



Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP)

Second Advisory Committee Meeting 2016-17 Investment Plan

January 21, 2016

Long Beach, CA



Meeting Agenda

- 9:30 Introductions and Opening Remarks
- 9:45 Program Status Update
- 10:15 Development of 2016-2017 Investment Plan Update
- 10:45 Advisory Committee Comments and Discussion
- 12:00 Lunch
- 1:00 Advisory Committee Comments and Discussion, cont.
- 2:00 Public Comment (or at end of committee discussion)



Program Status Update

Jim McKinney
Program Manager



California Transportation: Nation-State Statistics

- Population: 38 million
- GDP: \$2.0 trillion - 8th largest global economy
- GHG Emissions: 458 MMT (2012)
 - Transportation accounts for 37 % of all GHG emissions
- Air Pollution: Severe Non-Attainment for Ozone
 - San Joaquin and South Coast Air Basins
- Vehicles: 28.1 million cars + 0.9 million trucks
- Annual Fuel Consumption: 18.1 billion gallons
 - 14.5 billion gallons gasoline + 3.6 billion gallons diesel
- Primary Roadways: 170,000 miles



Origins in Statute

Assembly Bill No. 8

CHAPTER 401

An act to amend Sections 41081, 44060.5, 44125, 44225, 44229, 44270.3, 44271, 44272, 44273, 44274, 44275, 44280, 44281, 44282, 44283, 44287, 44299.1, and 44299.2 of, to add and repeal Section 43018.9 of, and to repeal Section 44299 of, the Health and Safety Code, to amend Sections 42885 and 42889 of the Public Resources Code, and to amend Sections 9250.1, 9250.2, 9261.1, and 9853.6 of the Vehicle Code, relating to vehicular air pollution, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor September 28, 2013. Filed with Secretary of State September 28, 2013.]

LEGISLATIVE COUNSEL'S DIGEST

AB 8, Perea. Alternative fuel and vehicle technologies: funding programs.
(1) Existing law establishes the Alternative and Renewable Fuel and Vehicle Technology Program, administered by the State Energy Resources Conservation and Development Commission, to provide to specified entities, upon appropriation by the Legislature, grants, loans, loan guarantees, revolving loans, or other appropriate measures, for the development and deployment of innovative technologies that would transform California's fuel and vehicle types to help attain the state's climate change goals. Existing law specifies that only certain projects or programs are eligible for funding, including block grants administered by public entities or not-for-profit technology entities for multiple projects, education and program promotion within California, and development of alternative and renewable fuel and vehicle technology centers. Existing law requires the commission to develop and adopt an investment plan to determine priorities and opportunities for the program. Existing law also creates the Air Quality Improvement Program, administered by the State Air Resources Board, to fund air quality improvement projects related to fuel and vehicle technologies.
This bill would provide that the state board has no authority to enforce any element of its existing clean fuels outlet regulation or other regulation that requires or has the effect of requiring any supplier, as defined, to construct, operate, or provide funding for the construction or operation of any publicly available hydrogen-fueling station. The bill would require the state board to aggregate and make available to the public, no later than June 30, 2014, and every year thereafter, the number of hydrogen-fueled vehicles that motor vehicle manufacturers project to be sold or leased over the next 3 years, as reported to the state board, and the number of hydrogen-fueled vehicles registered with the Department of Motor Vehicles through April 30. The bill would require the commission to allocate \$20 million annually, as specified, until there are at least 100 publicly available hydrogen-fueling

Established by Assembly Bill 118
(Nunez, 2007)

✓ \$100 million per year

Funding extended through January 1,
2024 by Assembly Bill 8 (Perea, 2013)

“...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 Section 44272(a))

