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Biofuel Production and Supply

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October 27, 2016

Opportunities for Meeting California's Climate Change Goals

- Large commercial facilities
  - High volumes of low-carbon fuels
- Community scale facilities
  - Matching production with locally available feedstock supply
  - Addressing complimentary state goals (waste diversion and short lived climate pollutants)
- Transformative technologies
  - Advancements to increase yield, productivity or cost effectiveness
- Sustainability
  - Preserve / enhance natural resources (water, energy, land, etc.)
  - Ex. forest biomass as feedstock

Biomass Utilization Sustainability Project

- Research Contracts for $2.22 million with:
  - US Forest Service Pacific SW Research Station
  - US Forest Service Pacific NW Research Station
  - UC Davis, UC Berkeley, and Portland State University
  - Spatial Informatics Group, LLC
- Over 30 academic and research scientist efforts spanning five years
- Study involved 10 technical tasks and two project administration / integration tasks

Pre-Commercial Development

PON-14-602, Biofuels Early & Pre-Commercial Technology Development

For transformative technology solutions to significant biofuels industry problems that target significant unmet needs in biofuels.

Over $2.9 million in funding (FY 15/16)

4 projects awarded

Pre-Commercial Awards

Proposal	Amount	Project Summary
Altex Technologies Corporation	$999,993	Biomass Conversion to Synthetic Gasoline System
San Diego State University Research Foundation	$305,624	Energy-efficient and cost-effective microalgae disruption for extraction of lipids for biodiesel production
University of California, Davis	$598,168	Improving microalgae feedstock for biofuel production using CO_2 and waste nutrients from anaerobic digestion
West Biofuels, LLC	$1,000,000	Production of advanced renewable fuels ethanol and value-added chemicals from biomass residues

Biofuel Production and Supply

GFO-15-606, Community-Scale and Commercial Scale Advanced Biofuels Production Facilities

For the development of low carbon production projects to increase production capacity

~$37 million in funding is available ($20 million in 16/17 funding)

Two funding categories based on annual production capacity:

100,000-1M DGE: ~$12 million

Above 1M DGE: ~$25

Biofuel Production and Supply

Proposed

$20 million allocation

FY 2017-2018

Electric Vehicle Charging Infrastructure

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October 27, 2016

History of Energy Commission Electric Vehicle Charging Infrastructure Deployment

Partnering with the American Recovery and Reinvestment Act

2010

Planning, Deploying EV Charging Infrastructure, and Upgrades to Legacy Chargers

2012

Increasing the Numbers and Meeting Specific Needs for Charging

2014

Allowing Border-to-Border Travel on California's Major Highway Corridors

2015

ARFVTP Electric Vehicle and Infrastructure Support

Number of Electric Vehicle Chargers as of June 2016

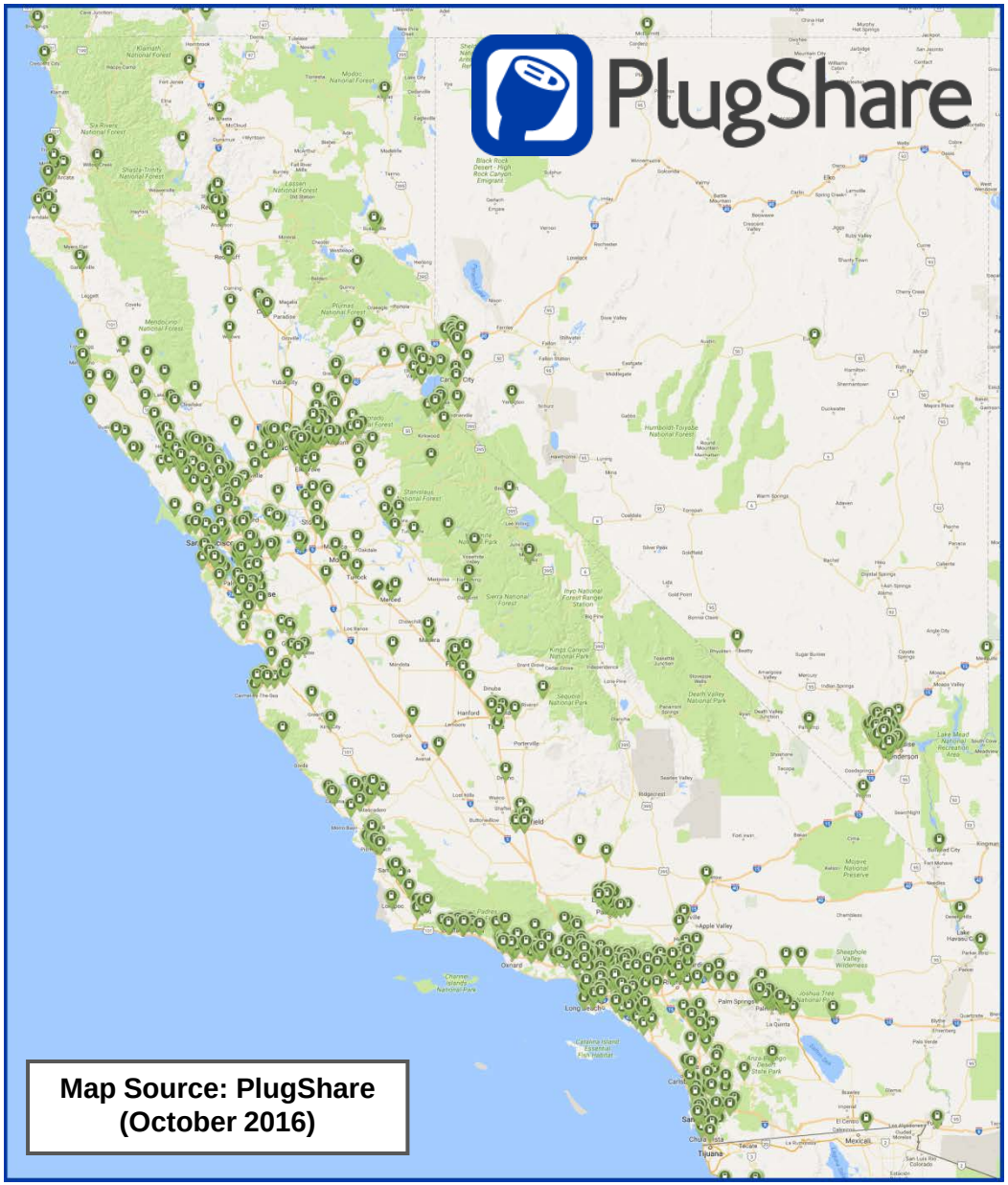
Chargers	Residential	MUD	Commercial	Other (Commercial & Workplace)	Workplace	Fleet	DC Fast Chargers	Total
Installed	3,937	186	1,717	76	199	97	56	6,268
Planned	-	109	781	139	174	36	125	1,364
Total Chargers	**3,937**	**295**	**2,498**	**215**	**373**	**133**	**181**	**7,632**
Total Connectors	**3,937**	**345**	**3,196**	**248**	**425**	**136**	**243**	**8,530**

