

CALIFORNIA AIR RESOURCES BOARD
On-Road Advanced Technology Demonstration Projects
Posted September 26, 2017



Page	Project Applicant	Project Title	Location(s)	Disadvantaged Community Status	Funding Amount Request
1	CALSTART	Intelligent Approaches to Reducing Truck Congestion and Emissions in Port Communities	Port of Oakland	Provides benefits to	\$742,760
2	CALSTART	Opposed Piston Engine Class 8 Heavy Duty On-Road Demonstration	Porterville, Riverside, and Compton	Located in and provides benefits to	\$7,000,000
3	Gas Technology Institute	Isuzu-Westport Near-Zero, Optimized, Natural Gas Engine	Fontana	Located in	\$4,997,620
4	Gas Technology Institute	Fast Track Fuel Cell Truck Project "Fast Track"	Compton and Port of San Diego	Located in and provides benefits to	\$5,081,478
5	South Coast Air Quality Management District	Fuel Cell Drayage Truck and Intelligent Transportation Systems Demonstration	Compton and Port of Los Angeles	Located in and provides benefits to	\$12,000,000

Application scoring criteria are described in the On-Road Advanced Technology Demonstration Projects Grant Solicitation at https://www.arb.ca.gov/msprog/aqip/solicitations/fy1617_onrddemo_solicitation.pdf

Project Title: Intelligent Approaches to Reducing Truck Congestion and Emissions in Port Communities

Project Executive Summary & Project Summary for Public Posting

CALSTART, in partnership with two technology providers (Konnect Kloud and Jupigo), three fleet/end user partners (GSC Logistics, Forward Logistics, Mutual Express, CRC, Central Valley Ag Group) and seven other partners (Environmental Defense Fund, City of Oakland, Port of Oakland, Bay Area Air Quality Management District) proposes to validate the reduction in truck congestion and associated environmental benefits of street turn (“empty container swaps”) approaches for trucks operating at and around ports by demonstrating two different technologies at the Port of Oakland. The project will take place in West Oakland (a SB535 disadvantaged community identified by CalEnviroscreen).

The proposed project, Intelligent Approaches to Reducing Truck Congestion and Emissions in Port Communities, will meet ARB’s On-Road Advanced Technology Demonstration Project solicitation goal to “fund emerging technologies that have the potential to reduce GHG, criteria and toxic emissions from heavy-duty on-road trucks by simultaneously demonstrating advanced technologies that are not yet commercially available (i.e., not yet produced for sale) but projected to be within three years of commercialization”. Specifically, the proposal will evaluate two different technologies that will reduce miles traveled (and reduced fuel use and associated combustion emissions) by trucks at two key “nodes” in the freight system: early in the goods movement process between importers and exporters when prior arrangements can be made, and late in the goods movement process between truckers and dispatchers when opportunistic turns can take place. Both technologies are new technologies that have been released as initial trials (Konnect Kloud) or as a prototype platform (Jupigo). In the proposed project, the technology provider, Konnect Kloud, will provide a platform to enable street turns for importers and exporters. This approach can also be thought of as a “round-trip transaction” that is set-up before a container gets to port to minimize empty container miles/bobtail-only miles. In the proposed project, the technology provider, Jupigo, will provide a technology app to allow drivers and dispatchers access to real-time information for container matching opportunities with other drivers to reduce empty container miles/bobtail-only miles.

The proposed project is anticipated to result in a total of more than 22,500 fewer miles traveled and almost 4,000 fewer gallons of diesel used for the 6-month demonstration period using 20 trucks (10 using Konnect Kloud, and 10 using Jupigo), in service 5 days a week. Benefits over the entire 2-year project for the 20 trucks would include: 1) reduced vehicle miles traveled of >90,000 miles, 2) reduced fuel use of >16,000 gallons, 3) reduced greenhouse gas emissions of >1,000 tons, and 4) reduced weighted criteria pollutant emissions of >0.4 tons. In addition, the technologies are expected to reduce truck congestion and idling emissions. CALSTART and partner are requesting \$742,760 in funding for the project, to be combined with \$480,410 in cost-share (\$169,390 cash/\$311,000 in-kind) for a total project cost of \$1,223,170.

Project Summary for Public Posting

Project Name: “Opposed Piston Engine Class 8 Heavy Duty On-Road Demonstration”

Name of applicant and project partners: CALSTART, South Coast AQMD, SJVAPCD, SMAQMD, Achates Power, Aramco, Southwest Research Institute, Peterbilt, Walmart, and Tyson Foods.