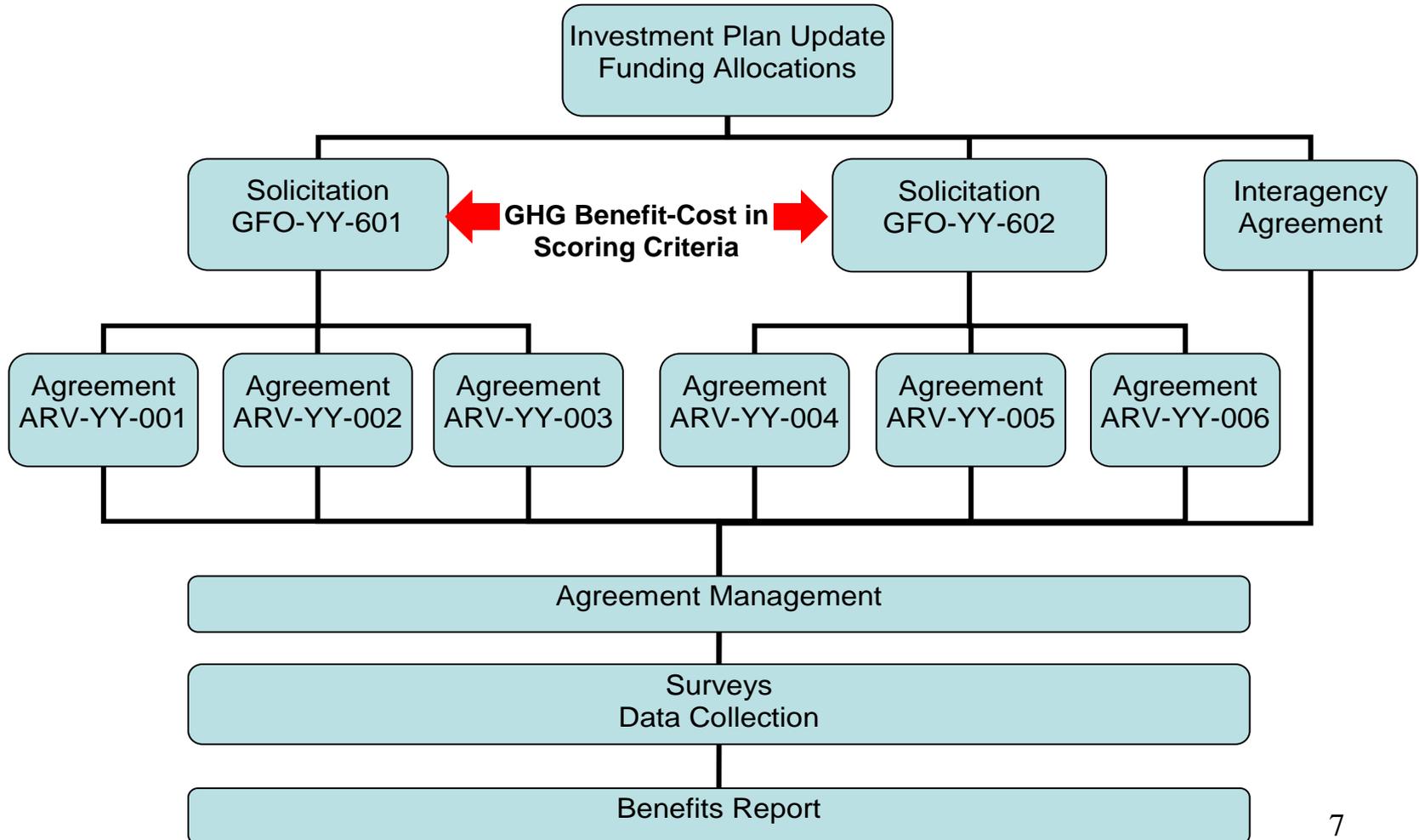


Key Policies and Regulations

Policy Objectives	Policy Origin	Goals and Milestones
Greenhouse Gas Reduction	AB 32, Executive Orders B-30-16 and S-3-05	Reduce greenhouse gas emissions to 1990 levels by 2020, 40% by 2030 and 80% below 1990 levels by 2050
Petroleum Reduction	<i>California State Alternative Fuels Plan</i>	Reduce petroleum fuel use to 15% below 2003 levels by 2020 in California
Low Carbon Fuel Standard	AB 32	10% reduction in carbon intensity of transportation fuels in California by 2020
Federal Renewable Fuel Standard	Energy Policy Act of 2005, Energy Independence and Security Act of 2007	36 billion gallons of renewable fuel by 2022
Air Quality	Federal Clean Air Act	80% reduction in NOx from current levels by 2023
ZEV Mandate	California Executive Order B-16-2012	Accommodate 1 million EVs by 2020 and 1.5 million by 2025 in California
Sustainable Freight	California Executive Order B-32-15	Improve freight efficiency, transition to ZEV technologies and increase economic competitiveness



Program Implementation





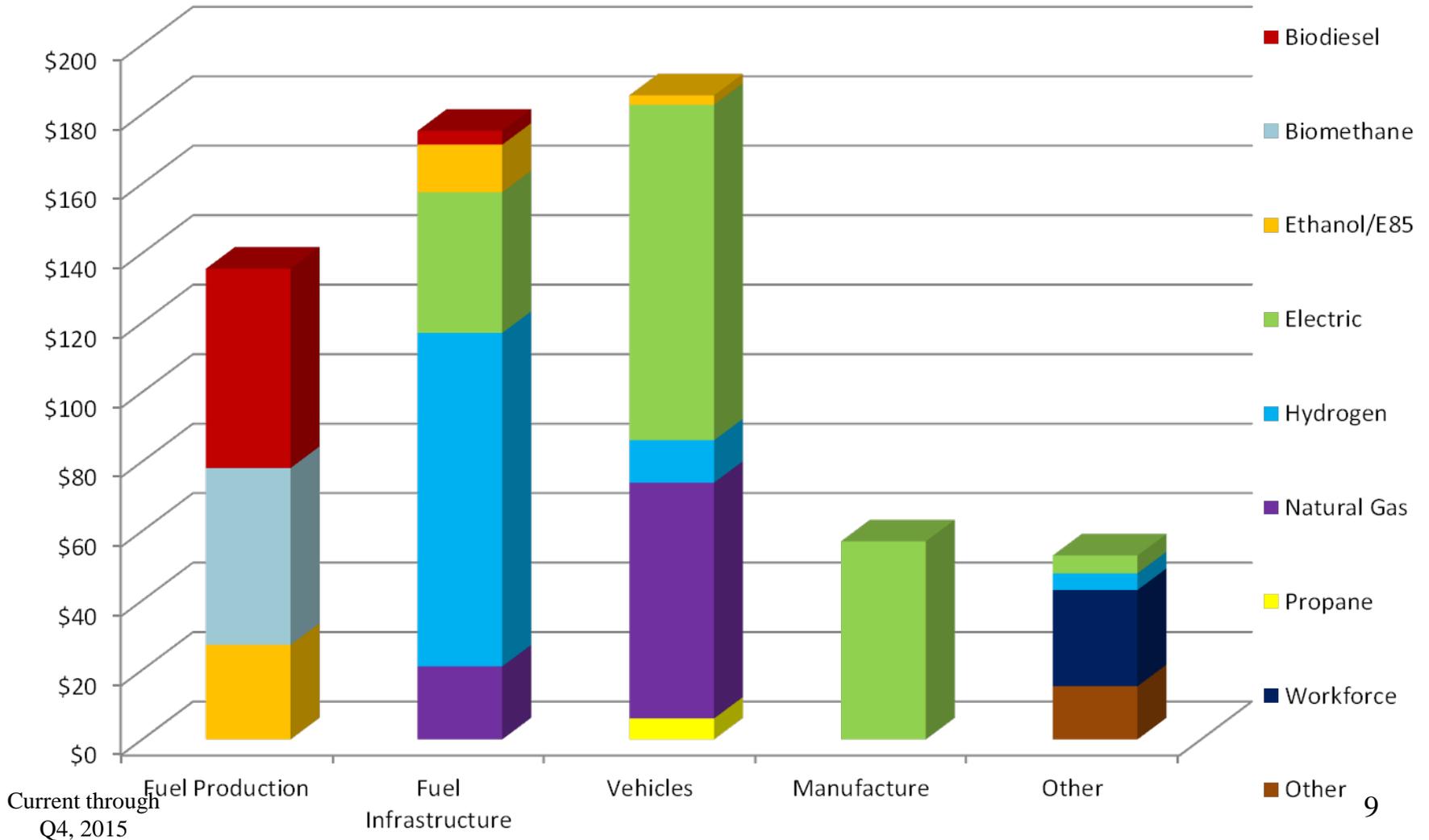
ARFVTP Funding Summary: 2009-2015

Investment Areas	Funding Amount (millions)	Percent of Total (%)	Number of Awards
Biofuels	\$158	26	61
Electric Drive	\$199	33	153
Natural Gas	\$95	16	185
Hydrogen	\$113	19	72
Workforce Development	\$28	4	58
Market & Program Develop.	\$13	2	16
Total	\$606	100	545

