



# Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP)

## Advisory Committee Meeting 2016-17 Investment Plan

**November 6, 2015**

**California Energy Commission  
Rosenfeld Hearing Room  
Sacramento**



# Meeting Agenda

- 10:00 Introductions and Opening Remarks
- 10:15 Program Status Update
- 10:45 Development of 2016-2017 Investment Plan Update
- 11:15 Advisory Committee Comments and Discussion
- 12:15 Lunch
- 1:15 Advisory Committee Comments and Discussion, cont.
- 2:00 Public Comment



# Program Status Update

**Jim McKinney**  
**Program Manager**



## California Transportation: Nation-State Statistics

- Population: 38 million
- GDP: \$2.0 trillion - 8<sup>th</sup> 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))

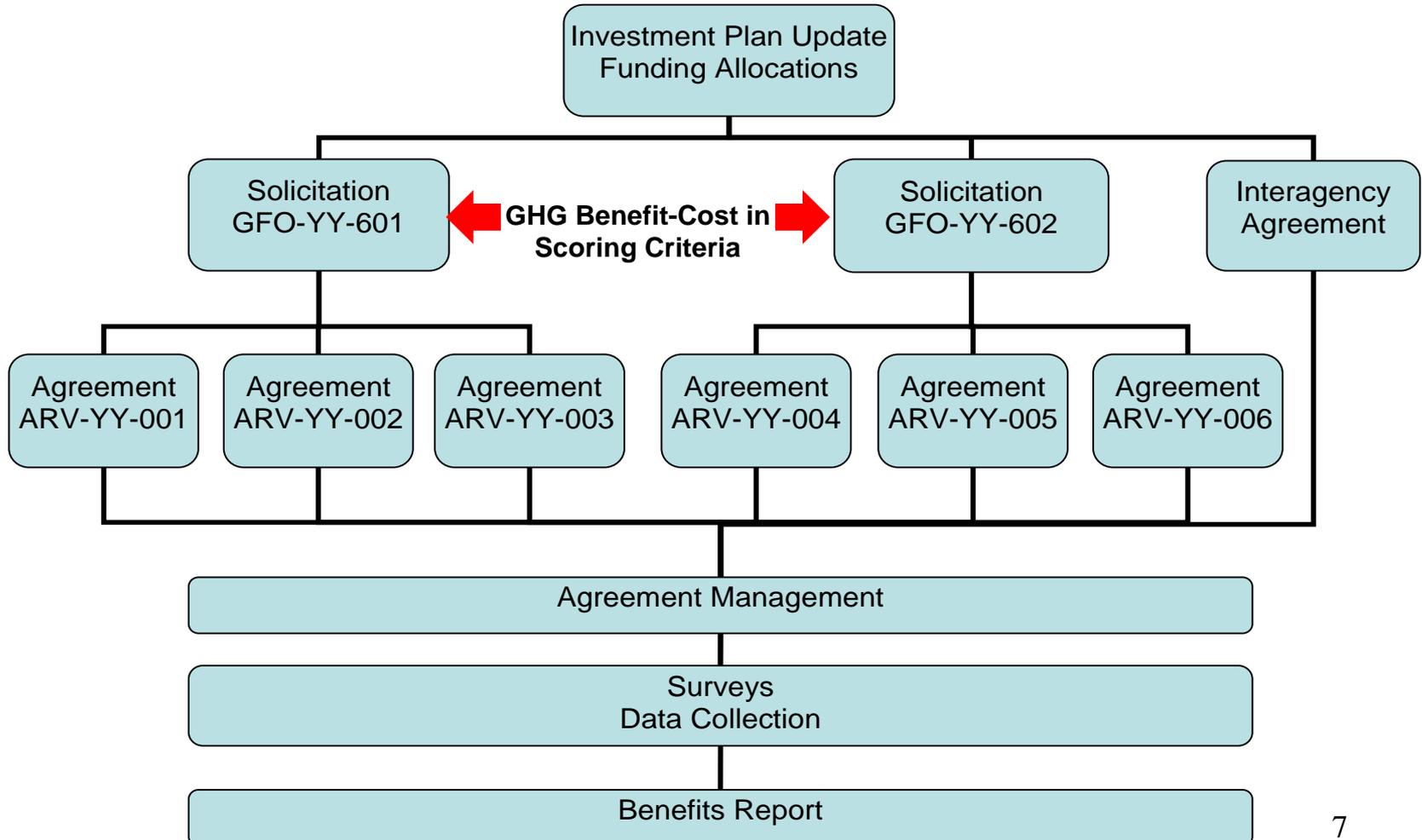


## Key Policies and Regulations

| 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



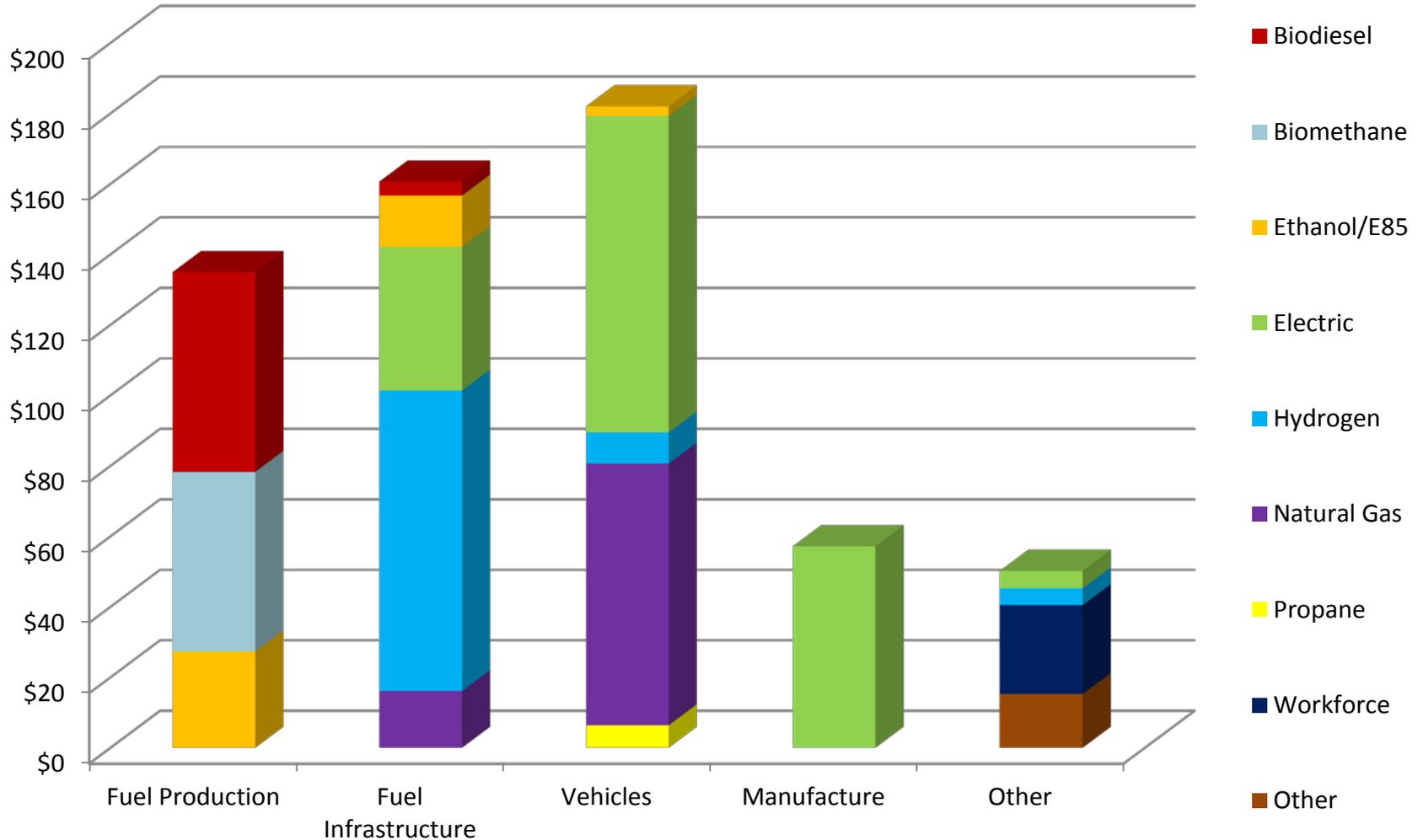


# ARFVTP Funding Summary: 2009-2015

| Investment Areas          | Funding Amount<br>(in millions) | Percent<br>of Total<br>(%) | Number<br>of<br>Awards |
|---------------------------|---------------------------------|----------------------------|------------------------|
| Electric Drive            | \$193                           | 33                         | 150                    |
| Biofuels                  | \$164                           | 27                         | 68                     |
| Hydrogen                  | \$99                            | 17                         | 43                     |
| Natural Gas               | \$95                            | 17                         | 168                    |
| Workforce Development     | \$25                            | 4                          | 55                     |
| Market & Program Develop. | \$13                            | 2                          | 12                     |
| <b>Total</b>              | <b>\$589</b>                    | <b>100</b>                 | <b>496</b>             |



# Existing Agreements: 2009-2015



Current through Q2, 2015