- $49.5 M for Charging Infrastructure
- $13.87 M pending approval at future business meeting for additional DC fast chargers on California Corridors
- $2 M for California Financing Authority's Loan Loss Reserve Financing Program for Small Businesses

Existing Level 2 Charging Sites in California

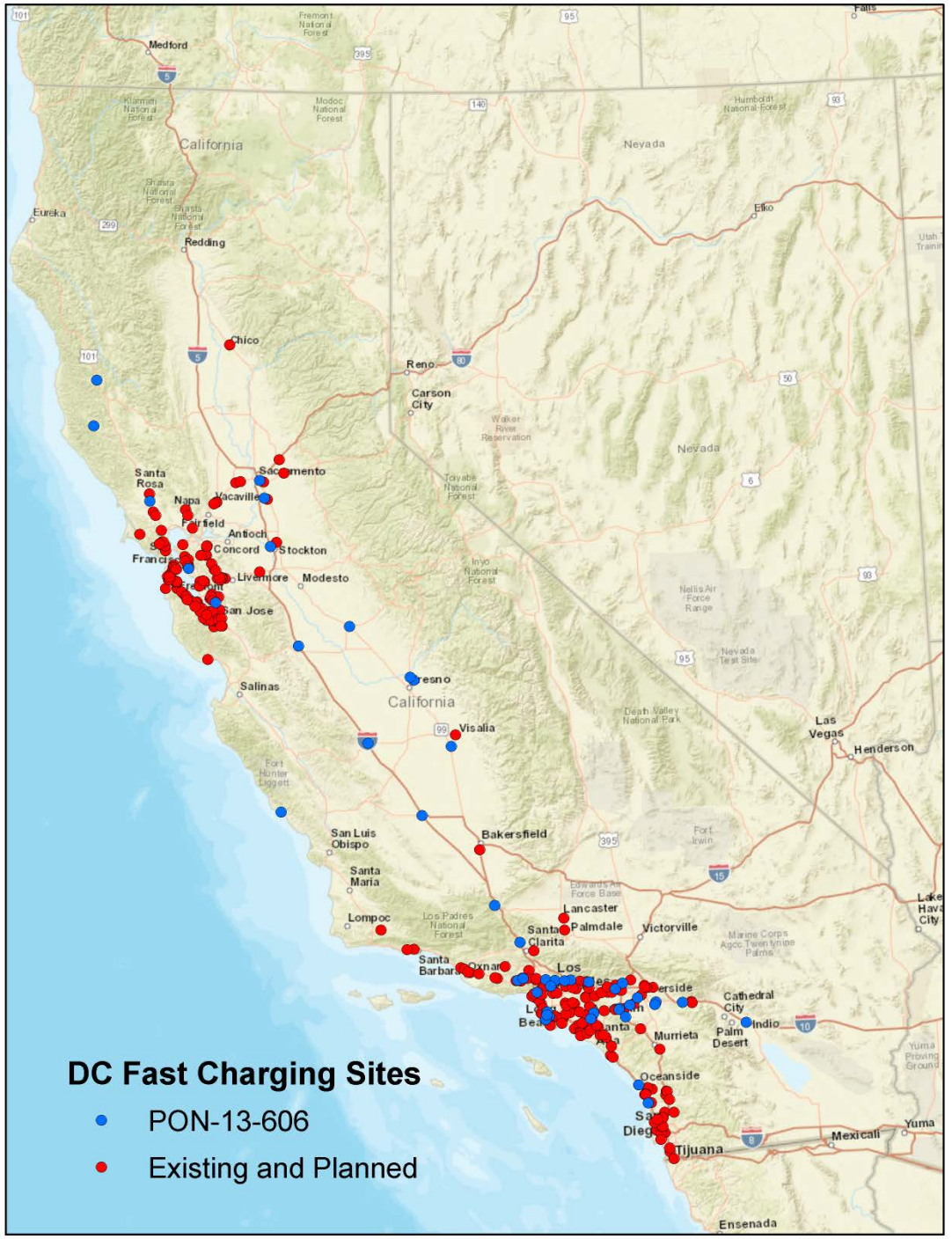
- US DOE Alternative Fuels Data Center
  - 8,554 Level 2 public charging outlets
- CEC Funded
  - 1,955 public outlets
  - Represents 23% of available public level 2 chargers

Excludes private stations



Previous DC Fast Charging Funding

- Fast charging demonstrations
- Fast charging for:
  - Destination
  - Corridor
  - Workplace
  - Multi-Unit Dwelling

