

## DOCKETED

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# Technology Merit Review: Medium- and Heavy-Duty Vehicles

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Alternative and Renewable Fuel and Vehicle Technology Program  
December 2, 2015



# Assembly Bill 8

*(Perea, Chapter 401, Statutes of 2013)*

Extended ARFVTP funding through January 1, 2024 at \$100 million/year

Transform California's transportation market into a diverse collection of alternative fuels and technologies that reduce California's dependence on petroleum.

“...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))



# Policy Drivers

Area	Directive	Goal
Greenhouse Gas (GHG) Reduction	EO S-3-05	Reduce greenhouse gas emissions to 1990 levels by 2020 and 80% below 1990 levels by 2050
Zero Emission Vehicle Mandate	EO B-16-2012	1.5 million ZEVs by 2025
Air Quality Standards	Federal Clean Air Act	80% reduction in NOx from current levels by 2023
California Sustainable Freight Strategy	EO B-32-15	Improve freight efficiency, transition to ZE technologies, and increase competitiveness through integrated action plan.
GHG Reduction Targets	EO B-30-15	Reduce GHG to 40 percent below 1990 levels by 2030
Low Carbon Fuel Standard	AB 32, California Global Warming Solutions Act	10% reduction in carbon intensity of transportation fuels by 2020



# MHD Vehicles and Vocations



## Class 3 through 8 Vehicles

- GVW of 10,001 lbs and above
- 3 percent of California vehicles
- 23 percent of on-road GHG emissions
- Significant opportunity to reduce GHG emissions
- Unique solutions required for each vehicle type and weight

Source: Oak Ridge National Laboratory

Technology Creation		Product Development		Early Commercial	Commercial	
STAGE 1	STAGE 2	STAGE 3		STAGE 4	STAGE 5	
Research & Development	Demonstration / Proof of Concept	Pilot/Deployment		Pre-Commercialization/Diffusion	Commercial Maturity	
Generate idea; Studies; Generate intellectual property (IP); business case; creation of standards	Design, integrate, and test prototype; Build company; Improve IP	Prove technical validity in the field; full system integration; Market technology		Prove manufacture process can be scaled economically; Prove technology is viable at scale; policy, regulatory, and financial incentives	Proven technology is sold and distributed	
TRL 1 - 2	TRL 3 - 5	TRL 6 - 9		MRL 1 - 7	MRL 8 - 10	
Series A	Series B	Series C		Series D	Series E; Debt; Carbon Markets	
EPIC, DOE	ARFVTP, EPIC, AQIP, Air Districts	ARFVTP, AQIP, Air Districts		ARFVTP, AQIP, HVIP	ARFVTP, Carl Moyer, Prop 1B, CPCFA, CAEATFA, CPCFA, DOE	
PON-13-506 NG Engine-Hybrid Electric R&D (\$2.7M)	PON-10-603 Advanced MHD Vehicle Demonstrations (\$26M)		PON-09-605: Manufacturing Plants: Electric Vehicles, Alternative Fuel Vehicles, Vehicle Components & Batteries (\$19M)			
	PON-13-602 Used MD EV Repower Demonstration (\$5M)			PON-11-604 Advanced Vehicle Technology Manufacturing (\$28M)		
			PON-14-605 Medium- and Heavy-Duty Advanced Vehicle Technology Demo (\$31M)		PON-14-604 Advanced Vehicle Technology Manufacturing (\$12M)	
						2015 Pilot EVCS Financing Program (\$2M)
			GFO-xx-xxx MHD Demonstration (TBD)			



# MHD Vehicle Demonstration Portfolio

Vehicle/Technology Type	Project #	Units	ARFVTP \$ (M)
Medium-Duty Hybrids, PHEVs and BEVs	8	164	\$ 15.8
Heavy-Duty Hybrids, PHEVs and BEVs	10	30	\$ 23.3
Electric Buses	7	31	\$ 14.6
Natural Gas Trucks	5	11	\$ 11.3
Fuel Cell Trucks and Buses	6	12	\$ 12.2
Vehicle-to-Grid	3	6	\$ 5.3
Off-Road Hybrids	2	2	\$ 4.5
E85 Hybrids	1	1	\$ 2.7
<b>Total</b>	<b>42</b>	<b>257</b>	<b>\$ 89.7</b>



