



Alternative and Renewable Fuel and Vehicle Technology Program

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California Energy Commission

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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 advances energy science and technology through research, development and demo projects



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.

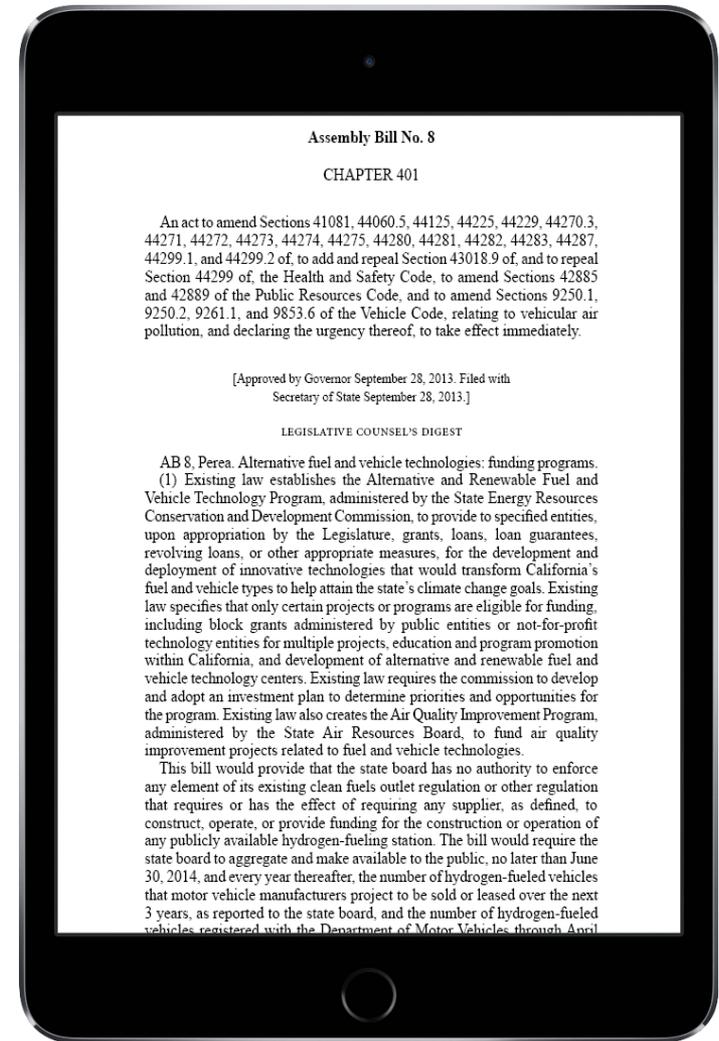
Alternative and Renewable Fuel and Vehicle Technology Program

“...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
- Reduce GHG emissions
- Increase alternative fuel use
- Reduce petroleum dependence
- Promote economic development





Vehicles

28.1 millions cars
1.0 million trucks

GHG Emissions

441.5 MMT CO₂e (2014)
37% from transportation

Air Quality

Severe Non-Attainment for Ozone
San Joaquin Valley & South Coast

Petroleum Consumption

14.5 billion gallons gasoline
3.6 billion gallons diesel



Guiding Policies and Regulations



Policy Objective	Goals
AB 32 SB 32; E.O. B-30-15 E.O. S-3-05	Reduce GHG Emissions to 1990 levels by 2020, 40% below 1990 levels by 2030, and 80% below 1990 levels by 2050
Low-Carbon Fuel Standard	Reduce carbon intensity of transportation fuels by 10% by 2020
State Alternative Fuel Plan	Reduce petroleum fuel use to 15% below 2003 levels by 2020
Clean Air Act	Reduce NOx by 80% by 2023
E.O. B-16-2012; ZEV Regulations	Infrastructure to accommodate 1 million EVs by 2020 1.5 million EVs by 2025
E.O. B-32-15 Sustainable Freight	Improve freight efficiency and transition freight movement to zero-emission technologies



Alternative and Renewable Fuel and Vehicle Technology Program



Alternative Fuel Production

- Biofuel Production and Supply



Alternative Fuel Infrastructure

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



Alternative Fuel and Advanced Technology Vehicles

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



Related Needs and Opportunities

- Emerging Opportunities
- Workforce Training and Development
- Regional Readiness



