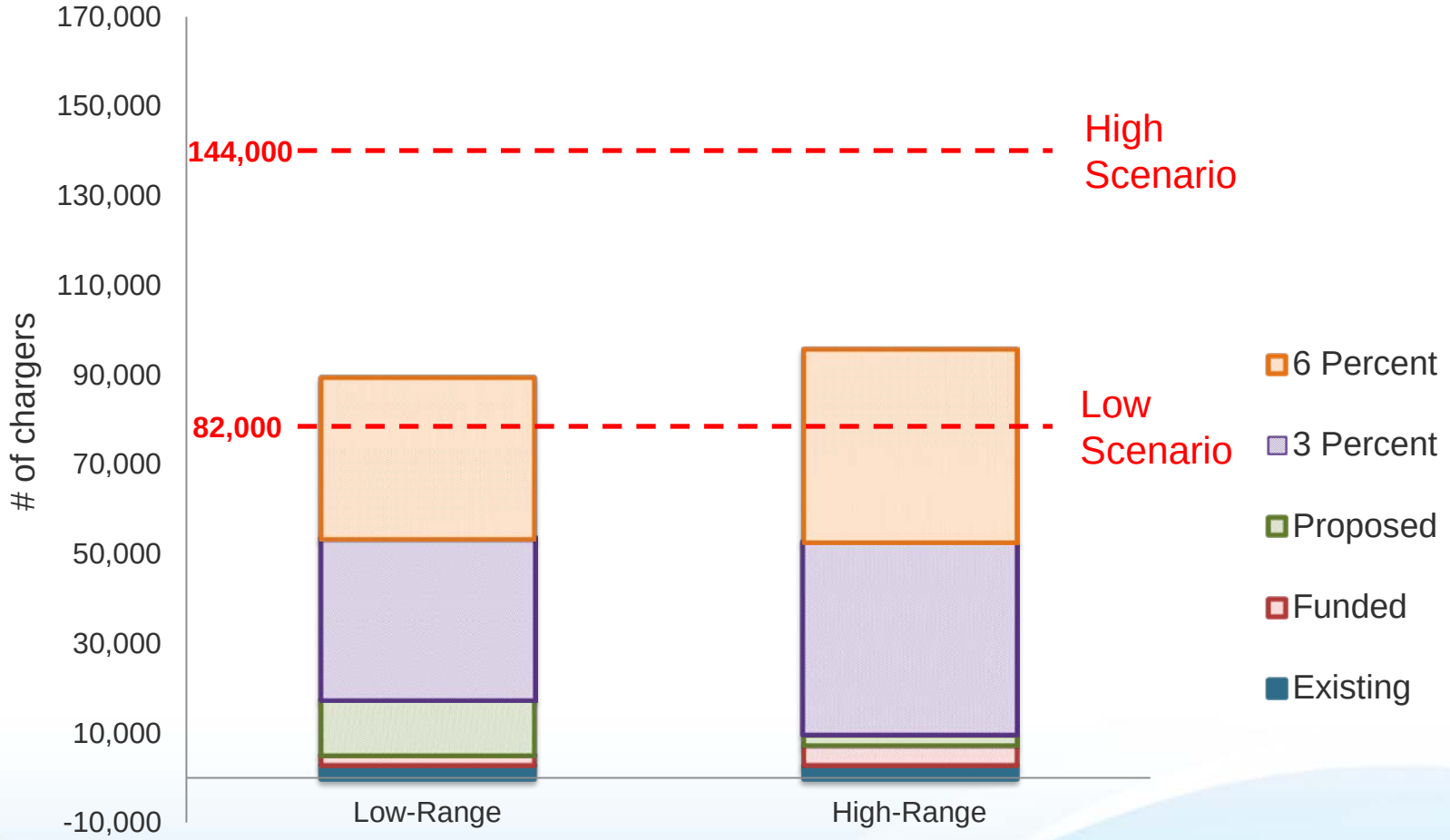
Voluntary "Reach" Standards:

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

Workplace Chargers: Level 2 Charge Points
Existing and Proposed Actions

Plug-in

Workplace



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

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

CALIFORNIA PLUG-IN ELECTRIC VEHICLE COLLABORATIVE

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

CALIFORNIA PLUG-IN ELECTRIC VEHICLE COLLABORATIVE

PEV Sales Numbers

CALIFORNIA PLUG-IN ELECTRIC VEHICLE COLLABORATIVE

PEV Collaborative Priorities

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

CALIFORNIA PLUG-IN ELECTRIC VEHICLE COLLABORATIVE

Charging at Work, Apartments & Condos

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

CALIFORNIA PLUG-IN ELECTRIC VEHICLE COLLABORATIVE

Best. Ride. Ever!