# Geographic Distribution of ARFVTP Funding by Air District

| Air District              | Total Funding Amount (\$ millions) | Percent of Total | Percent of State Population |
|---------------------------|------------------------------------|------------------|-----------------------------|
| Bay Area                  | 96.9                               | 16.5             | 18.4                        |
| Monterey                  | 9.4                                | 1.6              | 2.0                         |
| Sacramento                | 24.6                               | 4.2              | 3.6                         |
| Santa Barbara             | 3.0                                | 0.5              | 1.1                         |
| San Diego                 | 32.0                               | 5.4              | 8.4                         |
| San Joaquin               | 84.1                               | 14.3             | 10.5                        |
| South Coast               | 158.8                              | 27.0             | 44.0                        |
| Ventura                   | 1.3                                | 0.2              | 2.2                         |
| Yolo-Solano               | 16.6                               | 2.8              | 0.9                         |
| Other Northern California | 16.4                               | 2.8              | 8.9                         |
| Other So Cal Districts    | 4.4                                | 0.7              |                             |
| Statewide                 | 141.4                              | 24.0             | -                           |
| <b>Total</b>              | <b>588.9</b>                       | <b>100.0%</b>    | <b>100.0%</b>               |



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        | 239        | 90               | 1,466        |
| <b>Total</b> | <b>3,937</b> | <b>239</b>          | <b>2,818</b> | <b>401</b> | <b>120</b>       | <b>7,515</b> |



SAE Combo port  
(L2 + DC charging)