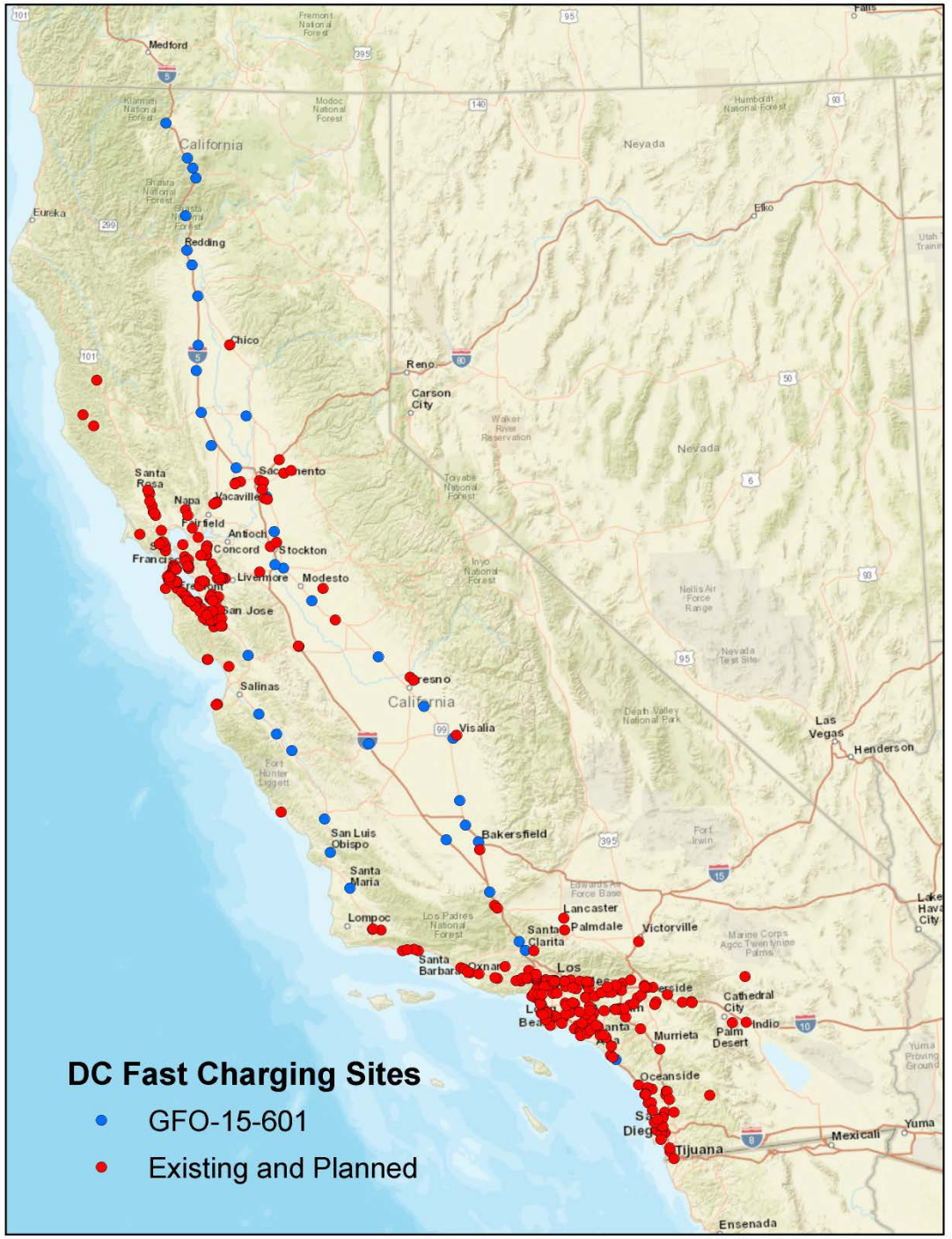


Source: Energy Commission Staff Analysis, PlugShare.com, US Department of Energy Alternative Fuels Data Center

DC Fast Chargers North-South Corridors

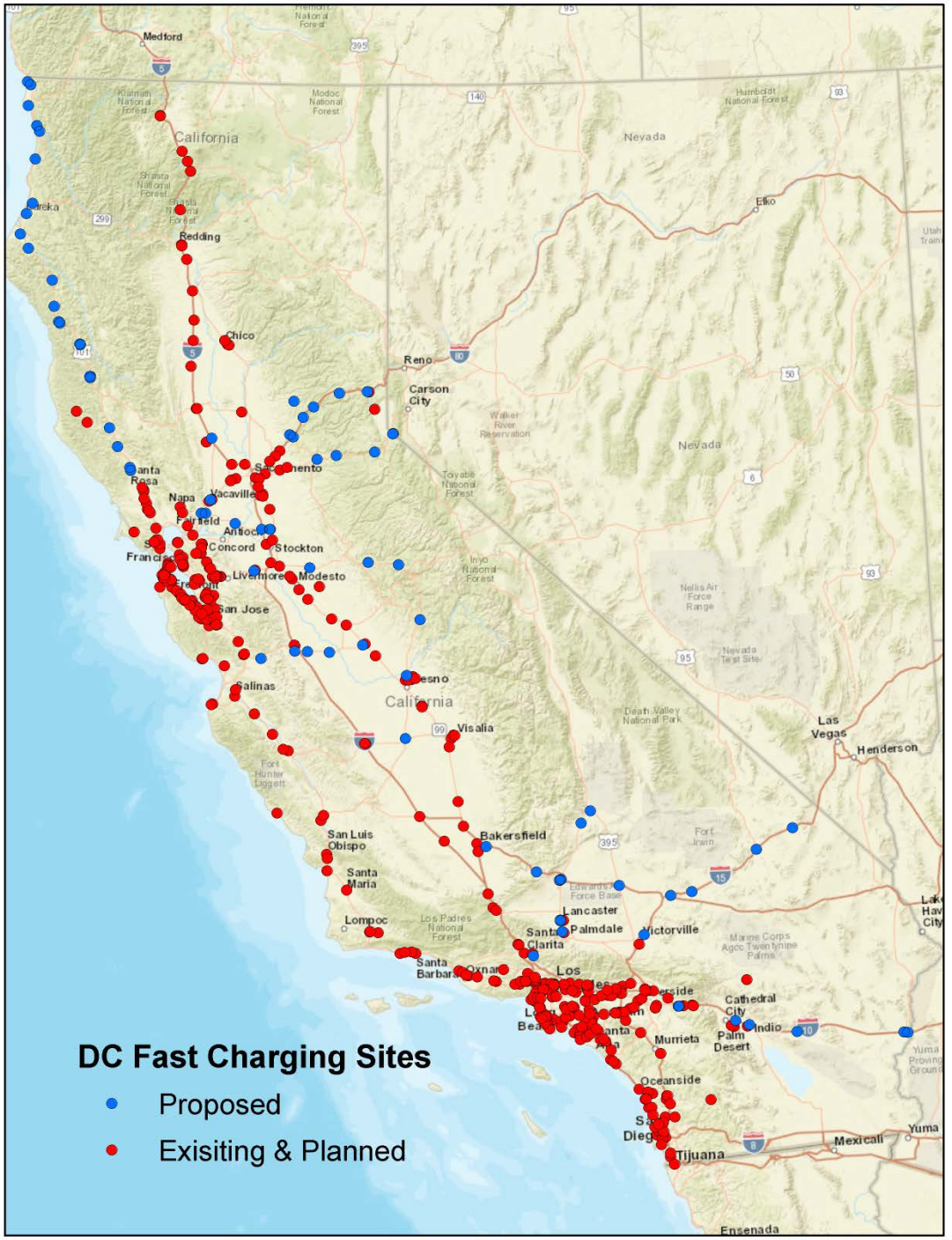
- 41 Sites
  - Interstate-5: 22 sites
  - Highway 99: 11 sites
  - US 101: 8 sites
- 61 DC Fast Chargers
- 42 Level 2 chargers