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

CALIFORNIA
PLUG-IN ELECTRIC VEHICLE
COLLABORATIVE

Coast to Coast e-Mobility

- International Partnership With the Netherlands
- Signed MOU in 2013

Coast to Coast
EV Connection

CALIFORNIA
PLUG-IN ELECTRIC VEHICLE
COLLABORATIVE

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

CALIFORNIA PLUG-IN ELECTRIC VEHICLE COLLABORATIVE

More Information & Questions

Find our resources and
sign up for eBlasts at:

www.PEVCollaborative.org

Christine Kehoe
Executive Director
ckehoe@pevcollaborative.org

CALIFORNIA
PLUG-IN ELECTRIC VEHICLE
COLLABORATIVE

Fuel Cell Electric Vehicles and Hydrogen Fueling Stations

Bill Elrick

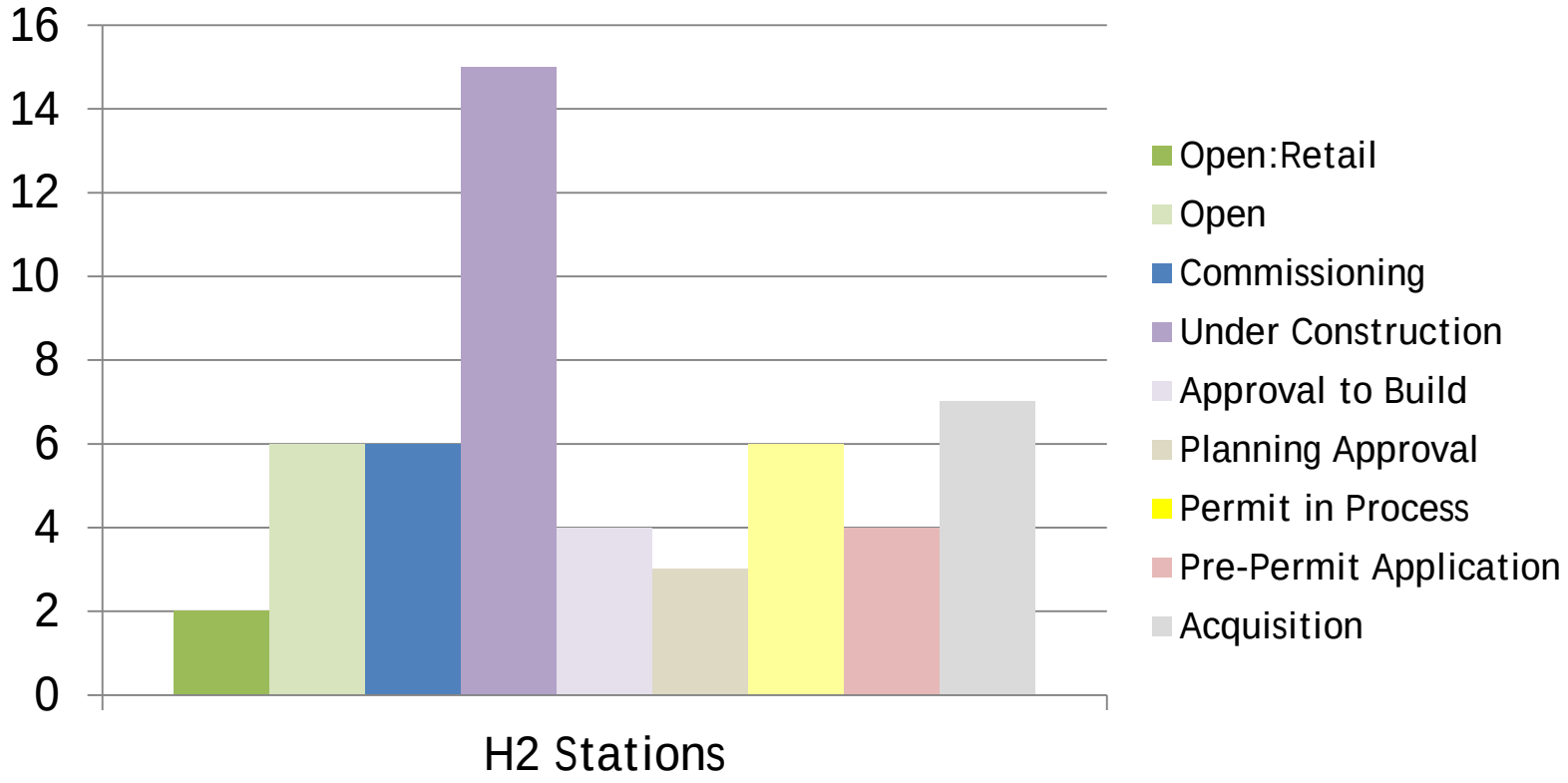
Executive Director

California FUEL CELL PARTNERSHIP

DRIVING FOR THE FUTURE

Here come the FCEVs….