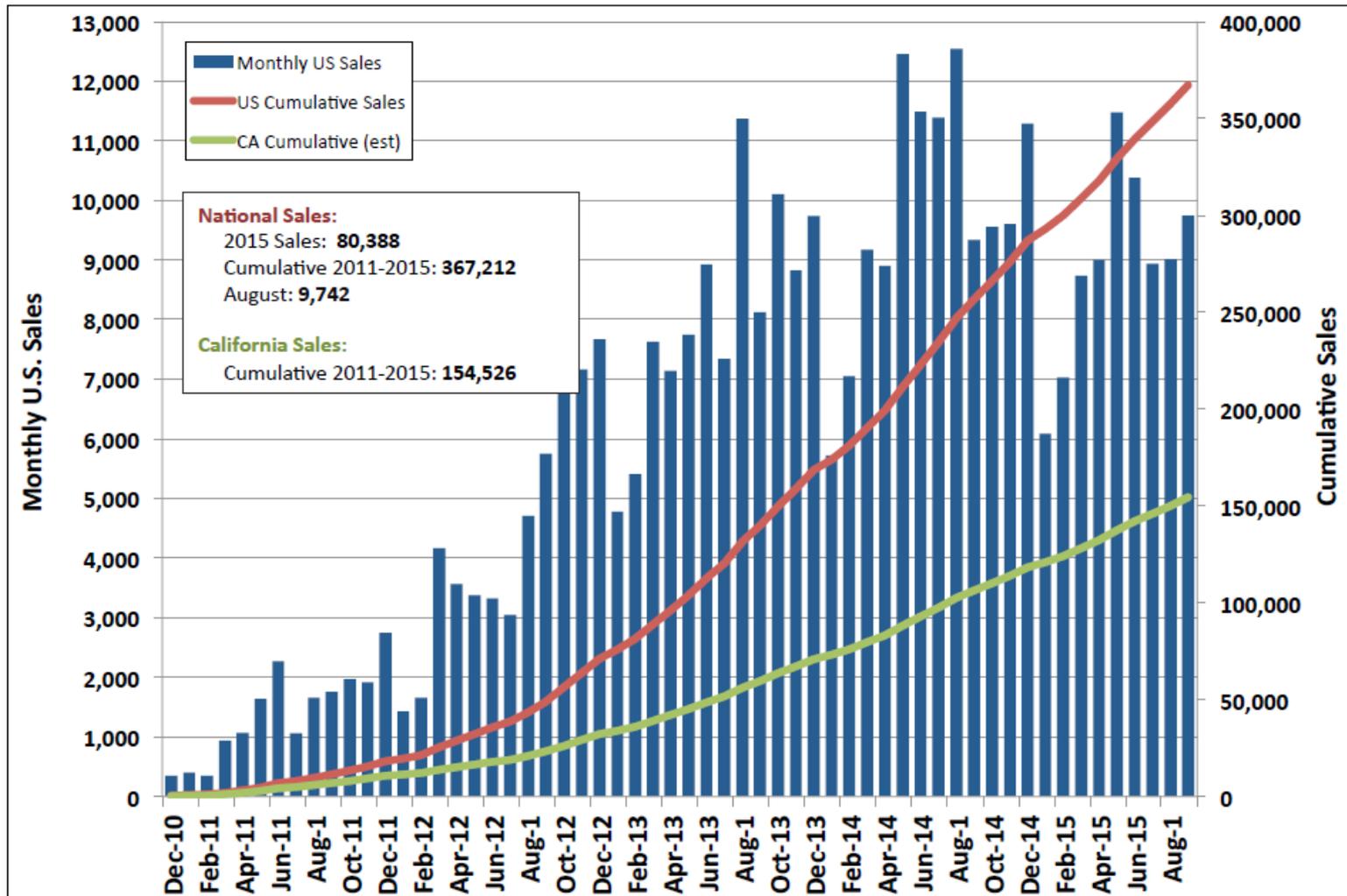
CHAdeMO port  
(DC charging)

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](http://www.hybridcars.com)



# CALIFORNIA ELECTRIC VEHICLE FAST CHARGING STATIONS



# Electric Charging Infrastructure in California

## *Current and Projected 2020 Need*

| <b>CURRENTLY INSTALLED</b>    | <b>Installed Chargers *</b> |
|-------------------------------|-----------------------------|
| 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.*

| <b>PROJECTED NEED</b>   | <b>High Scenario</b> | <b>Low Scenario</b> |
|-------------------------|----------------------|---------------------|
| 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*



# 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
- Upcoming EV Solicitation(s)
  - \$15.1 million
- 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 = \$100 million

## Public Station Funding

- 45 New Stations = \$72.7 million
- 4 Station Upgrades = \$6.7 million
- 33 Station O&M Grants = \$9.9 million
- 1 Mobile Refueler = \$0.9 million