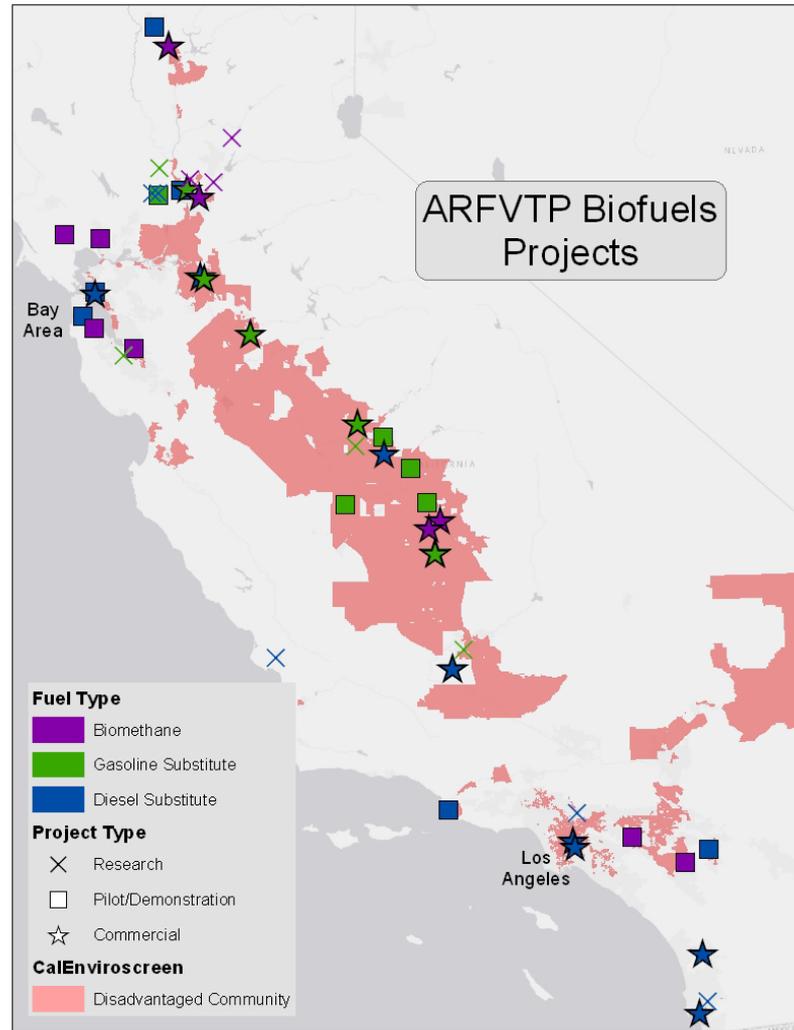


Funding Activities

Biomethane Production	\$50.9 M	16 Projects
Gasoline Substitute Production	\$27.2 M	12 Projects
Diesel Substitute Production	\$57.4 M	20 Projects
E85 Infrastructure	\$14.1 M	4 Projects
Upstream Biodiesel Infrastructure	\$3.5 M	4 Projects
TOTAL	\$153.1 M	56 Projects



Biofuel Project Locations



Electric Vehicle Infrastructure – \$49.5 M Awarded to Date

Charging STATIONS	Level 1	Level 2	DCFC	Total
Installed	41	6169	54	6264
Planned	106	1133	128	1367
Total	147	7302	182	7631
CONNECTORS	Level 1	Level 2	DCFC	Total
Total	283	8000	243	8526

Charging STATIONS	Residential	MUD	Commercial	Other (Commercial & Workplace)	Workplace	Fleet	DC Fast Chargers	Total
Installed	3937	186	1715	76	199	97	54	6264
Planned	0	109	781	139	174	36	128	1367
Total	3937	295	2496	215	373	133	182	7631



Electric Vehicle Infrastructure – Fast Chargers

The first deployments were clustered around the metropolitan areas where there were higher concentrations of vehicles.