As of today



Diamond Bar

West Sacramento

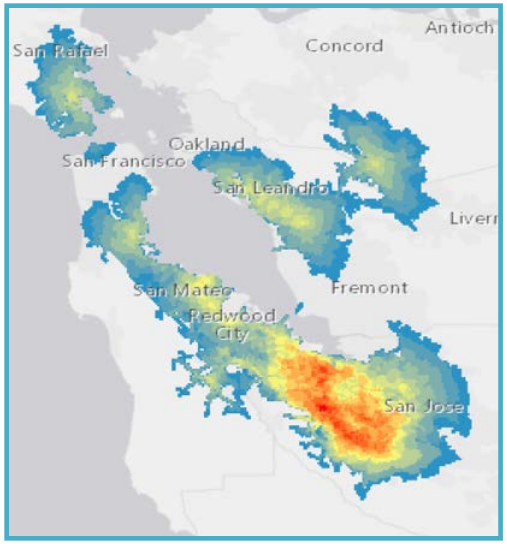
San Juan Capistrano

Coalinga

Irvine

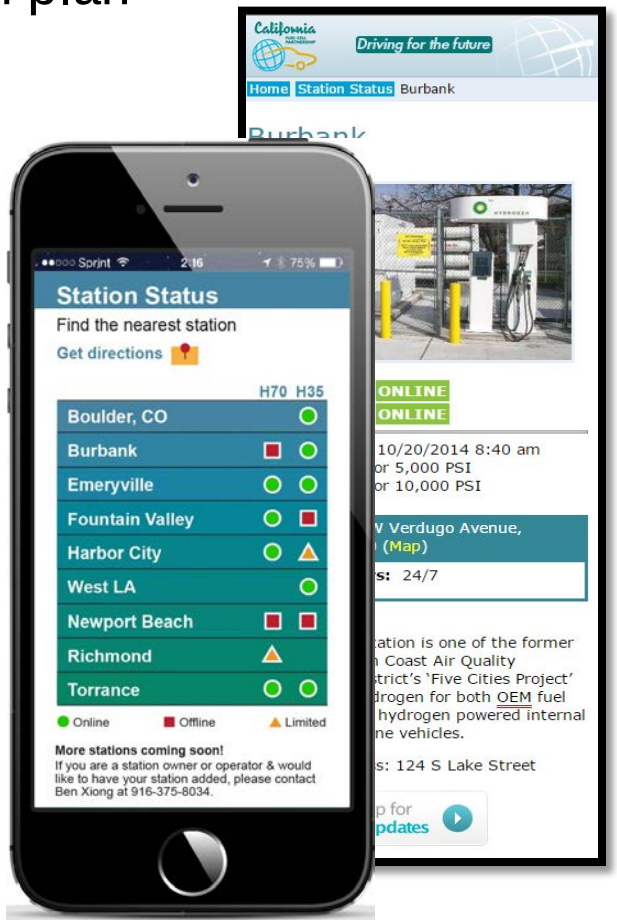
Addressing barriers

- 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



Outreach

CALIFORNIA

HYDROGEN FUEL CELL
ZERO EMISSION

Water Consumption
37.5
30
20
2.5
