



Breaking Down the Silos: Coupling Energy and Transportation

DE.CA.rbonize Transportation: The German-California Conference for Zero Emission Transportation

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California Energy Commission January 31, 2018



California: Nation-State Statistics

- Population: 39.5 million
- GDP: \$2.4 trillion 6th largest global economy
 GHG Emissions: 440 MMT (2015)
 - **Transportation accounts for 38.5% of all GHG emissions**
- Vehicles: 30 million cars + 1 million trucks
- Petroleum Consumption:
 - 15.8 billion gallons of gasoline
 - 3.7 billion gallons of diesel





"...climate change is unlike any other threat we humans face...It is subject to irreversible tipping points and vast unknowns. Combatting climate change, the existential threat of our time, will take heroic effort on the part of many people and many nations."

Governor Jerry Brown, 2016



Reducing GHG Emissions while Growing the Economy



California's GHG Emissions by Sector





California Policy Goals and Objectives

Policy Objectives	Policy Origin	Goals and Milestones	
Greenhouse Gas Reduction	California State Senate Bill 32 (2016)	Reduce greenhouse gas emissions to 1990 levels by 2020, 40% below 1990 levels by 2030 and 80% below 1990 levels by 2050 in California	
Low Carbon Fuel Standard	California State Assembly Bill 32 (2006), California Global Warming Solutions Act	10% reduction in carbon intensity of transportation fuels in California by 2020	
Air Quality	Clean Air Act	80% reduction in NOx from current levels by 2023	
Zero Emission Vehicle Mandate	Executive Order B-48-18	Install 200 hydrogen stations and 250,000 charging stations by 2025. Have 5 million ZEVs on California roadways by 2030.	
Increase Transportation Electrification (TE)	California State Senate Bill 350 (2015)	Encourages the state to take actions to accelerate widespread adoption of TE including increased access in disadvantaged communities and requiring utilities to address TE in Integrated Resource Plans.	
Short-Lived Climate Pollutant Reductions	California Senate Bill 605 (2014), California Senate Bill 1383 (2016)	Develop a strategy for reducing short-lived climate pollutants including black carbon (50%), methane (40%), and hydrofluorocarbons (40%) by 2030.	



Driving Towards Decarbonization

• SB 350 Clean Energy & Pollution Reduction Act (2015)

Doubling Energy Efficiency 50% Renewable Portfolio Standard

Widespread Transportation Electrification

- Reduce GHG Emissions 40% below 1990 levels by 2030
- Increase access for low-income communities to clean energy investments
 - Produce a study identifying barriers, opportunities, and actions
 - Create an Advisory Group to provide guidance for clean energy programs



Energy Efficiency in California





Renewable Generation in California







The California Energy Commission is the state's primary energy policy and planning agency

Established by the Legislature in 1974, seven core responsibilities guide the Energy Commission



Forecasting future energy needs

Promoting energy efficiency and conservation by setting the state's appliance and building energy efficiency standards

Supporting energy research that

development and demo projects

advances energy science and technology through research,



Developing renewable energy resources



Advancing alternative and renewable transportation fuels and technologies



Certifying thermal power plants 50 megawatts and larger



Planning for and directing state response to energy emergencies.

Alternative and Renewable Fuel and Vehicle Technology Program

"...to develop and deploy innovative technologies that transform California's fuel and vehicle types to help attain the state's climate change policies."

Health and Safety Code 44272(a)

Complementary state goals

- Improve air quality
- Increase alternative fuel use
- Reduce petroleum dependence
- Promote economic development





Alternative and Renewable Fuel and Vehicle Technology Program A Portfolio Approach



 Low-Carbon Biofuel Production and Supply



- Electric Charging Infrastructure
- Hydrogen Refueling Infrastructure
- Natural Gas Fueling Infrastructure



- Natural Gas Vehicle Incentives
- Med and Heavy-Duty Advanced Vehicle Technology Demo and Scale-Up



Related Needs and Opportunities

- Emerging Opportunities
- Workforce Training and Development
- Regional Readiness