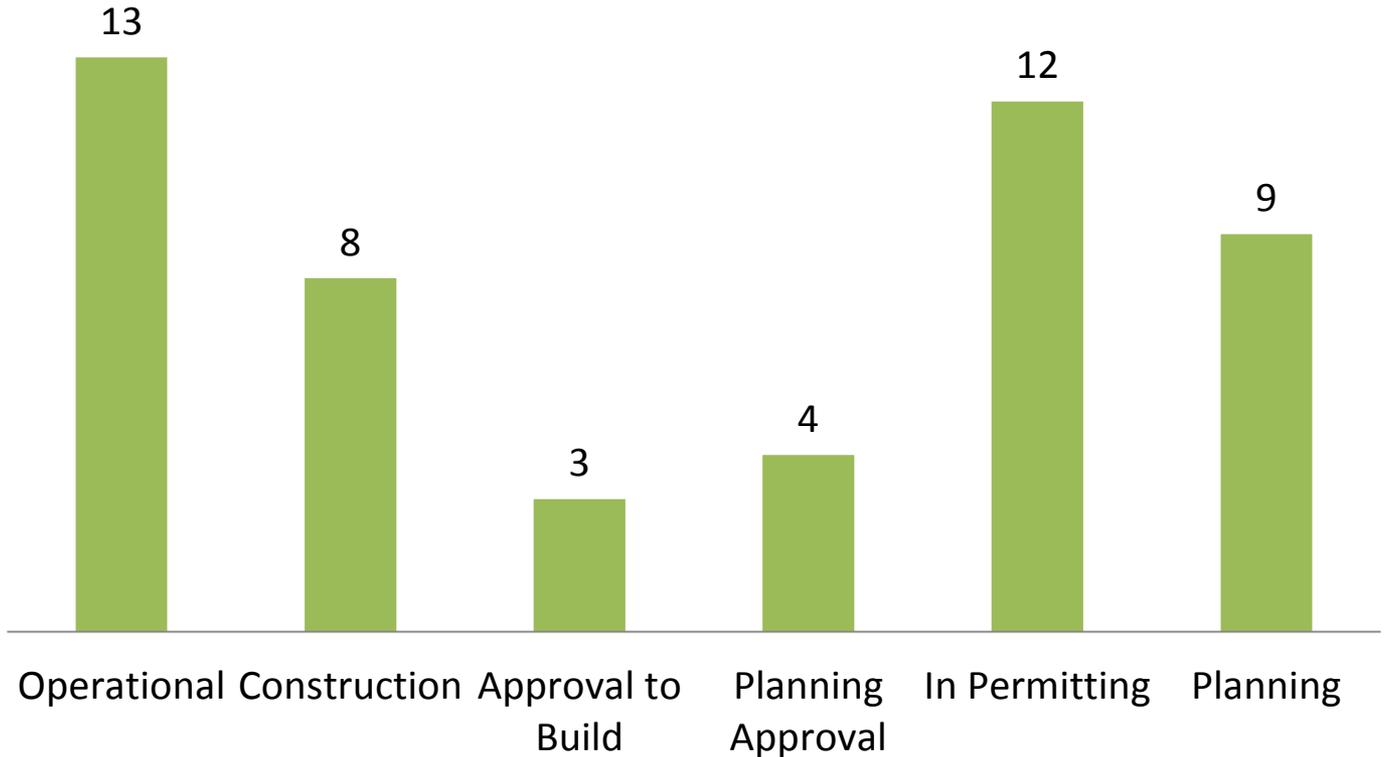
## Other Funding Activities

- 5 H2 Regional Readiness Plans = \$1.4 million
- AC Transit Fuel Cell Bus Station = \$3 million
- CDFR 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