Electric Vehicle Infrastructure

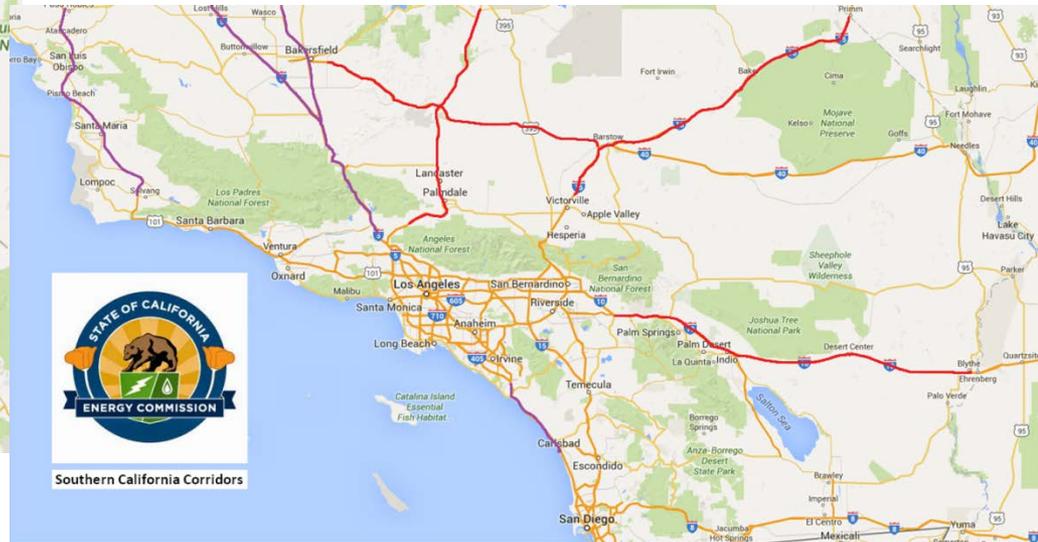
Now deployments are expanding the range of travel for electric vehicles – from the Oregon to the Mexican borders, and from the west coast to the Nevada and Arizona borders.



Central and Northern California Corridors



Southern California Corridors



Electric Vehicle Infrastructure



48 Hydrogen Refueling Stations in 2016

- 17 open-retail
- 24 operational
- 7 in permitting or construction
- **48** plus a mobile refueler
 - 8 are 100% renewable (840 kg/day)

- Total network capacity: 8,725 kg/day
 - 39,896 tonnes GHG reduction per year (est.)
- By 2020, 100 stations



Hydrogen Refueling Stations Long Beach, Costa Mesa and Coalinga





Medium- and Heavy-Duty Vehicle Funding Activities

Open to broad range of fuel and technology types

Focus on sustainable freight and goods movement

Separate focuses on near-term and longer-term technologies that will advance California's transportation sector

Funding for scale-up activities will enable a smoother transition to vehicle commercialization

Considering enabling technologies, non-propulsion projects, and fueling infrastructure

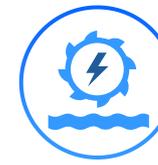
Provide technical expertise and education to help remove barriers for adoption of technologies



MD-HD Technology Investments

	Funding	
Advanced MD-HD Vehicle Demonstration	\$93.7 M	44 Projects
MD-HD Electric Vehicle Deployment	\$4.0 M	150 Trucks
Natural Gas Fueling Infrastructure	\$21.0 M	65 Stations
Natural Gas Vehicle Incentives	\$56.4 M	~2,800 Vehicles
Manufacturing	\$57.0 M	22 Projects
Emerging Opportunities	N/A	N/A





Natural Gas Fueling Infrastructure



Readily available alternative fuel



Allocation focuses on communities and entities without access to private capital



Emphasis on school districts to displace older diesel buses

- Provides public health benefits, especially for sensitive receptors





Alternative Fuel and Advanced Technology Vehicles

Natural Gas Vehicle Incentives



Opportunity for immediate GHG and petroleum reduction



Most recent incentive round fully reserved in less than one week



Emphasis on low-NOx emission powertrains, when available



Determining need for incentives and appropriate future incentive levels through contract with UC Irvine