1.5

California

Driving
Innovation
towards Zero
Emissions

Bill Elrick

belrick@cafcp.org

MULTI-STATE ZEV TASK FORCE

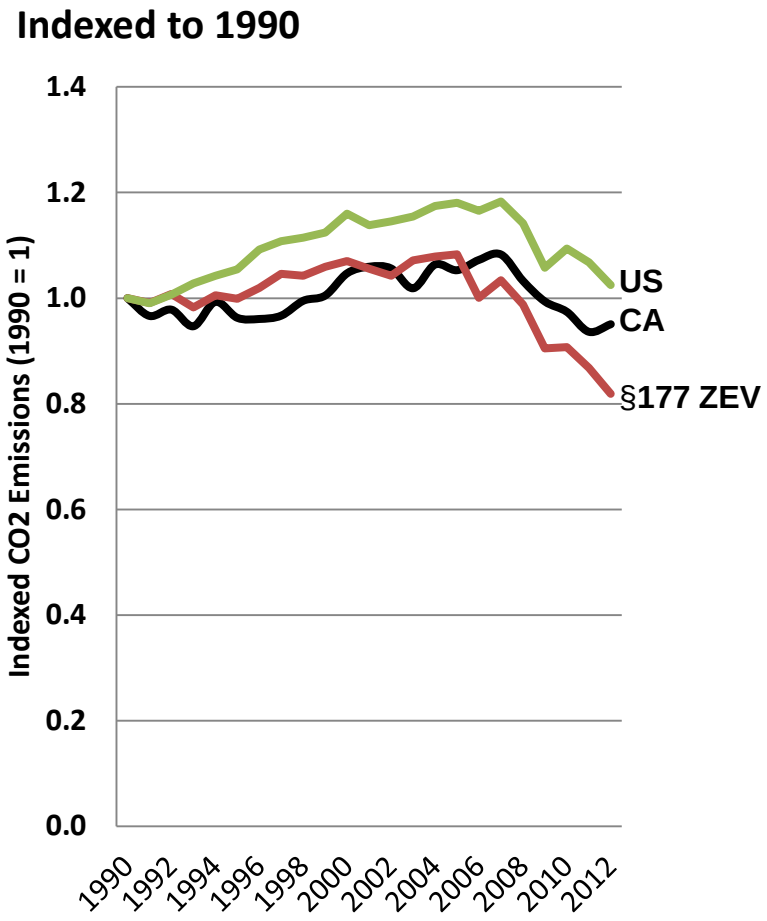
State Partners
Recent Success in Market Enablers

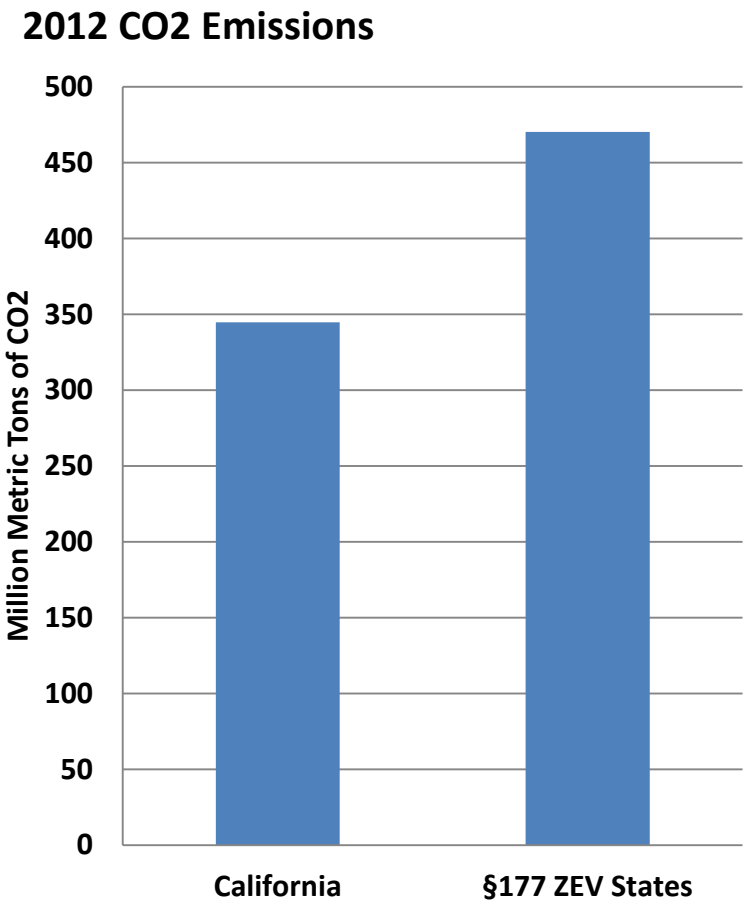
Rob Klee
Commissioner, Connecticut Department of Energy and Environmental Protection