Through Q4 2015



Existing Agreements: 2009-2015





Geographic Distribution of ARFVTP Funding by Air District

Air District	Total Funding Amount (\$ millions)	Percent of Total	Percent of State Population
Bay Area	102.7	16.9	18.4
Monterey	9.4	1.6	2.0
Sacramento	24.9	4.1	3.6
Santa Barbara	3.3	0.5	1.1
San Diego	32.5	5.4	8.4
San Joaquin	85.8	14.2	10.5
South Coast	167.7	27.7	44.0
Ventura	1.3	0.2	2.2
Yolo-Solano	12.3	2.0	0.9
Other Northern California	16.7	2.8	8.9
Other So Cal Districts	5.6	0.9	
Statewide	143.8	23.7	-
Total	606.0	100.0	100.0



CALIFORNIA ENERGY COMMISSION

ELECTRIC VEHICLE INFRASTRUCTURE AND SUPPORT



Electric Vehicle Support

\$40.7 M Total Funding

	Residential	Multi-unit Dwelling	Commercial	Workplace	DC Fast Chargers	Total
Installed	3,937	143	1,777	162	30	6,049
Planned	-	96	1,041	214	90	1,441
Total	3,937	239	2,818	376	120	7,490

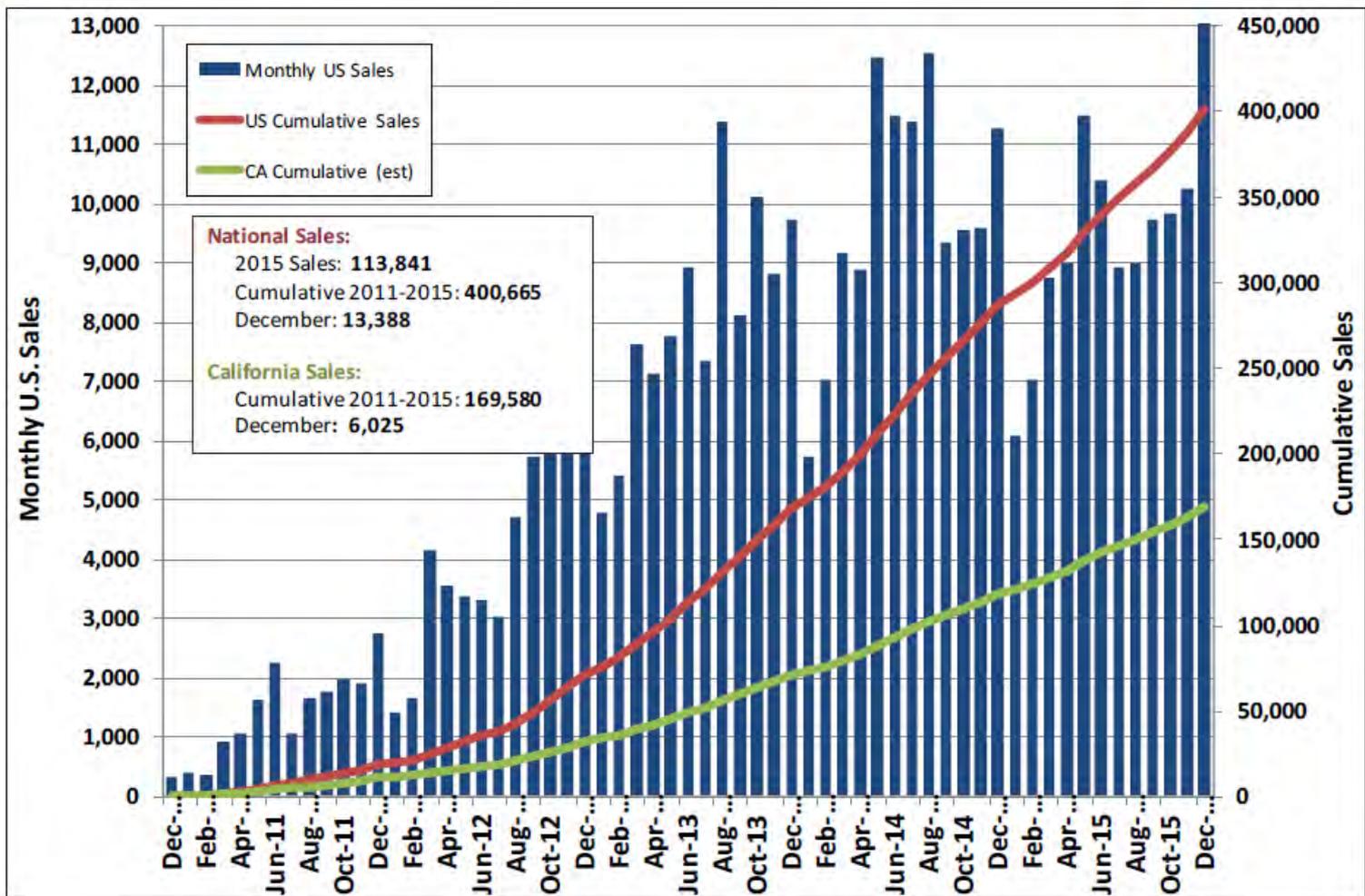


Plus 34 Regional Readiness Planning Grants = \$7.6 M

CPCFA Loan-Loss Reserve Program = \$2 M



2015 PEV Sales

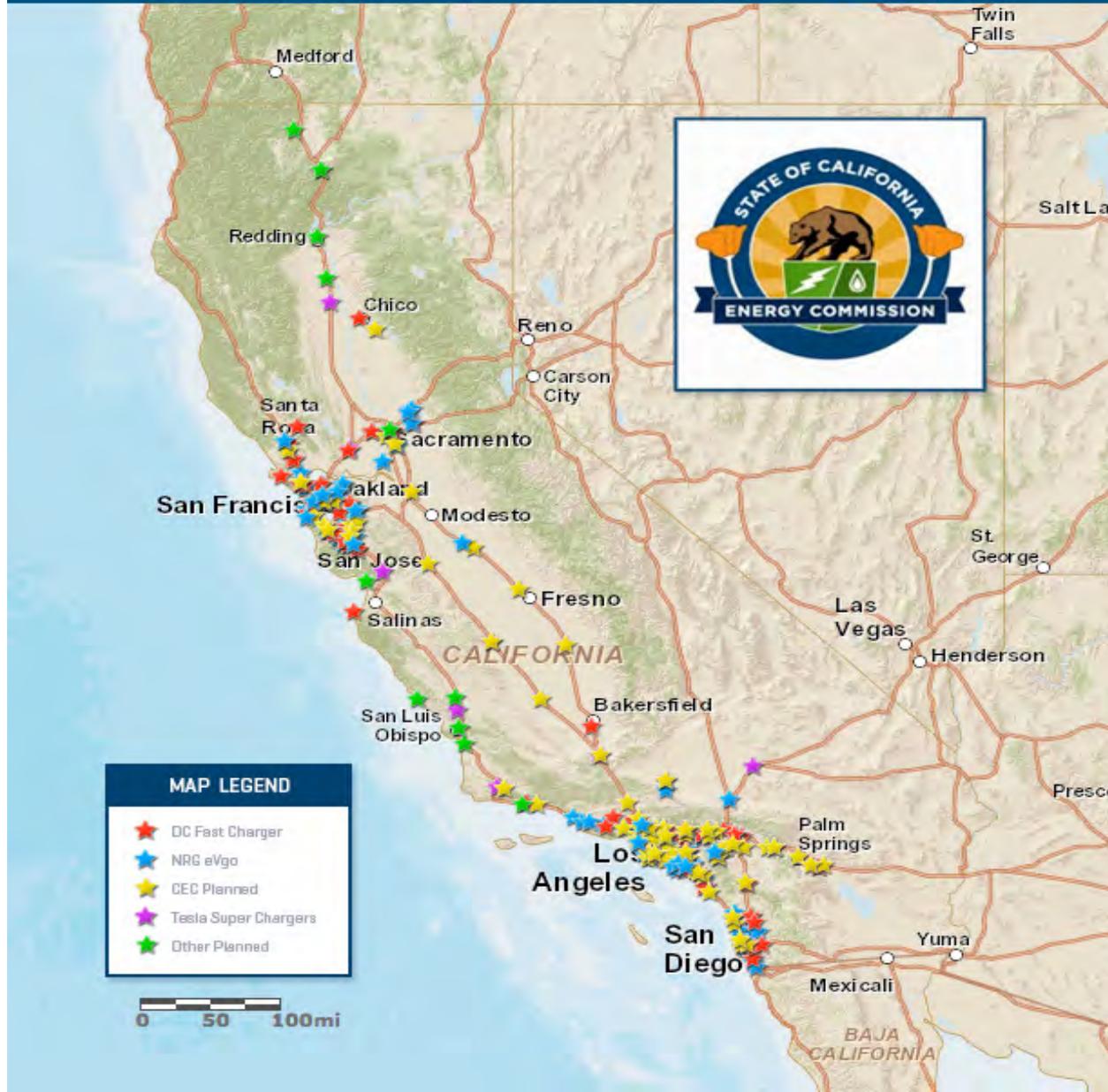


Note: Approximation assumes CA sales are 45% of national sales.

Reference: www.hybridcars.com



CALIFORNIA ELECTRIC VEHICLE FAST CHARGING STATIONS





CALIFORNIA ENERGY COMMISSION



CSU Fresno DCFC & L2





CALIFORNIA EN

Burbank Curbside L2 \$163,802 ARFVTP Grant





Woodland Hills Kaiser Clean Fuel Connection L2





EV Charging – Solicitation Update

- DC Fast Charger Solicitation Released July 27
 - \$10 million for freeway corridor fast chargers
 - Proposal review underway
- Upcoming EV Solicitations - \$15.1 Million
 - DC Fast Chargers – East West Corridors
 - General EV Installations
- Regional Readiness and Planning
 - \$1.2 million for 7 awards for Regional Readiness Plans and Implementation
 - \$1.9 million available for future solicitation



CALIFORNIA ENERGY COMMISSION

HYDROGEN FUELING INFRASTRUCTURE



Hydrogen Station Funding

Funding to Date = \$103 million

Public Station Funding

45 New Stations	= \$72.7 million
4 Station Upgrades	= \$6.7 million
44 Station O&M Grants	= \$12.5 million
1 Mobile Refueler	= \$0.9 million