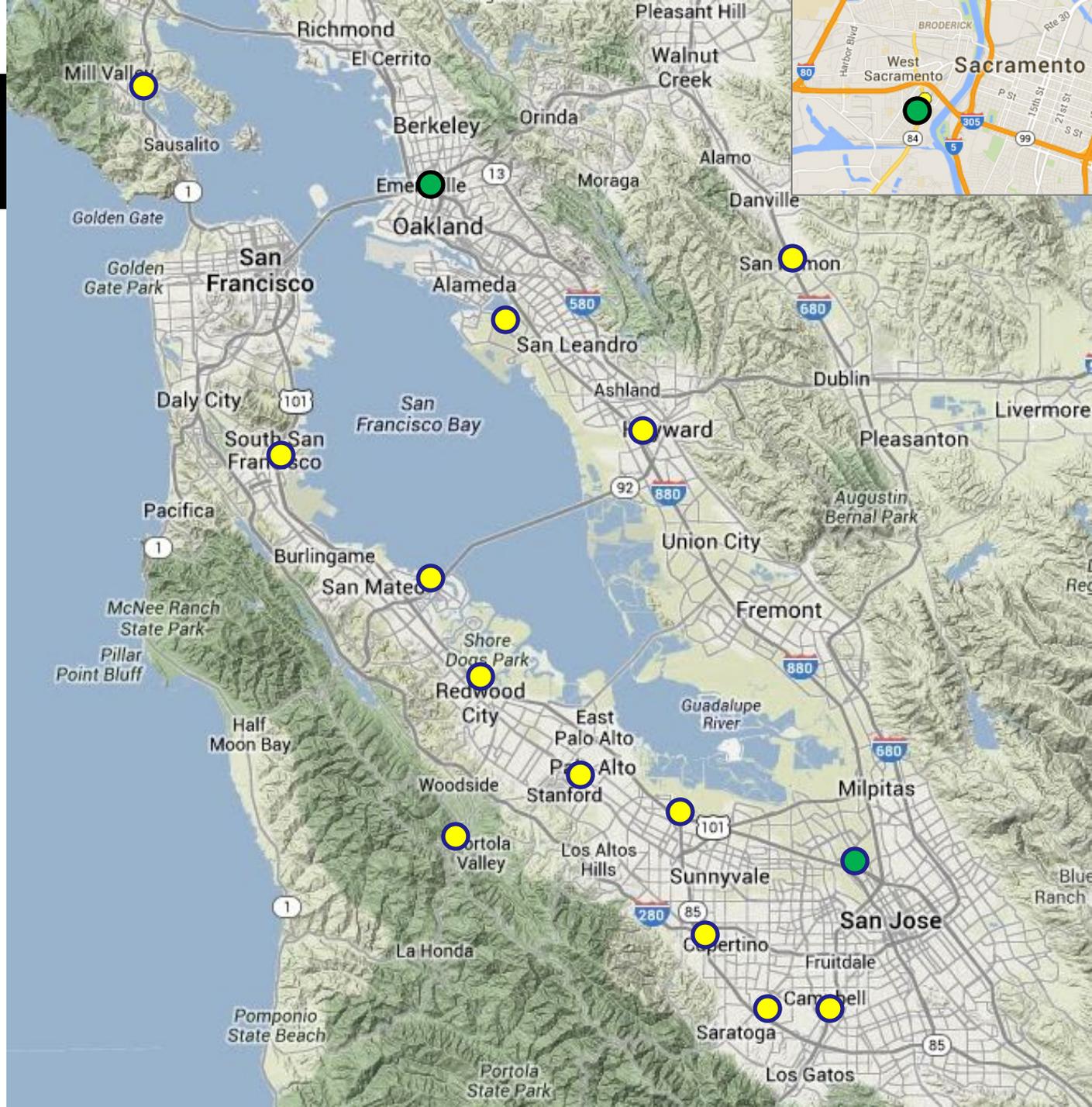
## Operational

- Emeryville – AC Transit
- San Jose
- West Sacramento

## In Development

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

*\*Not shown on map*



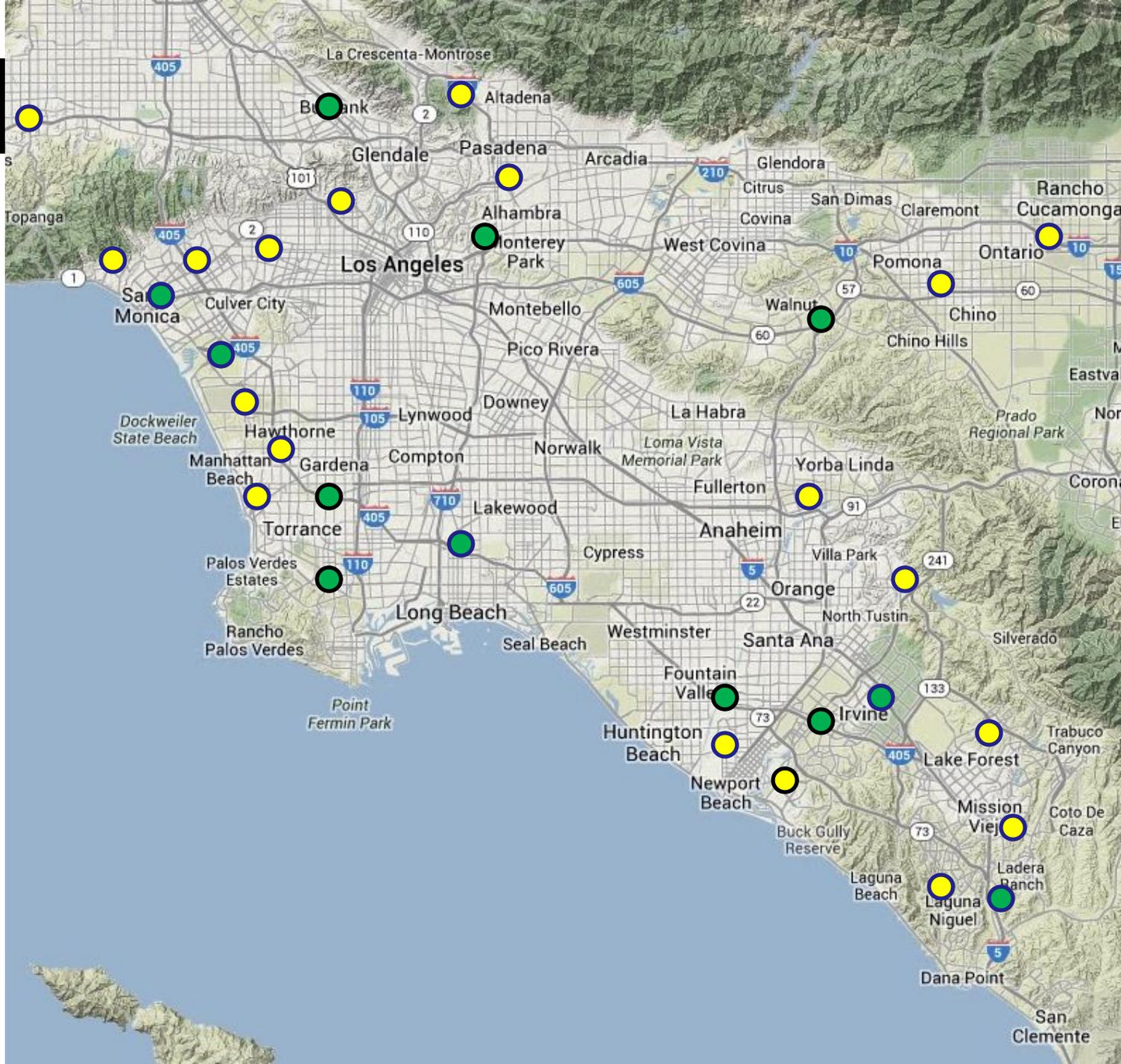
# Southern CA Hydrogen Stations

## Operational

- Burbank
- Coalinga\*
- Diamond Bar
- Fountain Valley – OCS
- Irvine – UC Irvine
- 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)
- Costa Mesa
- Irvine - Walnut Ave.
- La Canada Flintridge
- 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~~ 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<br>(\$ Millions) | No. of Vehicles,<br>Fueling Stations or<br>Projects |
|---|--------------------------|---|
| Commercial Natural Gas Trucks                               | 57.0                     | 2,735 Trucks  |
| Natural Gas Infrastructure                                  | 15.5                     | 50 Stations   |
| Commercial Propane Trucks                                   | 6.4                      | 514 Trucks  |
| Commercial ZEV Trucks<br>(Class 6 package delivery)         | 4.0                      | 160 Trucks  |
| Advanced Technology Truck<br>Demonstration or Manufacturing | 89.7                     | 42 Projects   |
| <b>Total Funding</b>  | <b>172.60</b>            | 30  |



## MD-HD Solicitations and Awards

- MD-HD Advanced Technology Demo NOPA
  - 11 projects totaling \$31.1 M
- MD-HD Advanced Technology Demo Solicitation
  - \$13.8 M, Q1 2016
  - Freight and Port Focus
- Natural Gas Truck Vouchers
  - UCI Contract Operational
- Natural Gas Fueling Station Awards
  - 13 awards totaling \$5.5 M – 10 School Districts



# 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





# BIOFUELS



## ARFVTP Biofuels Funding

| Fuel Type          | Funding (\$ millions) | No. of Projects | Production (MGY) |
|--------------------|-----------------------|-----------------|------------------|
| Biomethane         | 50.9                  | 15              | 9.6              |
| Ethanol            | 24.5                  | 10              | 8.9              |
| Cellulosic Ethanol | 3.9                   | 1               | 0.021            |
| Renewable Gasoline | 1.0                   | 1               | 0.0              |
| Biodiesel          | 40.5                  | 15              | 98.8             |
| Renewable Diesel   | 17.1                  | 5               | 47.9             |
| <b>Total</b>       | <b>137.9</b>          | <b>47</b>       | <b>165.2</b>     |