Source: Energy Commission Staff Analysis, PlugShare.com, US Department of Energy Alternative Fuels Data Center



DC Fast Charging on Interregional Corridors

- "East-West" Corridors
- 79 Sites
- 126 DC Fast Chargers
- 87 Level 2 Chargers



Source: Energy Commission Staff Analysis, PlugShare.com, US Department of Energy Alternative Fuels Data Center

DCFC Corridor Efforts In California

nrg EVgo

Bay Area Air Quality Management District

South Coast AQMD

NEDO New Energy and Industrial Technology Development Organization

Monterey Bay Air Resources District

greencharge networks

Sunspeed Enterprises

SCPPA

BMW

RECARGO

US|GVC green vehicle council

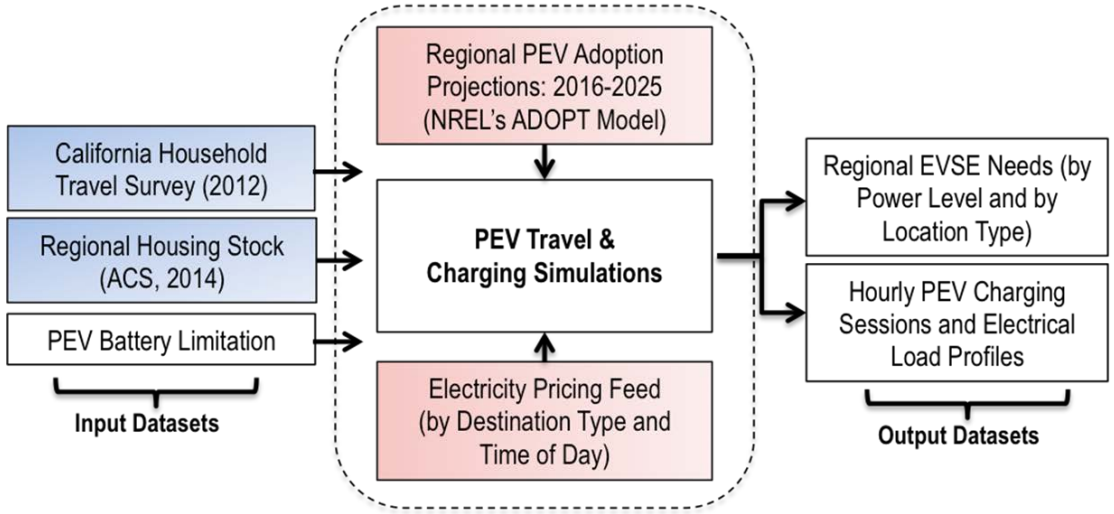
SMUD

The MOU Signing Ceremony

Data Collection and Analysis

- Strategically plan for additional stations and funding opportunities that will support the goal of 1.5 million vehicles on California roadways by 2025
- Track impact of electric vehicle charging station investments
- Electric Vehicle Infrastructure Projections or EVI-PRO

EVI-PRO Conceptual Diagram



US Green Vehicle Council

Fast Chargers at Hotel/Motel Sites Along Highway Corridors

Santa Clara Public EV Charging Center

One of the largest public electric vehicle charging centers of its kind in California.

48 Level 2 charge connectors

1 DC Fast charger

1 Intelligent Energy Storage System

City of Burbank – Curbside Charging

8 Curbside Level 2 Chargers located at diverse locations along major roadways, near heavily frequented destinations and multi-unit dwellings in Burbank.

Continued Infrastructure Support for PEVs

- Monitor vehicle markets and consumer response
- Evaluate electric charging requirements and support infrastructure demands through focused funding efforts

- Work with community based programs in underserved areas
- Work cooperatively with utilities, regional readiness planning coalitions, air districts, and OEMs on strategic placement of charging infrastructure, deployment of adequate service to support chargers, and support zero-emission vehicle deployment.

Electric Charging Infrastructure

Proposed

$17 million allocation

FY 2017-2018

Hydrogen Refueling Infrastructure

Jean Baronas
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California Energy Commission

October 27, 2016

Hydrogen Stations

Truckee-First Element Fuel

- 22 open retail stations
- 4 stations are operational and working on becoming open retail
- 23 stations in planning or under construction
- 48 total *plus* a temporary refueler
- Network capacity: 9,300 kg/day