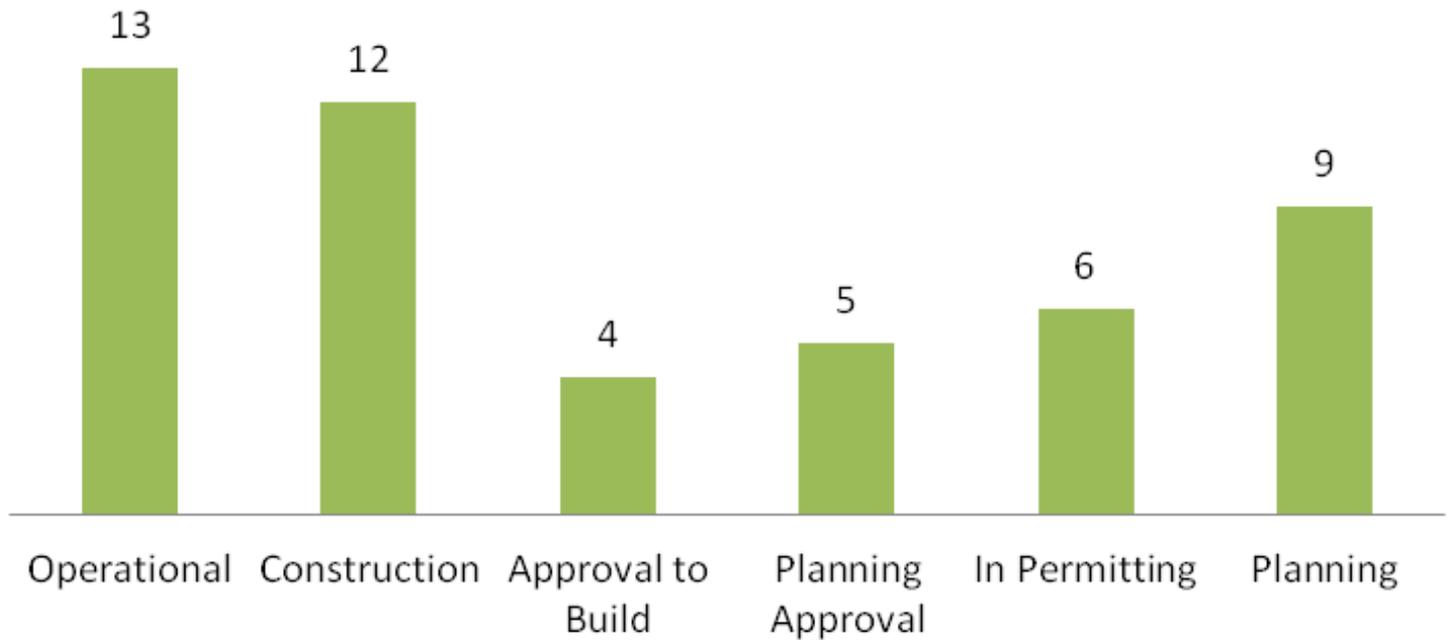
Other Funding Activities

5 H2 Regional Readiness Plans	= \$1.4 million
AC Transit Fuel Cell Bus Station	= \$3 million
C DFA Div of Weights and Measures	= \$4 million
Retail Dispensing Fuel Standards	
HyStEP Test Device	= \$0.1 million
UC Irvine STREET Model	= \$1.5 million
GoBiz ZEV Infrastructure Manager	





Status of 49 Energy Commission Funded Hydrogen Stations



Planning Targets: 20 Operational Stations in 2015
49 Operational Stations by 2016

Northern CA Hydrogen Stations

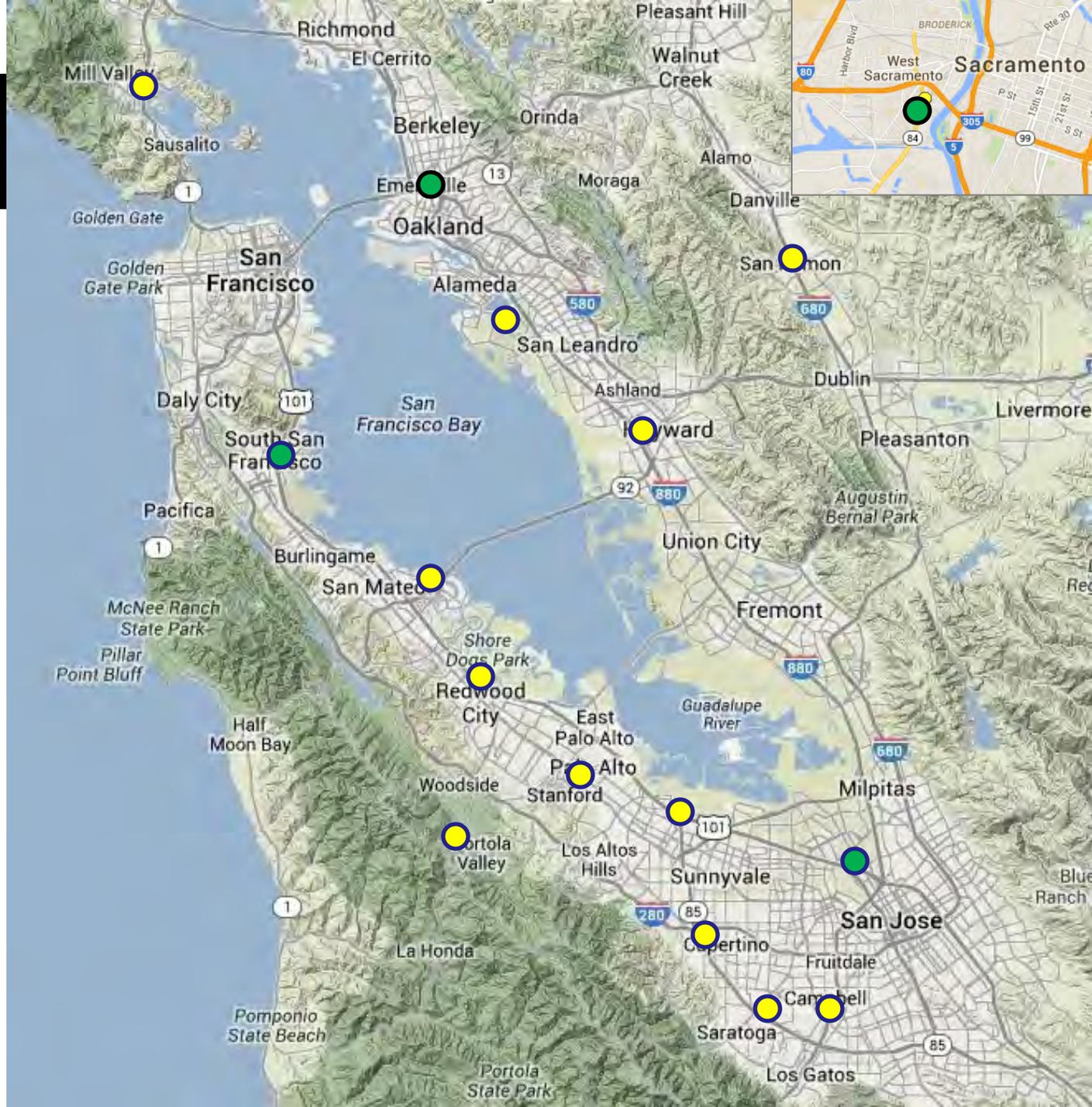
Operational

- Emeryville – AC Transit
- San Jose
- South San Francisco
- West Sacramento

In Development

- Campbell
- Cupertino
- Foster City
- Hayward
- Mill Valley
- Mountain View
- Oakland
- Palo Alto
- Redwood City
- *Rohnert Park
- San Ramon
- Saratoga
- *Truckee
- Woodside