Cummins Westport ISL G Near Zero Natural Gas Engine

ISL G NEAR ZERO



Production to start Q2
2016

8.9 Litre (540 cu. In.)

In line 6 cylinder

Spark ignition

Peak Rating:
HP-320 hp
Torque - 1000 lb-ft

**Certified to CARB
Optional Low NOx 0.02
Standard (Near Zero)**
NOx: 0.02 g/bhp-hr
PM: 0.01 g/bhp-hr

Certified to 2016 EPA/
DOT GHG standards

Three Way Catalyst
After treatment

Manufactured by Cummins in Cummins Engine
Plant- Rocky Mount, North Carolina



Alternative Fuel and Advanced Technology Vehicles

Expanding the Advanced MD-HD Vehicle Sector



Development of zero and near-zero emission options



Current focus on freight sector

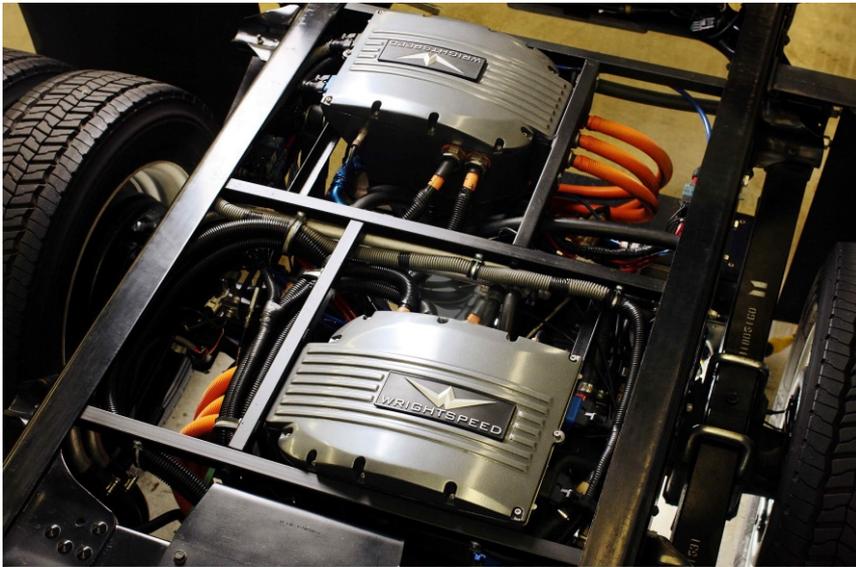


Just completed seaports targeted solicitation and will establish MD-HD workgroup over the Summer



Determining need for incentives and appropriate future incentive levels through contract with UC Irvine





Alternative Fuels Workforce Development and Training

Work with public agencies to establish Workforce Development Programs directly related to alternative fuels and alternative fuel vehicle technology.

Partnerships include:

- Employment Training Panel
- California Community Colleges
- Employment Development Department
- California Workforce Development Board

Special focus on:

- Apprenticeships
- Unemployed/underemployed workers
- Disadvantaged communities
- Veteran training programs

To date the ARFVT Program has funded over 16,000 trainees for employment in the alternative fuels industry.



Upcoming and Current Solicitations

Investment Plan Category	Upcoming Funding Opportunities	Anticipated Funding Amount*	Proposed Release Date (Calendar Quarter)
Alternative Fuel Production	Biofuel Production and Supply	\$27.0 million	GFO-15-606 Q3 2016
Alternative Fuel Infrastructure	Electric Charging Infrastructure	\$9.9 million	GFO-15-603 Q3 2016
	Natural Gas Fueling Infrastructure	\$3.5 million	GFO-16-602
	Hydrogen Refueling Infrastructure	\$33 million	GFO-15-605
Alternative Fuel and Advanced Technology Vehicles	Medium and Heavy Duty Advanced Vehicle Technology Demonstrations and Scale-Up	\$27 million	Q4 2016
	Natural Gas Vehicle Incentive Funding Opportunity (NGVIP) - UC Irvine Click above link for more information		
Related Needs and Opportunities	Emerging Opportunities	\$3 million	Q3/Q4 2016
	Regional Alternative Fuel Readiness and Planning	\$3.9 million	Q3 2016



Energy Commission Drive Website

<http://energy.ca.gov/drive/>



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DRIVE

California's Alternative & Renewable
Fuel & Vehicle Technology Program

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SPURRING ADVANCED LOW NOX NATURAL GAS ENGINES

Along with the South Coast Air Quality Management District and Southern California Gas Company, the Energy Commission awarded funding to Cummins Westport to create an advanced, low NOx natural gas engine that can be used in medium and heavy-duty truck applications. NOx emissions are expected to be 90% lower than the current EPA limit. [More Info](#)

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CALIFORNIA ENERGY COMMISSION