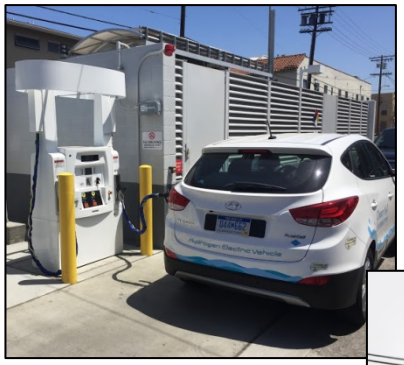
Diamond Bar- APCI

Truckee-First Element Fuel

2015 October:
2 open retail stations

2016 October:
22 open retail stations

Costa Mesa Station-First Element Fuel



Fairfax Station-APCI

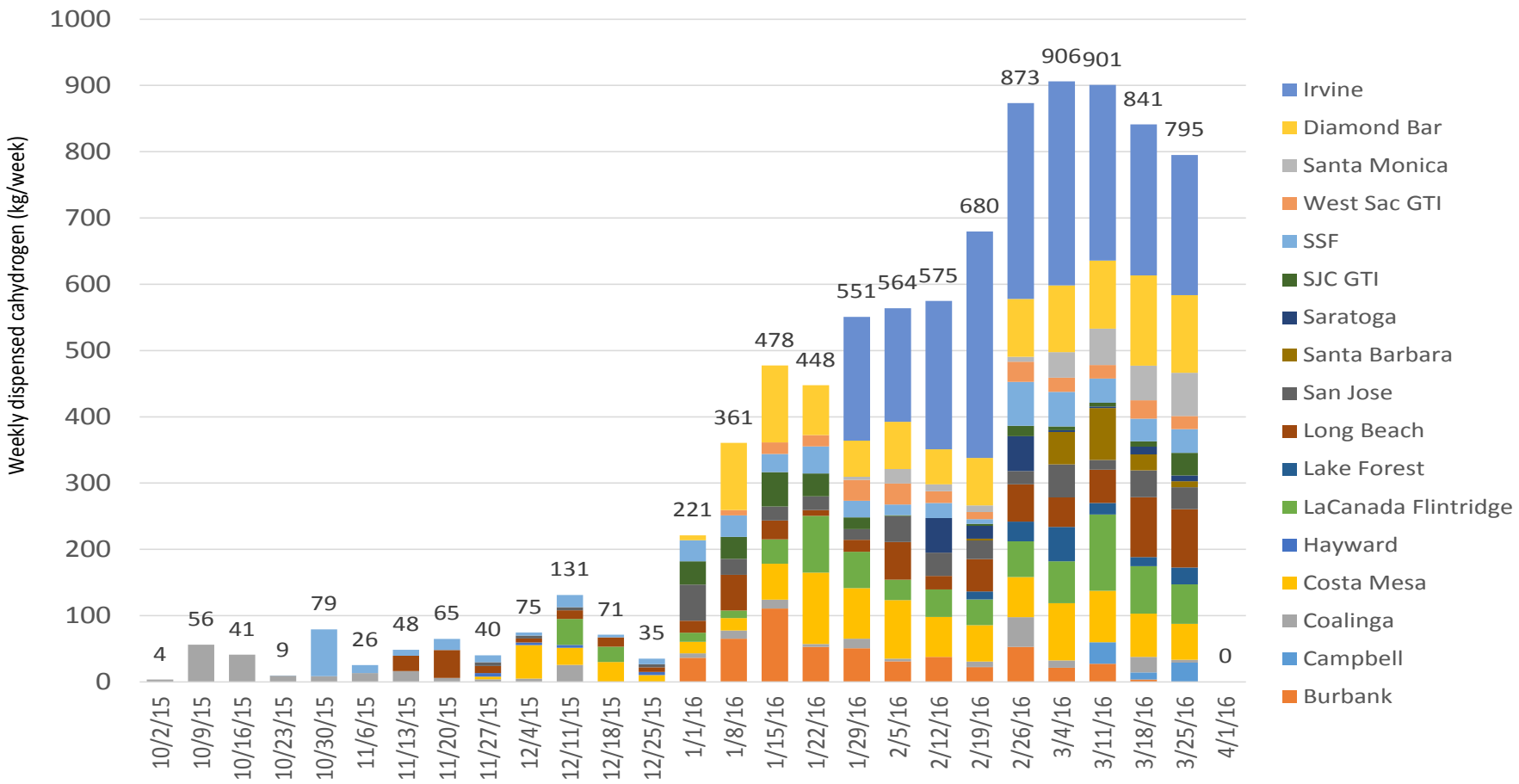
West Sacramento Station-Linde

Reports to the National Renewable Energy Laboratory Technology Validation Program

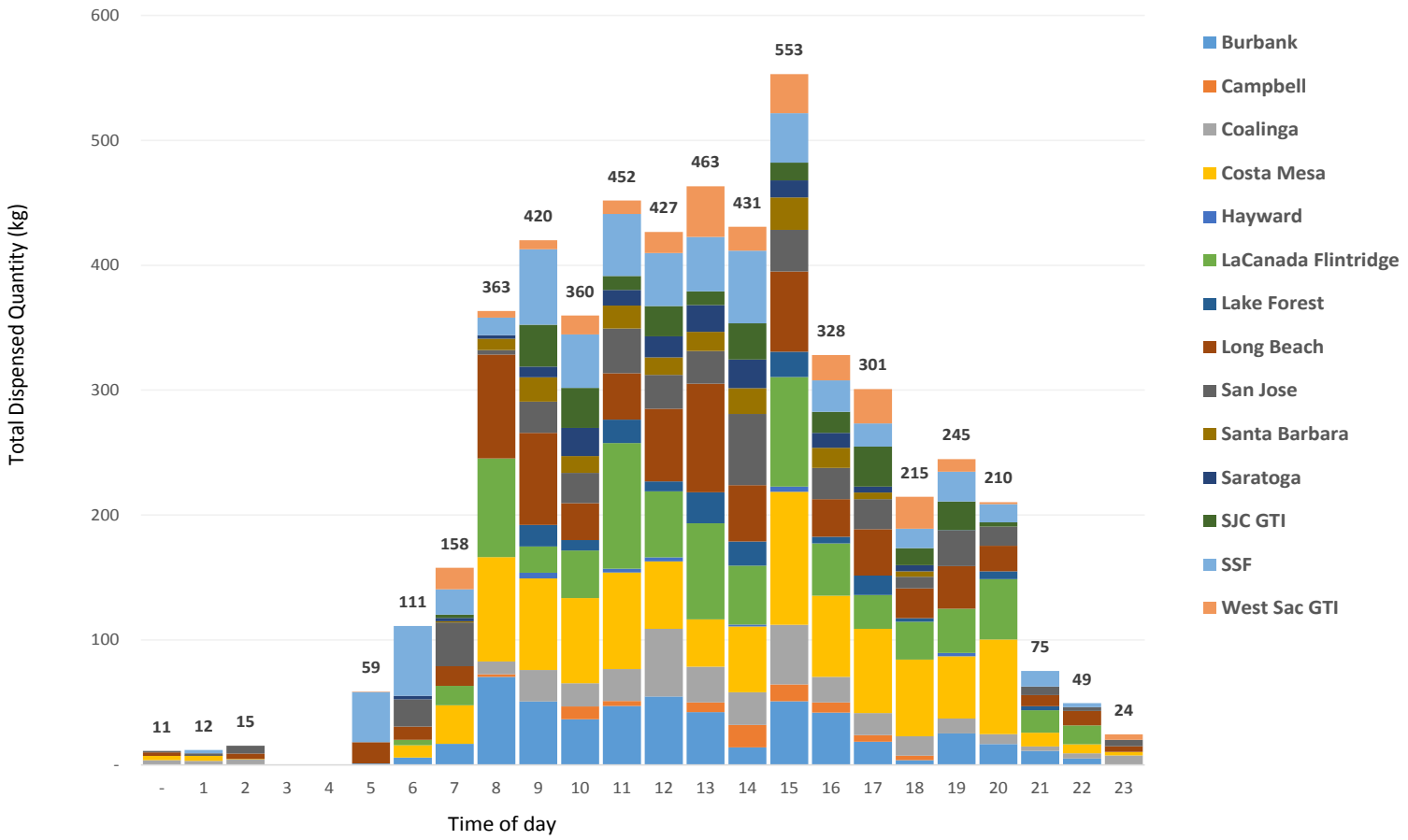
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

NREL Data Collection Template
Energy consumed during compression, pre-cooling, dispensing
Quantity and day and time of fills
Fueling pressures
Retail price of dispensed hydrogen ($/kg)

2016 Assessment: Weekly Dispensed Hydrogen



2016 Assessment: Time of Day Dispensed



2016 *Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California*

- Progress toward establishing the network.
  - Capital expense
  - Station throughput
  - Operation and maintenance
- California Energy Commission and California Air Resources Board Joint Report

http://www.energy.ca.gov/publications/displayOneReport.php?pubNum=CEC-600-2015-016

2016 Assessment: Self-sufficiency Study

Entity	Value Proposition	Value Proposition Threshold	Affected by Fuel Cost Difference?