**Not shown on map*



Southern CA Hydrogen Stations

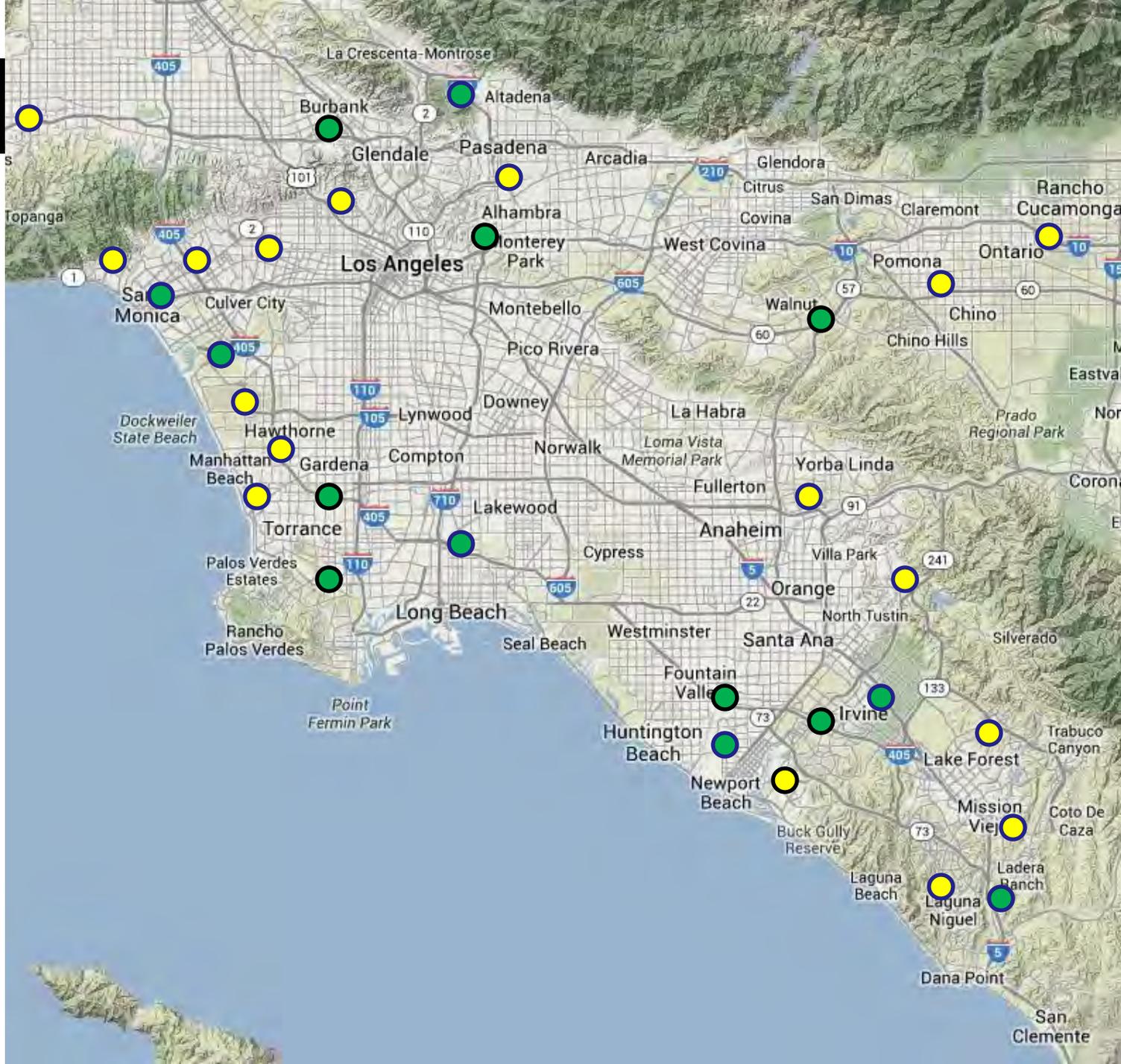
Operational

- Burbank
- Coalinga*
- Costa Mesa
- Diamond Bar
- Fountain Valley – OCSD
- Irvine – UC Irvine
- La Canada-Flintridge
- Long Beach
- Los Angeles – Cal State LA
- Los Angeles - Harbor City
- Los Angeles – LAX
- Los Angeles – Santa Monica Blvd
- Newport Beach
- Riverside*
- San Juan Capistrano
- Santa Monica
- *Thousand Palms – SunLine Transit
- Torrance

In Development

- Anaheim
- Chino (upgrade)
- Irvine - Walnut Ave.
- Laguna Niguel
- Lake Forest
- Lawndale
- Los Angeles - Beverly Blvd.
- Los Angeles - Lincoln Blvd.
- Los Angeles - Hollywood Blvd.
- Los Angeles - Woodland Hills
- Mission Viejo
- Ontario
- Orange
- Pacific Palisades
- Redondo Beach
- *Riverside
- *San Diego
- *Santa Barbara
- San Juan Capistrano
- Santa Monica
- South Pasadena

**Not shown on map*





South Coast AQMD H2 Station Opening March 25, 2015





First Element: Long Beach, Costa Mesa, Coalinga





Here Comes the Mirai

Station Developers and State Agencies Working Aggressively to Maximize Number of Open Stations for Mirai Customers