# PON-14-605 Demonstration Results

Recipient	Project Title	Partners	NOPA	Class / Fuel
Transportation Power Inc.	Heavy-Duty Electric Yard Tractors	IKEA; Harris Ranch; Grimmway Enterprises	\$3,000,000	8/BEV
Motiv Power Systems	Class C Electric-Quest School Bus Demonstration	Starcraft Bus; LAUSD; Kings Canyon USD; SCAQMD	\$2,760,391	6/BEV
Transportation Power Inc.	Advanced Battery-Electric Port Vehicles	EPC Power; Port of San Diego; Dole Fresh Fruit; BAE Systems	\$3,000,000	4-8/BEV
Transportation Power Inc.	Heavy-Duty Electric Refuse Trucks	EPC Power; Peterbilt Motors; County of Sacramento; Waste Management	\$2,884,812	8/BEV
CALSTART, Inc.	LADOT-BYD Battery Transit Bus	LADOT; BYD Motors	\$2,886,248	8/BEV





# PON-14-605 Demonstration Results (Cont.)

Recipient	Project Title	Partners	NOPA	Class / Fuel
Motiv Power Systems	Electric Refuse and Loader Truck Demonstration	Roush; Heil Co.; City of Sacramento	\$2,980,875	8/BEV
North American Repower, LLC	Sectran Security PHEV-Renewable Natural Gas Truck Demonstration Project	Sectran Security; Efficient Drivetrains Inc; McLaren Performance	\$3,000,000	5/RNG-PHEV
Hydrogenics USA Inc.	Hydrogenics Advanced Fuel Cell Demonstration for Drayage Truck	TTSI; Siemens; ACTIA; Port of LA	\$2,679,417	8/H2
Hydrogenics USA Inc.	New Flyer Advanced Fuel Cell Vehicle Technology Demonstration for Bus	New Flyer of America; Siemens; Sunline Transit	\$2,148,177	7-8/H2
CALSTART, Inc.	H2Ride Hydrogen Shuttle Bus Demonstration Project	US Hybrid; Sunline Transit; CSULA	\$2,998,948	5-6/H2
Gardena Municipal Bus	Zero Emission Re-power	Complete Coach Works	\$2,780,903	8/BEV

Total Funds = \$31,119,771  
 Total Vehicles = 42  
 Total Miles = 1,093,572  
 Total Hours = 530,000  
 Total Months = 648

GHG Reduced (MT) = 10,441  
 Petroleum Displaced (GGE & DGE) = 314,697  
 Jobs Created/Retained = 173  
 Disadvantaged communities



## PON-14-604 Manufacturing Results

Applicant	Project Title	NOPA
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
	<b>Total</b>	<b>\$10,000,000</b>



# Natural Gas Vehicles 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	120	\$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	1,616	\$1.60
	8,501-16,000 GVW	628	\$3.80
	16,001-26,000 GVW	314	\$1.90
	26,001-33,000 GVW	0	\$0.00
	33,001 GVW and up	551	\$13.80
UC Irvine Natural Gas Vehicle Incentive Project	<b>TBD</b>	<b>TBD</b>	<b>\$10.20</b>
<b>TOTAL</b>		<b>4,470 (+TBD)</b>	<b>\$64.60</b>



# Proposed 2015-16 Investment Plan

Category	Funded Activity	2014-2015	2015-2016	2016-2017 (Proposed)
<b>Alternative Fuel Production</b>	Biofuel Production and Supply	\$20	\$20	\$20
<b>Alternative Fuel Infrastructure</b>	Electric Charging Infrastructure	\$15	\$17	\$17
	Hydrogen Refueling Infrastructure	\$20	\$20	\$20
	Natural Gas Fueling Infrastructure	\$1.5	\$5	\$2.5
<b>Alternative Fuel and Advanced Technology Vehicles</b>	Natural Gas Vehicle Incentives	\$10	\$10	\$10
	Light-Duty Electric Vehicle Deployment	\$5	-	-
	Medium- and Heavy-Duty Vehicle Technology Demonstration & Scale-Up	\$15	\$13.7	\$23
Manufacturing	\$5			
<b>Related Needs and Opportunities</b>	Emerging Opportunities	\$6	\$3	\$3
	Workforce Training and Development Agreements	\$2.5	\$3	\$2.5
	Regional Alternative Fuel Readiness and Planning	-	\$2	\$2
	<b>Total</b>		<b>\$100</b>	<b>\$100</b>



## Information

### **DRIVE Website**

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

### **Driving to Cleaner Transportation**

<http://www.energy.ca.gov/transportation>

### **ARFVTP FY 2016-17 Investment Plan**

<http://www.energy.ca.gov/altfuels/2015-ALT-01/documents/>