Alternative and Renewable Fuel and Vehicle Technology Program Funding

Funded Activity	Cumulative Awards to Date (in Millions)*
Alternative Fuel Production	
Production of low-carbon biofuels	\$168.1
Alternative Fuel Infrastructure	
Electric Vehicle Charging Infrastructure	\$79.9
Hydrogen Refueling Infrastructure	\$132.3
Biofuel Infrastructure	\$17.7
Natural Gas Fueling Infrastructure	\$21.9
Alternative Fuel and Advanced Technology Vehicles	
Natural Gas Vehicle Deployment	\$65.8
Propane Vehicle Deployment	\$6.0
Light-Duty ZEV Deployment	\$28.0
Hybrid and Zero-Emission Truck and Bus Voucher Inventive Project Supplemental Funding	\$4.0
Advanced Freight and Fleet Technology Vehicles	\$128.4
Related Needs and Opportunities	
Manufacturing	\$46.5
Workforce Training and Development	\$31.7
Regional Alternative Fuel Readiness and Planning	\$9.6
Other	\$17.3
Total	\$752.7

ENERGY COMMISSION

Funding as of 12/1/17

Energizing an EV Infrastructure Network

- Since 2009, CEC has invested \$80 million in 8,686 electric vehicle chargers*. (California currently has over 14,000 public stations.)
 - 4,281 Residential
 - 3,130 Public/Opportunity
 - 808 Corridor (Level 2 & DC Fast)
 - 467 Fleet & Workplace
- Leveraged \$44 Million match funding
- Funding charging and building the EV ecosystem (manufacturing, workforce training & development, and planning) account for 35% of program investments.







Building a Foundation for Hydrogen Refueling Stations

Station Funding to Date = \$127.8 million

= \$110.9 million

Public Station Funding

- 64 Funded Stations
- 28 O&M Support Grants = \$6.9 million

Infrastructure Support

= \$10 million

- 5 Hydrogen Regional Readiness Plans
- AC Transit Fuel Cell Bus Station
- CDFA Div of Weights and Measures
- UC Irvine STREET Model





An Emerging Network

Mary's Valley Rally April 2016





Bay Area H2 Tour April 2017







1. SACRAMENTO

- 2. HAYWARD
- 3. SAN JOSE
- 4. TREASURE ISLAND



ARFVTP Project Benefits (anticipated by 2025)



 Displace 243 million gallons of petroleum annually

Economic Benefits



- Reduce GHG emissions by 2 M
 metric tons of CO2e annually
- Reduce 25 tonnes of NOx and 7.5 tonnes of PM2.5 annually



Workforce Training

- Over 4,600 long-term jobs
- Over 5,100 short-term jobs

- 17,000 individuals have received training
- Over 255 businesses have received assistance



C40

Examples of ARFVTP Funded Projects

















Current State of the ZEV Market in California



- ZEVs as a percentage of new passenger car sales in California continues to increase
- California 2017 ZEV sales exceeded 5% of all new passenger car sales compared to the previous year and is trending upward US ZEV sales were 1% of new passenger car sales in 2017.



California's Cap-and-Trade Program

Market based regulation that sets a GHG limits on emission sources

- Creates a carbon market that spurs innovation and investment in clean technology
- Proceeds support investments that will further California's climate goals
- Nearly \$3.4 billion has been appropriated to GHG emission reduction programs and projects
- Lifetime emission reductions from implemented projects estimated to be 15.2 MMTCO2e





Recent Announcements

Governor Brown boldly increases funding for ZEV infrastructure five-fold.

Cap and Trade Expenditure Plan

- \$1.25 Billion in climate investments
 - \$460 million for low carbon transportation
 - \$235 million for ZEV infrastructure

Executive Order B-48-18

- 200 hydrogen refueling stations by 2025
- 250,000 charging stations by 2025
- At least 5 million ZEVs by 2030

"To meet our ambitious goals, we will need <u>five million zero-</u> <u>emission vehicles on the road</u> <u>by 2030</u>. Think of all the jobs that will create and how much cleaner our air will be."

> Governor Jerry Brown January 2018



Key Strategies for Moving Ahead

- Building and Maintaining Strategic Partnerships
- Investing in Transformative Change
- Spurring Innovation
- Increasing Access





International Zero-Emission Vehicle Alliance

- The ZEV Alliance is a collaboration of governments working together to accelerate adoption of ZEVs through:
 - Setting ambitious, achievable targets for ZEV deployment
 - Taking actions to achieve those targets in each jurisdiction
 - Acting together to achieve targets
 - Encouraging others to set and achieve ZEV targets
- Announced vision for all electric-drive sales by 2050





International ZEV Alliance: http://zevalliance.org





Thank You!

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