- New station commissioning process: from Operational to Open
- Ensuring fuel quality, POS credit card readers and data feeds on operational status





Hydrogen Solicitation Update

- Draft Hydrogen Solicitation Concepts Released
 - Workshop held August 14
 - Solicitation expected Q1 2016
 - \$ 17.3 million available
- Ongoing Permitting and Siting Support to Grantees
 - Staff support for local government planning with Go-Biz
 - Assistance on site relocations



ZEV and Near-ZEV TRUCKS



ARFVTP Truck Sector-Related Funding About 30 Percent of Total Program Funding

Technology	Funding (\$ Millions)	No. of Vehicles, Fueling Stations or Projects
Commercial Natural Gas Trucks	67.9	2,400 Trucks
Natural Gas Infrastructure	21.0	65 Stations
Commercial Propane Trucks	6.4	514 Trucks
Commercial ZEV Trucks (Class 6 package delivery)	4.0	160 Trucks
Advanced Technology Truck Demonstration or Manufacturing	146.7	64 Projects
Total Funding	246	



MD-HD Solicitations and Awards

- Freight Transportation Projects at California Seaports
 - \$17.8 M – Released Jan. 6, 2016
 - Freight and Port Focus
 - Includes MD-HD Technology Demos, ITS, and Natural Gas Vehicle Incentives
- Natural Gas Truck Vouchers
 - UCI Contract Operational
- Natural Gas Fueling Stations
 - Next Solicitation: Q2/Q3 2016



EPRI – Valley Power



**EPRI-Odyne:
Retrofit 5
Work Trucks
to PHEV
drive**

**\$1.1 M
ARFVTP
Grant**



Transpower Class 8 Electric Trucks



**South Coast Catenary
Truck with Pantograph**





Motiv Electric Drive School Buses



Demonstrated in Kings Canyon Unified School District





Lompoc USD CNG Station

\$300,000
ARFVTP
Grant

New
Station
Will
Support
15 CNG
Buses

9,700
Student
District

On-Line
Nov 2015





Cummins Westport ISL G Near Zero Natural Gas Engine

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

ISL G NEAR ZERO





BIOFUELS



ARFVTP Biofuels Funding

Fuel Type	Funding (\$ millions)	No. of Projects	Production (MGY)
Biomethane	50.9	16	8.4
Ethanol	24.5	10	8.9
Cellulosic Ethanol	3.9	1	0.021
Renewable Gasoline	1.0	1	0.0
Biodiesel	40.5	15	56.7
Renewable Diesel	17.1	5	17.9
Total	137.9	48	91.9

E85 Infrastructure: \$13.9M for 157 Stations

Biodiesel Tank Storage: \$4M for 4 projects



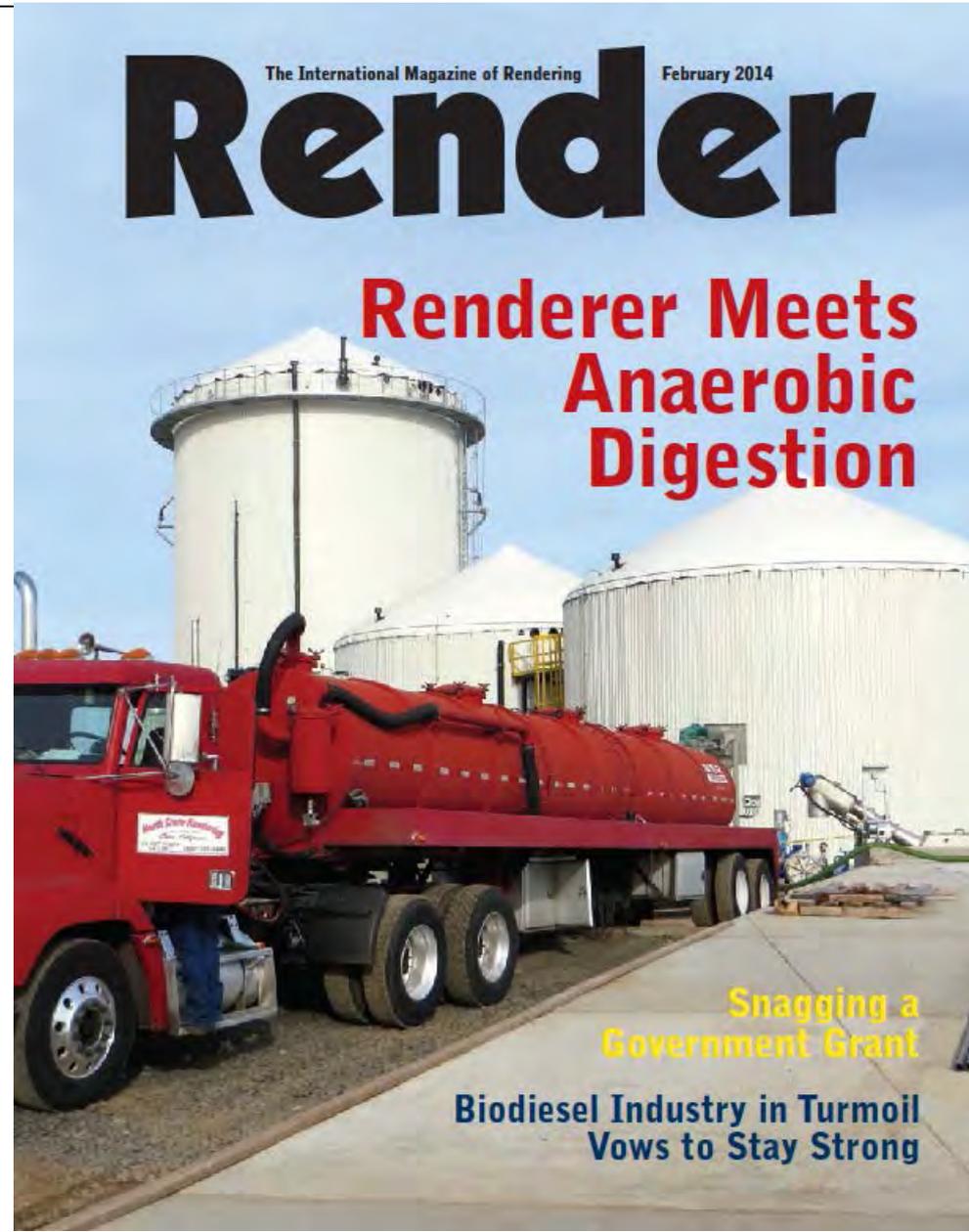
Biofuels Awards and Solicitations

- Early and Pre-Commercial NOPA
 - 4 Awards for \$2.9 M
- Upcoming Solicitation
 - \$17 M in Q1 2016