E85 Infrastructure: \$13.9M for 157 Stations

Biodiesel Tank Storage: \$4M for 4 projects



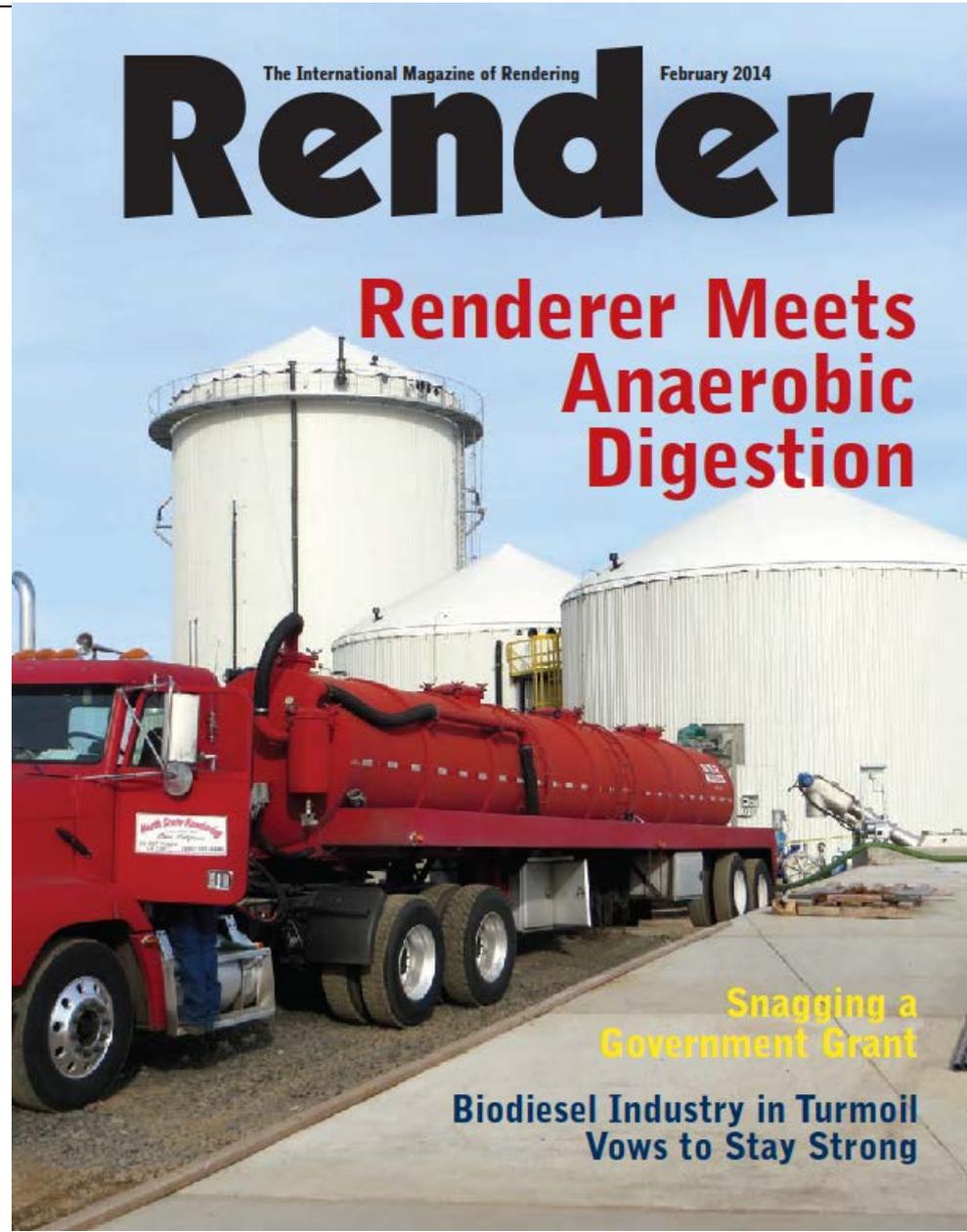
## Biofuels Awards and Solicitations

- 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



Snagging a  
Government Grant

Biodiesel Industry in Turmoil  
Vows to Stay Strong



# 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 gCO<sub>2</sub>e/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                         |                                   |               |                     |                         |
| <b>Total</b>   | <b>\$27.7</b>                 | <b>\$18.3</b>                     | <b>14,762</b> | <b>246</b>          | <b>14</b> <sub>42</sub> |



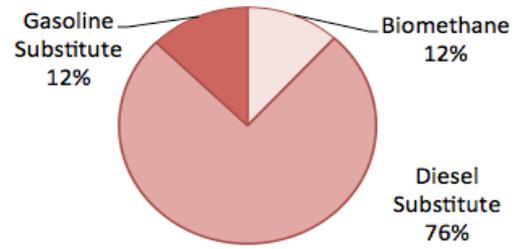
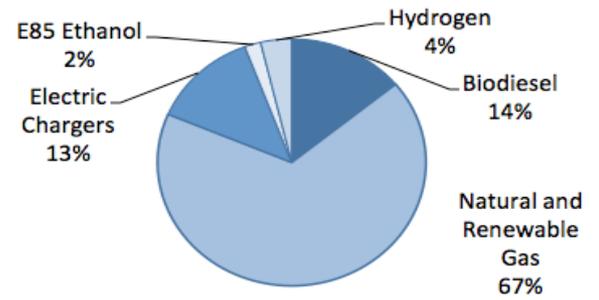
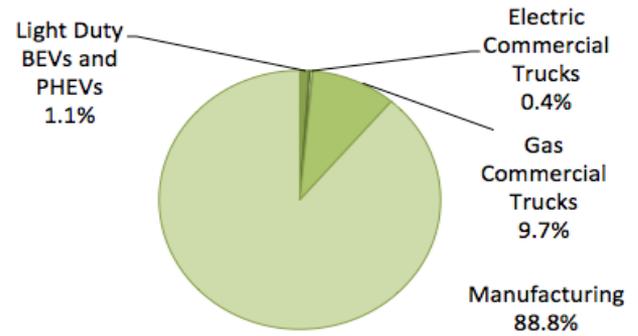
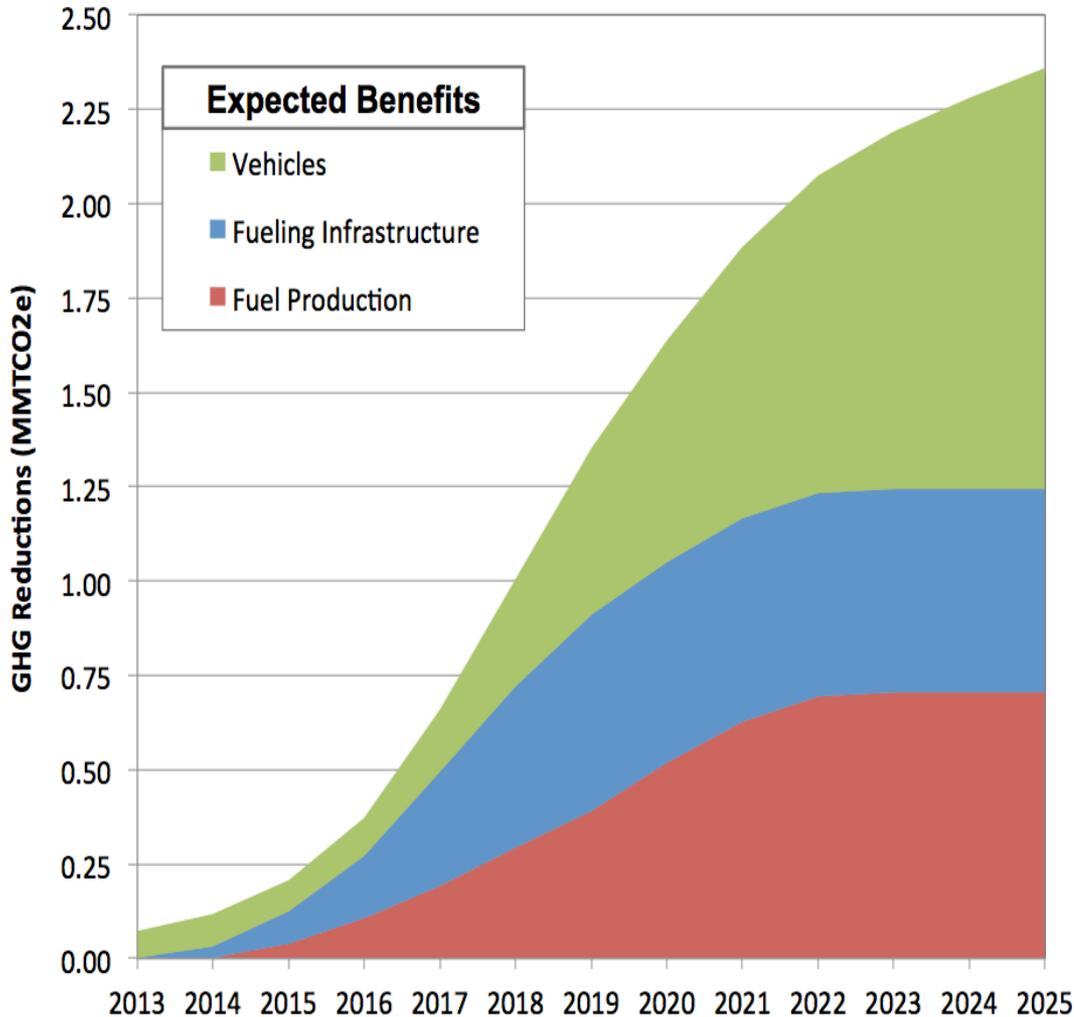
# Projected Carbon Reduction Benefits from ARFVTP Investments