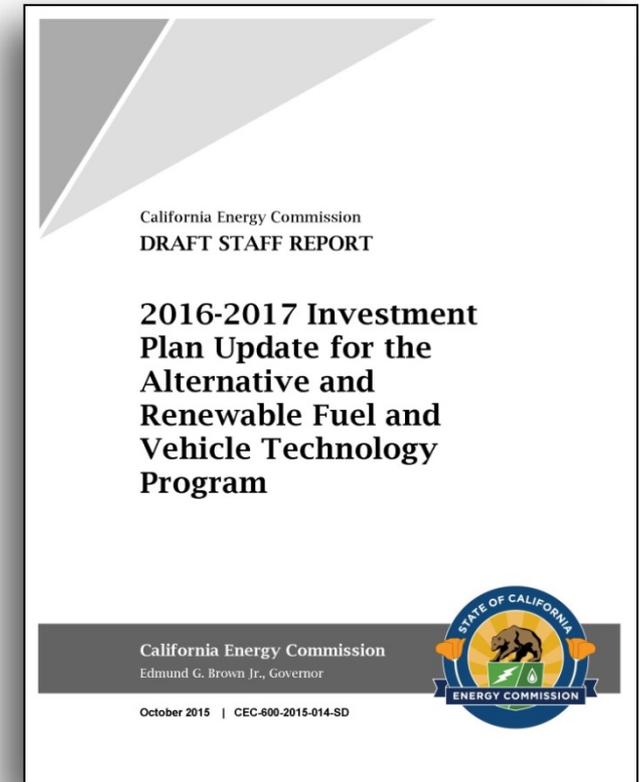
Investment Plan Purpose



Basis for FY 2017-2018 solicitations, agreements, and other funding opportunities

\$100 million funding allocation for a portfolio of fuels, technologies, and supporting elements

Funding allocations for categories (not individual projects)



Investment Plan Update Schedule



Activity	Date
Release Draft Staff Report	October 13, 2016
1 st Advisory Committee Meeting	October 27, 2016
Release Revised Staff Draft	By January 10, 2017
2 nd Advisory Committee Meeting	Late January 2017
Release Lead Commissioner Report	March 2017
Business Meeting Approval	April 2017



Proposed Funding Allocations



Category	Funded Activity	Proposed Funding Allocation
Alternative Fuel Production	Biofuel Production and Supply	\$20 million
Alternative Fuel Infrastructure	Electric Charging Infrastructure	\$17 million
	Hydrogen Refueling Infrastructure	\$20 million
	Natural Gas Fueling Infrastructure	\$2.5 million
Alternative Fuel and Advanced Technology Vehicles	Natural Gas Vehicle Incentives	\$10 million
	Advanced Freight and Fleet Technologies	\$18 million
Related Needs and Opportunities	Manufacturing	\$5 million
	Emerging Opportunities	\$4 million
	Workforce Training and Development	\$3.5 million
	Total Proposed	\$100 million





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Fuels and Transportation Division

- »  [2016-2017 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program - Commission Final Report](#). Posted May 9, 2016, pub # CEC-600-2015-014-CMF. (89 pages, 1.6 MB)



Perhaps no other population in the world has embraced the automobile as passionately, nor is any other state defined as much by the car, as California. There are over 26 million cars and 1 million trucks on California roads and highways. Roughly half of the energy Californians consume is for transportation.

In 2010, Californians consumed over 18 billion gallons of gasoline and diesel fuel, resulting in the estimated emission of over 200 million metric tons of greenhouse gas equivalence. According to the latest inventory of statewide greenhouse gas emissions values, in 2009 the transportation sector represented 38 percent of statewide greenhouse gas emissions.

Reducing the rolling resistance of tires can lead to substantial improvements in vehicle fuel economy. In 2003, a consumer bill AB 844, directed the California Energy Commission to develop and implement a [Fuel-Efficient Tire Program](#) that included standards for tires on passenger vehicles and light duty trucks.

The Energy Commission is concerned with the impact transportation fuels have on our state. The Fuels and Transportation Division was created to focus on transportation energy and alternatives to conventional fossil fuels. The Division's mission is to ensure that adequate and reliable transportation energy is provided to the California transportation sector while balancing economic, public health, safety, and environmental consequences.

The Fuels and Transportation Division is divided into two offices; the Emerging Fuels and Technologies Office (EFTO) and the Zero-Emission Vehicle Infrastructure Office (ZEVIO)

Transportation Programs

- Implementation of Energy Commission Activities within the Zero Emission Vehicle Action Plan
- Alternative and Renewable Fuel & Vehicle Technology Program
- AB 118 Advisory Committee
- DRIVE: California's Alternative & Renewable Fuel & Vehicle Technology Program
- Bioenergy Action Plan

Transportation Proceedings

- Electric Transportation in Integrated Resource Plans of Publicly Owned Electric Utilities
- Rulemaking to Modify Alternative and Renewable Fuels and Vehicle Technology Program Funding Restrictions (Docket # 15-OIR-02)
- 2016-2017 Alternative Fuels Investment Plan (Docket # 15-ALT-01)
- AB 118 Rulemaking (Docket # 08-OIR-1)
- AB 118 Implementation (Docket # 08-ALT-1)
- Calif. Fuel-Efficient Tire Program (Docket # 07-FET-1)



Thank you for your attention!

Questions?

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