Entities:

- Gas Station Owner
- Industrial Gas Company
- Independent Operator
- FCEV Driver (early and mass market)
- Fleet Operator
- Station Equipment Provider
- Energy/Fuel Company
- Public Agency

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Grant Funding Opportunity (GFO) 15-605

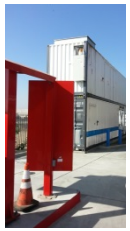
- Standards compliance for fuel quality, fueling protocols, and hoses,
- Minimum daily fueling and peak fueling
- Dispenser conformance,
- Safety plans,
- Renewable hydrogen,
- Point of sale (POS) terminal,
- Connection to the Station Operational Status System (SOSS).

Sept 2016

Southern CA Hydrogen Stations

Retail: Open

Anaheim
Costa Mesa
Diamond Bar
Fairfax-LA
*Harris Ranch
La Cañada Flintridge
Lake Forest
Long Beach
San Juan Capistrano
*Santa Barbara
Santa Monica
UC Irvine
West LA



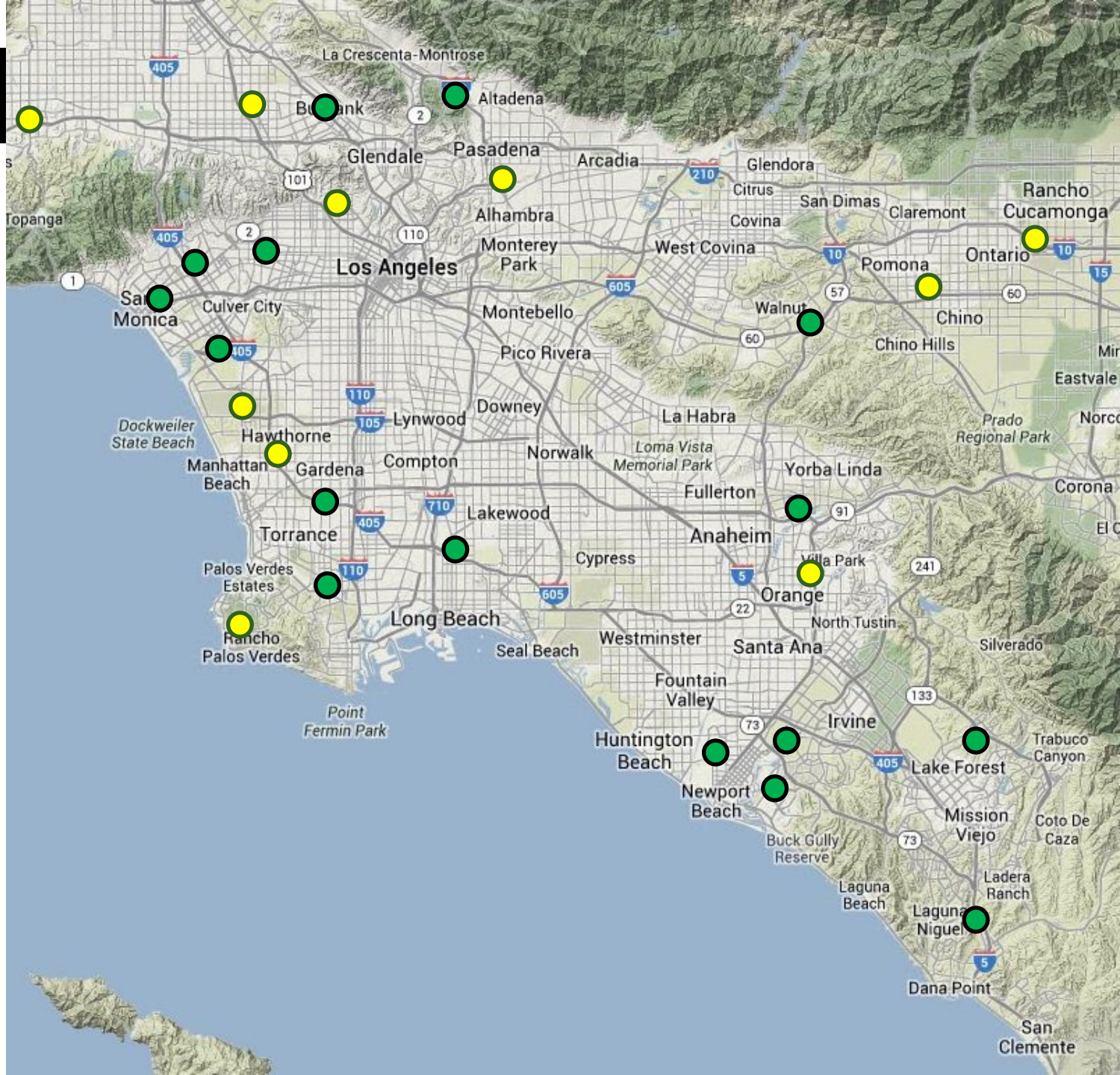
Other: Open

Burbank
Newport Beach
Torrance

Planned

Chino (upgrade)
*Del Mar
Lawndale
Hollywood
LAX (upgrade)
North Hollywood
Ontario
Orange
Playa Del Rey
*Riverside
Rancho Palos Verdes
South Pasadena
*Thousand Oaks
Woodland Hills

**Not shown on map*



Sept 2016

Northern CA Hydrogen Stations

Retail: Open

Campbell
Hayward
Mill Valley
San Jose
Saratoga
South San Francisco
*Truckee
West Sacramento