## Results from NREL's 2015 Analysis of Expected and Market Transformation Benefits

- **Dr. Marc Melaina, Principal Investigator**
  - Analyzed 290 projects totaling \$515 million

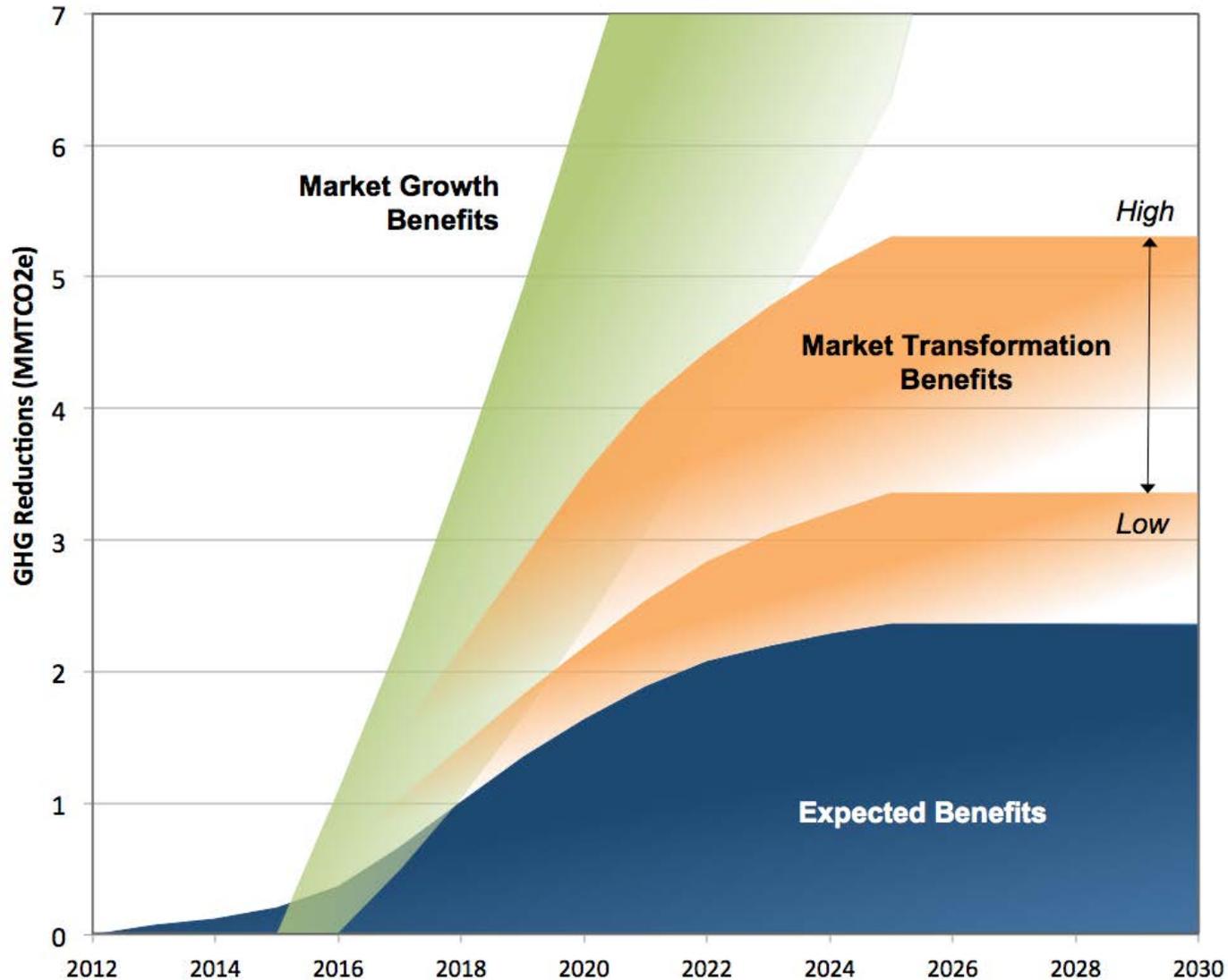


# Expected GHG Reductions of Projects Funded to Date





# Cumulative Carbon Reduction Benefits





# 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 Workshops at UCD and CEC
  - Upcoming Dec MD-HD Workshops
- **Sustainable Freight**
- **AB 8 Report: Remaining Time and Cost to Reach 100 Hydrogen Fueling Stations**