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

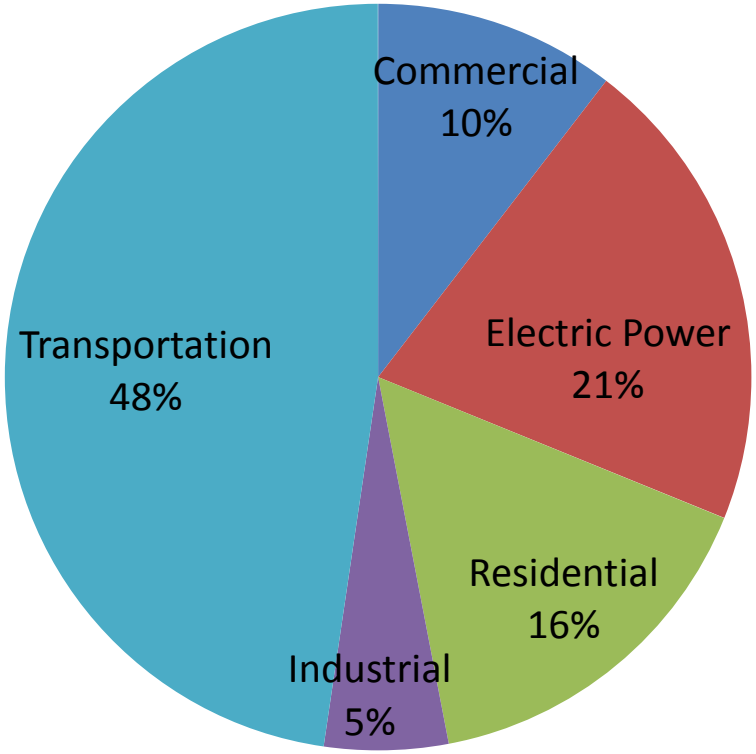
CO_2 Emissions in ZEV States





Source: U.S. Energy Information Administration. http://www.eia.gov/environment/emissions/state/

Transportation Electrification: The Key to Achieving Climate Goals



2012 Section 177 ZEV State CO2 Emissions

Source: U.S. Energy Information Administration. http://www.eia.gov/environment/emissions/state/

State Incentives

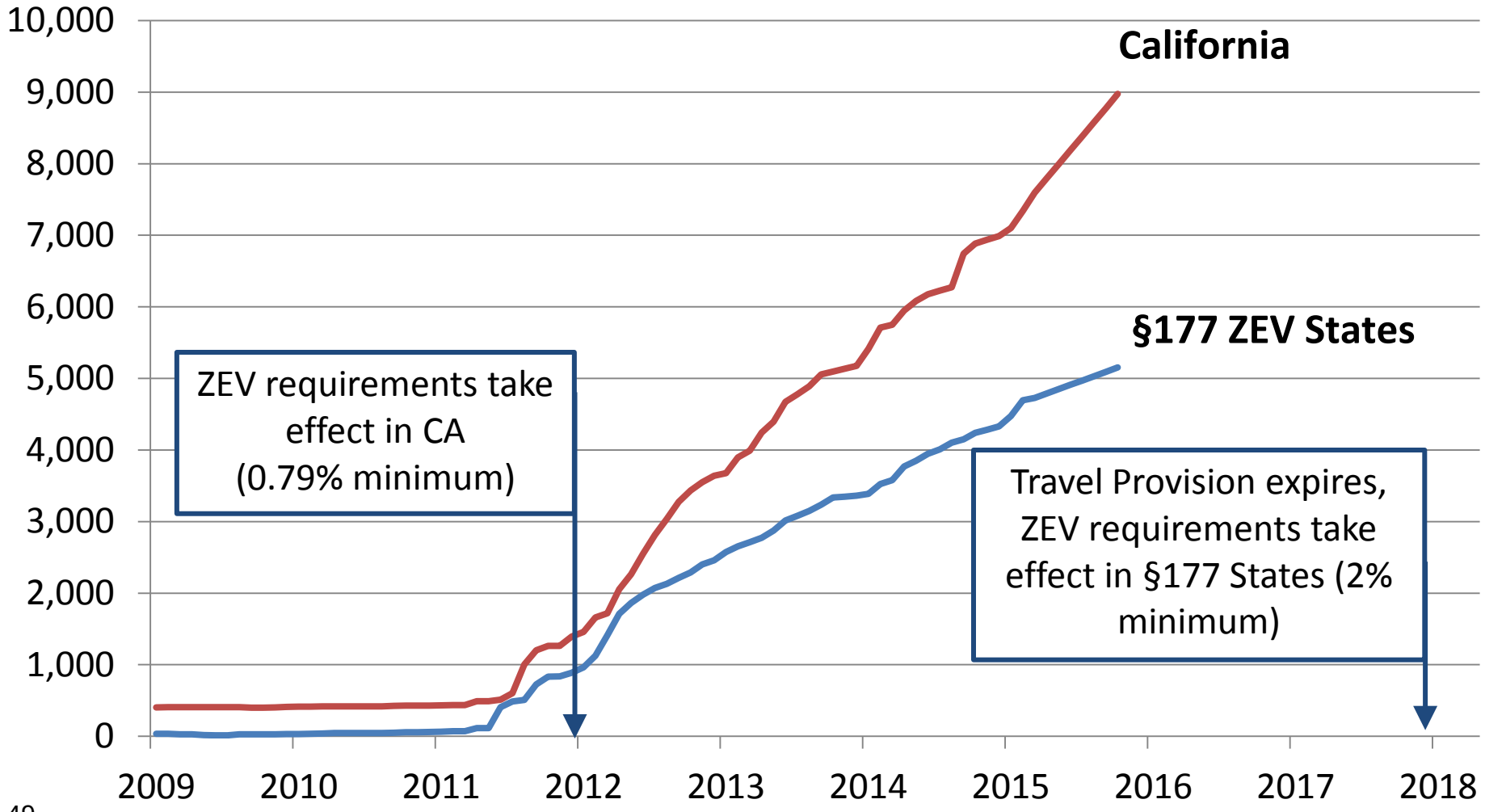
ZEV MOU states are:

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

CHEAPR
Connecticut Hydrogen and Electric Automobile Purchase Rebate

MOR-EV
Massachusetts Offers Rebates for Electric Vehicles

Public and Non-Residential Private EV Charging Stations



Source: Alternative Fuels Data Center

State Progress on Dealerships

ZEV MOU states are:

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

EVconnecticut
The Path to a Clean Vehicle Future

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:

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

DRIVE THE DREAM VERMONT

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

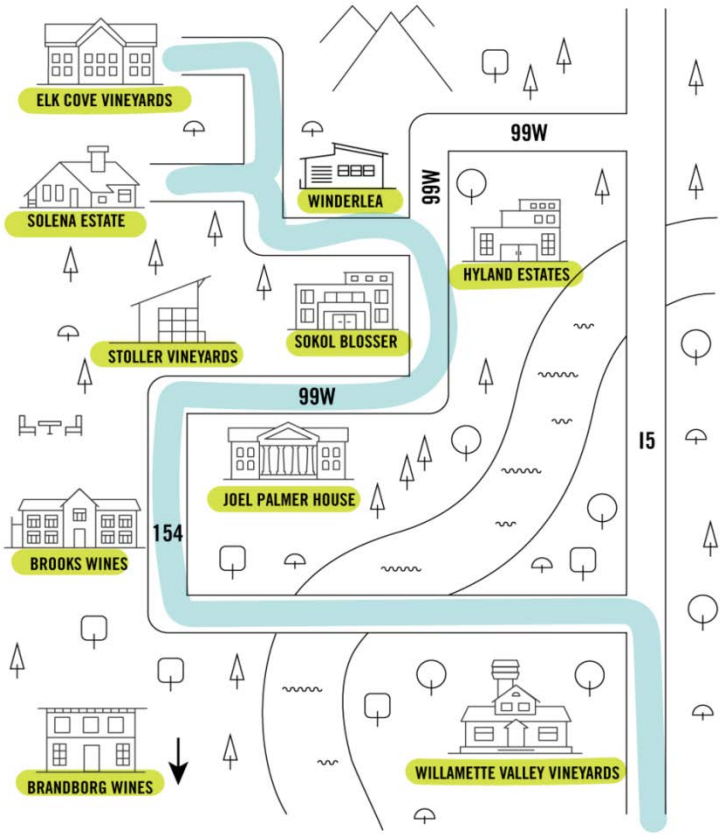
To pursue opportunities for collaborative action between DOE and ZEV MOU states on:

- 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

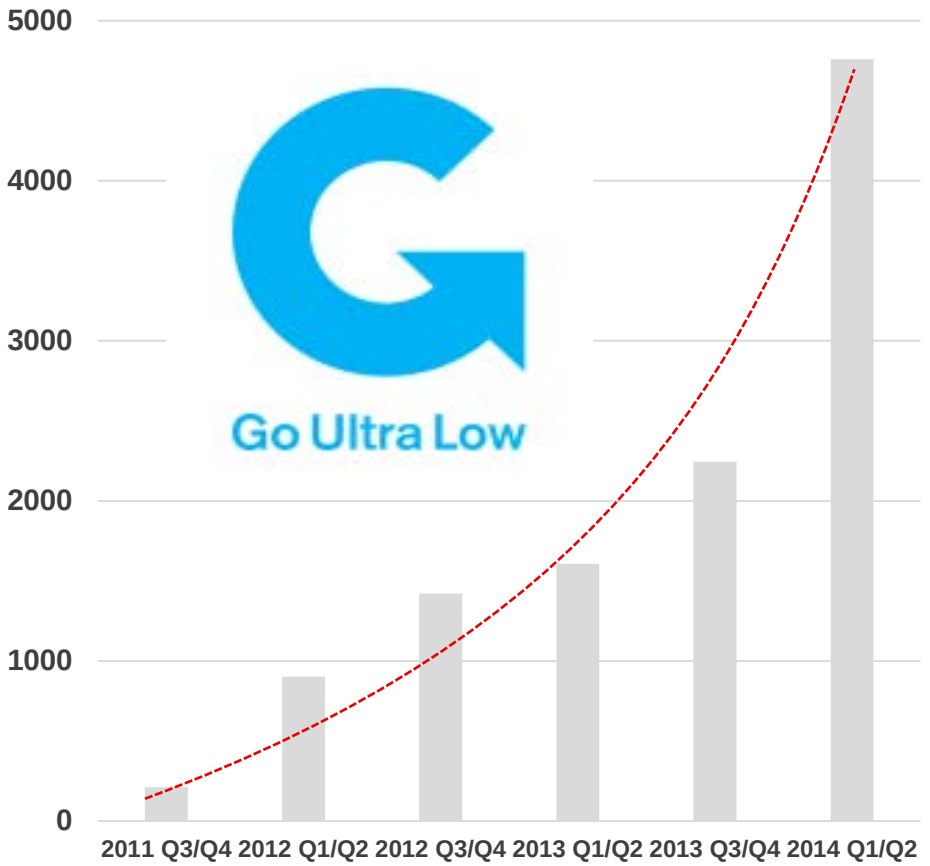
Go Ultra Low Campaign

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

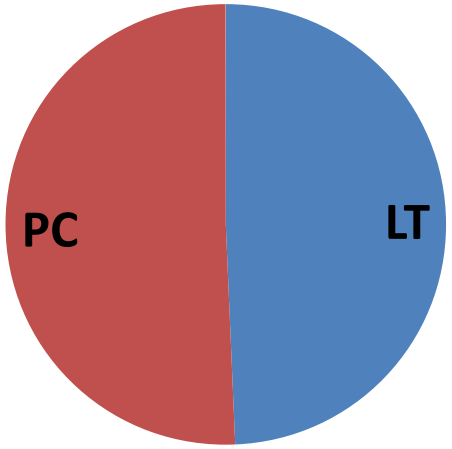
(2017) Tesla Model 3: $27,500* / 200 miles