Northstate Rendering Biogas Project, Oroville

\$5.4 Million ARFVTP Grant
370,000 dge output





Springboard Biodiesel, Chico

\$758,000

ARFVTP Grant

350,000 annual

dge





New Leaf Biodiesel, San Diego

\$511,000 ARFVTP Grant
- 5 MGY Expansion
- 90% carbon reduction





Pixley Biogas – Calgren Ethanol Biorefinery



\$4.6 million ARFVTP Grant

Develop Biogas from Dairy Farm Waste

Reduce Calgren's Natural Gas Consumption by 6%
Reduce Calgren's Carbon Intensity Score to 67 gCO₂e/MJ

Lowest Carbon Industrial Scale Ethanol in California



Workforce Development and Training

Partner Agency	Funded Training (in Millions)	Match Contributions (in Millions)	Trainees	Businesses Assisted	Municipalities Assisted
ETP	\$11.5	\$10.8	13,763	142	14
EDD	\$8.2	\$7.5	999	36	-
CCCO	\$5.5	N/A	N/A	68	-
ATTE	\$2.0	N/A	N/A	N/A	
Other	\$0.5				
Total	\$27.7	\$18.3	14,762	246	14 ⁴³



ARFVT PROGRAM ACTIVITIES



Program Diversity

- **Fairness** - Increase funding accessibility to all Californians
- **Diversity of Ideas** - Great ideas occur in a variety of areas
- **Inclusion** - Small businesses make up a significant portion of the U.S. economy
- **Job Creation** - Projects can create jobs for residents of under-served communities
- **Diversity in Needs** - Needs vary widely from one community to the next (air quality, socioeconomic, etc.)



Program Activities

- **2015 Benefits Report and IEPR**
- **3103 Rulemaking**
 - OAL Approved October 20, 2015
- **Technology Merit Review**
 - Biofuels and MD-HD Workshops at UCD and CEC
 - Upcoming EV Charger Workshop
- **Sustainable Freight**
- **AB 8 Report: Remaining Time and Cost to Reach 100 Hydrogen Fueling Stations**



AB 8 Joint Agency Report: Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California

Energy Commission – ARB Report to
California Legislature

(with technical support from NREL)



Key Findings

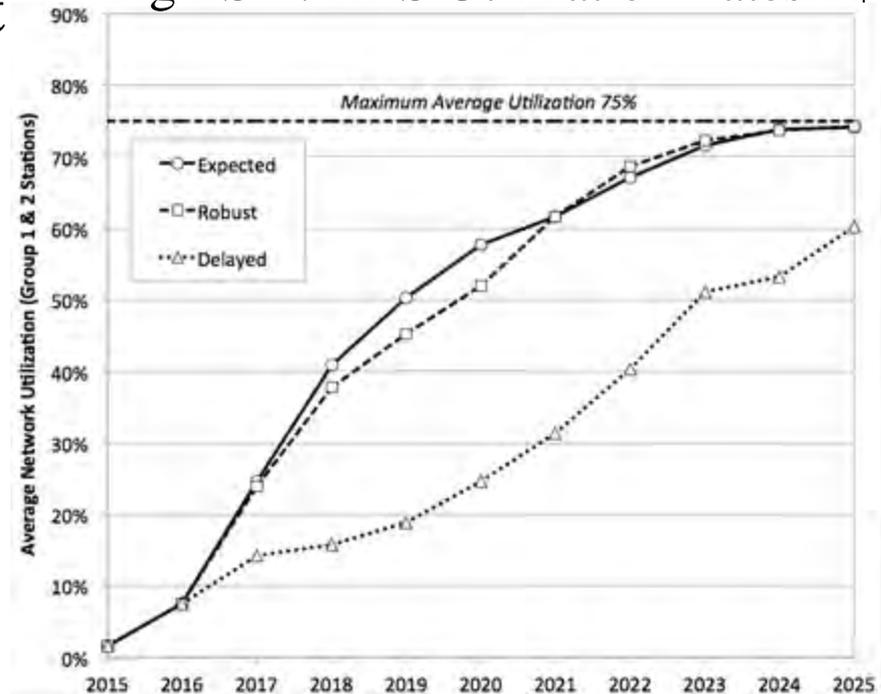
1. **More than 50 HRS will be open in 2016** with fueling capacity for 10,000 FCEVs, but demand could outpace capacity in 2020-21 time period, demonstrating critical need for continuing state financial support.
2. **Scenarios for 100 Stations**
 - a) **Expected:** 100 HRS by 2020 requiring \$160 M total ARFVTP funding. 19,500 kg capacity system. Market value of hydrogen sales: \$80 to \$400 M in 2021-2025
 - b) **Robust:** 100 HRS by 2020 requiring \$160 M ARFVTP funding. 26,000 kg capacity system. Market value of hydrogen fuel sales: \$100 to \$800 M in 2021-2025.
 - c) **Delayed:** 100 HRS by 2024 requiring \$170 M in ARFVTP funding. 16,000 kg capacity system. Market value of hydrogen fuel sales: \$70 to \$80 M.



Key Findings

- HRS costs range from \$2.1 to over \$3 M per station, but could decline by up to 50 percent in 2025 if global development continues.**
- Continuing public investment required until business case established**

Fig ES-2: HRS Utilization Rates





Key Findings

5. Hydrogen Station Development Times Decreasing from Nearly 5 Years (2009 funding) to 1.6 Years (2013 funding – 6 stations)

Fig 8: Average Station Development Time (days)