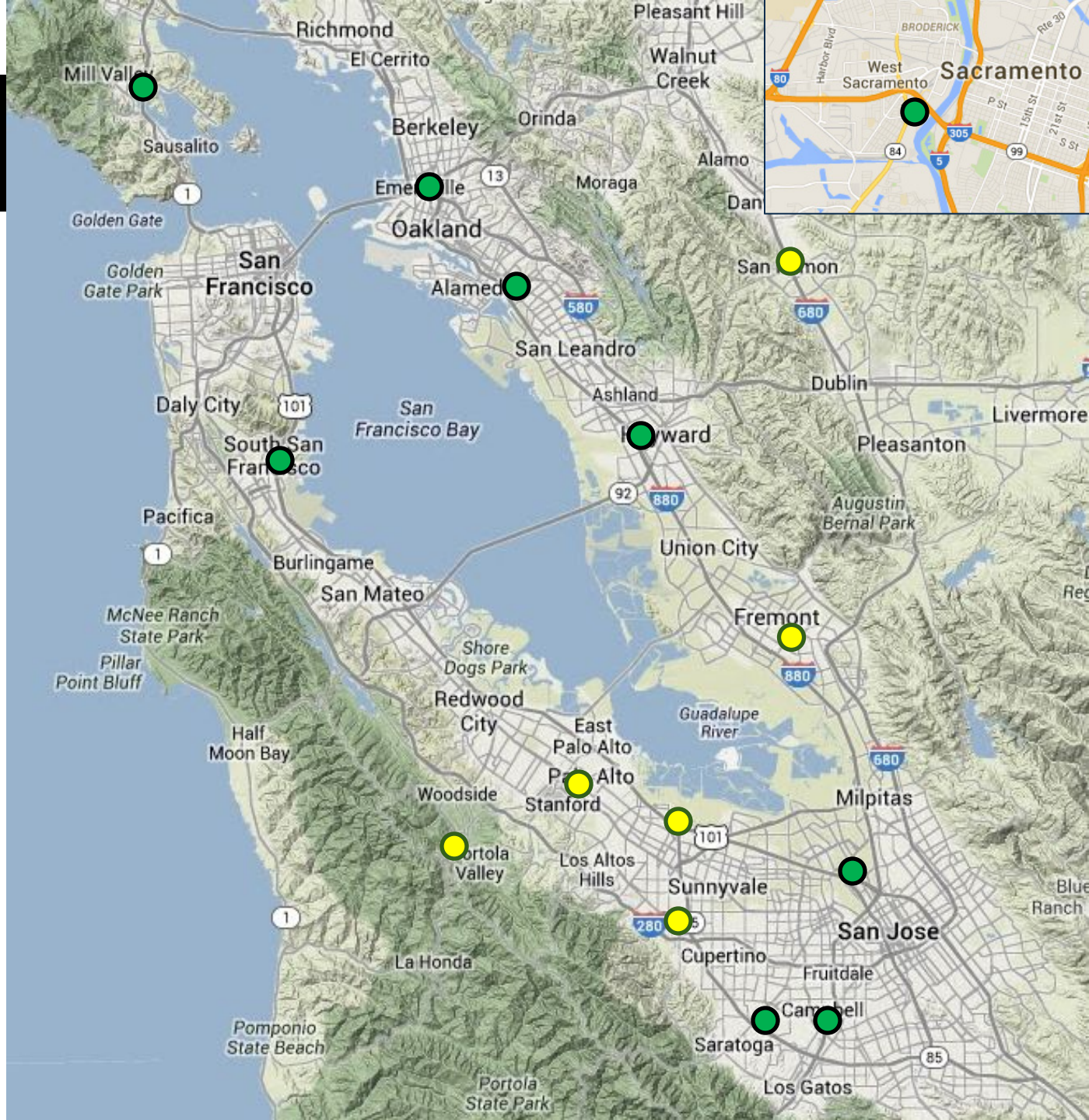
Other: Open

Emeryville – AC Transit
Oakland – AC Transit

Planned

Fremont
Los Altos
Mountain View
Palo Alto
*Rohnert Park
San Ramon
Woodside

**Not shown on map*



Hydrogen Refueling Infrastructure

Proposed

$20 million allocation

FY 2017-2018

Natural Gas Vehicles and Infrastructure

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California Energy Commission

October 27, 2016

MD-HD and Manufacturing Investments to Date

Natural Gas Fueling Infrastructure	$20.4 M	65 Stations
Natural Gas Vehicle Incentives	$54.1 M	~2,568
Advanced MD-HD Vehicle Demonstration	$103.5 M	297 Vehicles
Intelligent Transportation Systems	$2.0 M	2 Projects
Manufacturing	$46.5 M	22 Projects

Natural Gas Fueling Infrastructure 2015-2016

- PON-14-608 released March 2015
- Awarded $5.5 million for 13 projects
- Awardees included Public K-12 school districts and local government fleets
- Mix of private and public access stations
- Provides fueling for over 275 vehicles operating currently
- Allows for the expansion of additional CNG vehicles for fleets
- GFO-16-602 released September 2016
- Limited to school districts only
- $3.5 million total available

PON-14-608 Natural Gas Infrastructure Projects

Recipient	Funding
Sanger Unified School District	$500,000
Beaumont Unified School District	$500,000
Rialto Unified School District	$500,000
Fresno Unified School District	$500,000
Fontana Unified School District	$500,000
Kern County Superintendent of Schools	$500,000
Kings Canyon Unified School District	$500,000
Huntington Beach Union High School District	$500,000
Fullerton Joint Union High School District	$500,000
Lindsay Unified School District	$245,418
City of Sacramento	$250,000
City of San Diego	$250,000
Las Gallinas Valley Sanitary District	$250,000

Natural Gas Fueling Infrastructure

Natural Gas Vehicle Incentive Program 2015-2016

- Administered by the University of California, Irvine
- $10.2 million, 100% funded/reserved
- Additional $11.0 million on waitlist
- 453 vehicles confirmed across 44 applicants
- Light, medium, and heavy duty vehicles
- Majority of Reservations for Class 8