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

**Prices include $7,500 federal tax credit for electric vehicles*

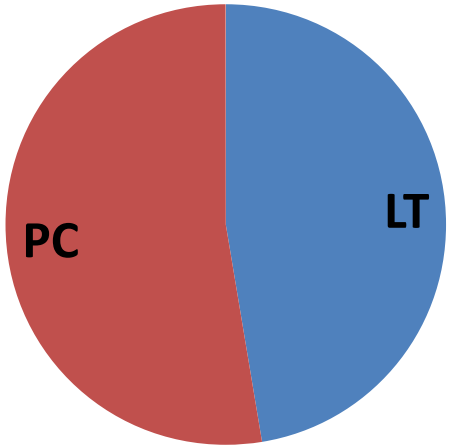
New Market Segments & AWD Options

In-Use Fleet Mix



§177 ZEV States

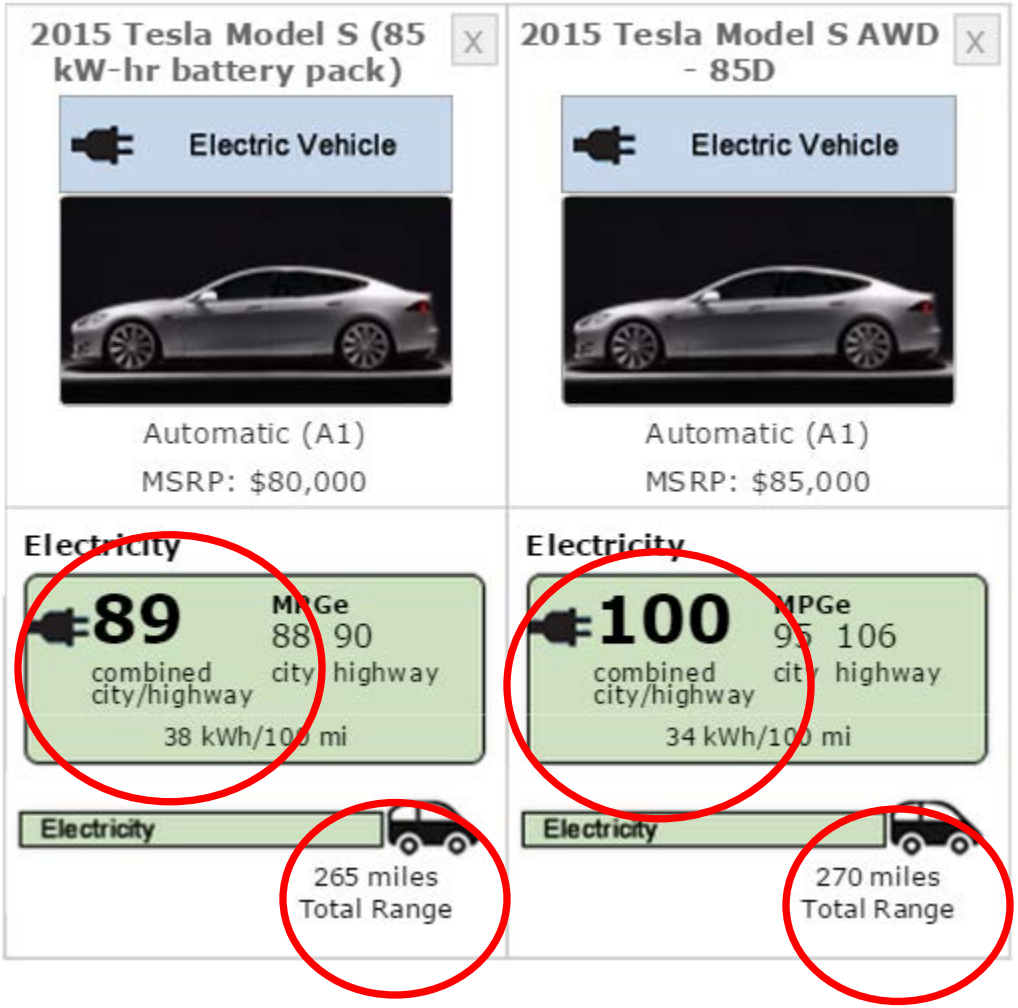
Drivetrain Market Share



California

2014 in-use fleet mix from NADA Data 2014. https://www.nada.org/nadadata
2013 drivetrain market share data from Car and Driver based on data from Ward's. http://blog.caranddriver.com/differential-distribution-where-rwd-awd-and-fwd-vehicles-are-sold-in-the-u-s-infographic/

Electric AWD → Improved Range & Performance



Source: FuelEconomy.gov

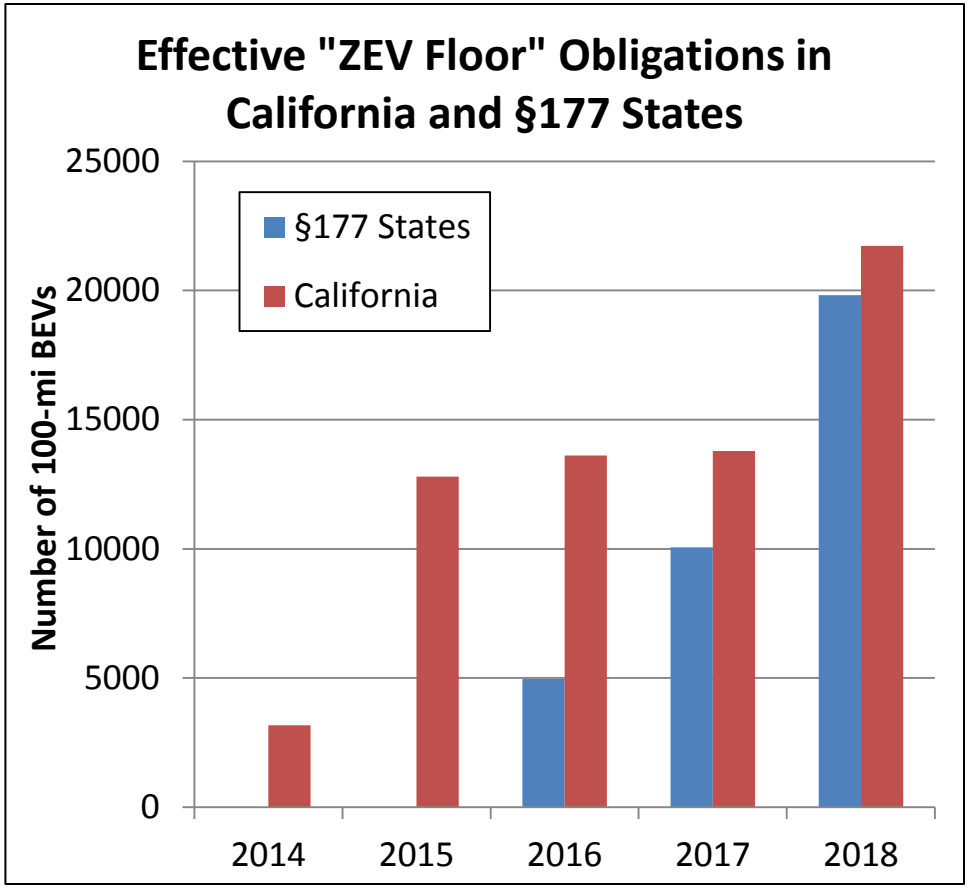
Expiration of Travel Will Enable Market

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.