Natural Gas Vehicle Deployment Portfolio

Funding Agreement / Solicitation	Vehicle Type	# Vehicles	Amount $ (M)
San Bernardino Association of Governments (ARV-09-001)	Heavy Duty Trucks	202	$9.30
South Coast Air Quality Management District (ARV-09-002)	Heavy Duty Drayage Trucks	132	$5.10
Buy Down Incentives Approved (PON-10-604 and PON-11-603)	Up to 8,500 GVW	245	$0.70
	8,501-14,000 GVW	137	$1.10
	14,001-26,000 GVW	211	$4.20
	26,001 GVW and up	446	$12.90
Buy down Incentives (PON-13-610; approved reservations)	Up to 8,500 GVW	117	$0.1
	8,501-16,000 GVW	154	$0.9
	16,001-26,000 GVW	71	$0.8
	26,001-33,000 GVW	0	$0.00
	33,001 GVW and up	353	$8.8
UC Irvine Natural Gas Vehicle Incentive Project (approved reservations to date)		500 estimated	$10.20 total ($9.1 confirmed)
TOTAL		**2,568**	**$54.1**

Natural Gas Vehicle Incentives

Natural Gas Fueling Infrastructure

Proposed

$2.5 million allocation

FY 2017-2018

Natural Gas Vehicle Incentives

Proposed

$10 million allocation

FY 2017-2018

MD-HD Vehicle Demonstrations

Sam Lerman

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California Energy Commission

October 27, 2016

Advanced MD-HD Vehicle Demonstrations 2015-2016

- GFO-15-604 released January 2016
- Awarded $11.7 million for 2 projects
- Focused on demonstrating technologies at California Seaports
- 20 Low Nox Yard Trucks, 8 BEV Yard Trucks, 4 BEV Drayage Trucks, 3 BEV forklifts
- Includes ITS (FRATIS, ECO Drive, GEOSTAMP, and Platooning)
- Direct reduction of 2,000 MT CO2e, 17 tons NOx, 0.7 tons PM10 over term of projects.
- Next GFO expected to be released later this year
- $27 million with continued focus on California Seaports

GFO-15-604 Advanced MD-HD Projects

Recipient	Advanced Vehicles	ITS Vehicles	Technology Vendors	Fleet Demonstrators
San Diego Port Tenants Association	10 BEV (4 Drayage, 3 Forklift, 3 Yard Truck	10 (Platooning)	• BYD • Efficient Drivetrains • Transpower • Peleton (ITS)	• CEMEX • Continental Marine • Dole Foods • Harborside • Marine Group • Pasha • Terminalift
Port of Los Angeles	• 20 Low Nox CNG Yard Trucks • 5 BEV Yard Trucks	100 (Fratis, ECODrive, GEOSTAMP)	• BYD	• Harbor Trucking Association • LACMTA

Advanced MD-HD Vehicle Demonstrations

Looking Ahead

- Continued focus on freight/seaport applications?
- Technology/application neutral?
- Infrastructure deployment support vs. vehicle demonstration?
- Early demonstration vs. large deployment?
- Continued support for ITS technologies?

Advanced Freight and Fleet Technologies

Proposed

$18 million allocation

FY 2017-2018

Advanced Vehicle Manufacturing

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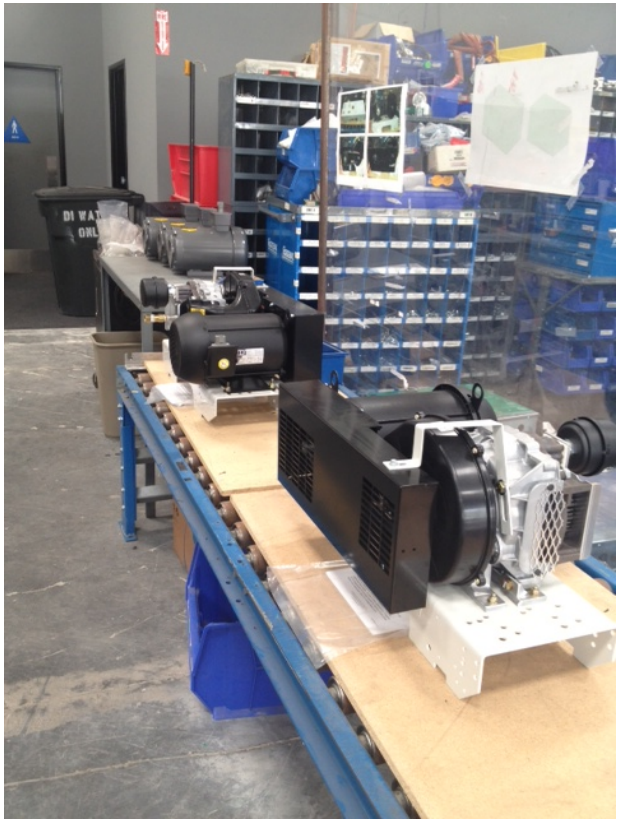
California Energy Commission

October 27, 2016

Advanced Vehicle Manufacturing

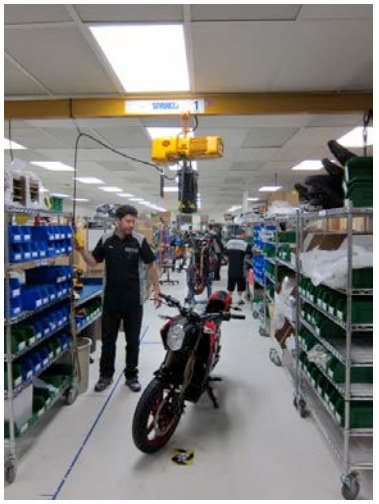
- PON-14-604 released September 2014
- Awarded 4 projects for $10 million
- Expanding existing facilities and establishing new manufacturing plants
- Power-train component manufacturing for light and MHD vehicles
- Complete builds for EV bus, truck, and motorcycle



PON-14-604 Manufacturing Projects

Recipient	Project Title	Amount
Proterra	California Zero Emission Transit Bus Manufacturing Project	$3,000,000
Transportation Power, Inc.	Heavy-Duty Electric Vehicle Manufacturing Initiative	$2,999,880
Efficient Drivetrains, Inc	EDI Advanced Vehicle Manufacturing Facility	$2,990,900
Zero Motorcycles, Inc.	California Manufacturing Acceleration for Electric Motorcycles	$1,009,220
	Total	**$10,000,000**

Advanced Vehicle Manufacturing



Manufacturing

Proposed

$5 million allocation

FY 2017-2018

Emerging Opportunities

Proposed $4 million allocation

Workforce Training and Development

Proposed $3.5 million allocation

Regional Readiness Planning

No Allocation Proposed

Public Comment

Docket No. 16-ALT-02

https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=16-ALT-02