Brief description of project including location: This project will build and demonstrate opposed piston engine equipped class 8 heavy-duty line haul trucks that will demonstrate the CARB ultra-low NO_x emissions target (0.02 g / bhp-hr) with at least a 15% reduction in CO₂ when compared to a 2017 commercial vehicle equipped with a current diesel engine. We call the project HP OP Engine Demo. Achates Power has developed an industry-leading opposed-piston engine architecture that demonstrates superior efficiency and emissions performance when compared to any similar four-stroke engine on the road today. Achates Power will contribute this technology to the project. Peterbilt will contribute one vehicle and integration services, Tyson Foods will supply the second vehicle. The HD OP Engine Demo project will build four 10.6L diesel engines based on Achates Power’s proven power cylinder design and technology. Engines will be tested on dynamometer to establish their capability for efficiency and emissions, and one will be installed in a new 2017 Peterbilt 579 tractor. That tractor will then be placed in revenue service with Walmart. In addition, a second engine will be installed in a similar tractor and placed in revenue service with Tyson Foods. This will demonstrate the engine’s ability to substantially impact emissions and efficiency goals in California, and globally. Walmart and Tyson Foods will run these demonstration vehicles in revenue service on regional long haul routes, based from disadvantaged community locations in Stockton, LA, and San Diego. CARB has been requested for a \$7.0 million contribution towards a project totaling \$17.7 million; with \$10.7 million in matching funds proposed by the team partners. We expect this project to significantly accelerate commercialization and mass adoption of this engine architecture, with IP commercialization (Achates Power will finalize OEM production licensing) planned in the 2020-2021 timeframe and OEM production occurring shortly thereafter, by 2022 – 2023.

Expected reductions in criteria, toxic and GHG emissions: Commercial vehicles are 5% of the global total, and yet use 25% of the fuel and emit 40% of the NO_x. This engine will improve fuel consumption and NO_x emissions in segment by 30-50% once mass adoption is achieved. The project itself will save 200 tons of CO₂. Mass adoption by the class 8 truck fleets in California has the potential to save **6,300,000** metric tons of CO₂ annually, and mass adoption by the US class 8 truck fleets will save **43,000,000** metric tons of CO₂ annually. Mass adoption will proceed quickly once commercialization is achieved; Current technology engines will not be able to compete with the new technology engines due remarkable advantages in efficiency, emissions, and cost which will be demonstrated in this project. This project is the necessary catalyst and precursor to rapid mass adoption of opposed-piston engine technology for class 8 heavy-duty trucks..

Whether the project is located within or provides benefits to a disadvantaged community:
This project is located with a disadvantaged community (DAC), and will provide benefits to DACs.

CARB Funding Request:	\$7,000,000	Total Project Cost:	\$16,700,000
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Project Summary for Public Posting

Project Name: Isuzu-Westport Near-Zero, Optimized, Natural Gas Engine

Project Applicant: Gas Technology Institute (GTI)

Project Partners: Isuzu Technical Center of America, Westport Fuel Systems Inc., Ryder Transportation, UC Riverside - Center for Environmental Research and Technology, Southern California Gas Company

Project Description: The project will provide a game-changing engine technology that will enable an alternative fueled engine to outperform diesel for the first time. The engine concept is derived from technologies that Westport has developed continuously over the past 15 years with partners in the light and medium duty spaces, including Westport's successful joint venture with Cummins. The latest breakthrough with Westport's HESI technology enables, for the first time, a spark ignited natural gas engine to achieve higher peak torque than state-of-the-art diesel engines. Current technology levels of diesel-derived natural gas engines in production consistently have a shortfall of 15 to 25% in peak torque output relative to diesel. This is due to sub-optimal Otto-cycle natural gas combustion inside an engine optimized for diesel-cycle combustion. Isuzu and Westport have been collaborating since 2015 on developing and testing this advanced engine and the knowledge gained from the initial phase will be the starting point for the work on the proposed ARB project. This project will finish the development and fully optimize the HESI technology on a 5.2L Isuzu engine. Two Isuzu F Series Class 7 demonstration trucks will be built with the optimized engines and will each spend six months in revenue service with Ryder on field trials demonstrating the fuel economy and emissions benefits.

Expected Emissions Reduction: The annual greenhouse gas emission reductions are expected to be 162 metric tons CO₂e/year for each truck deployed. The project weighted annual surplus emissions reduction (WER) is 0.083 tons/yr.

Disadvantaged Community: The proposed project will benefit disadvantaged communities in Fontana, in San Bernardino County, and other disadvantaged communities through which the trucks will operate.

Cost: Total project cost is \$8,253,620 with a requested funding amount of \$4,997,620. The Project Team is providing 40% match share with \$2,785,000 (34%) in cash and \$471,000 (6%) of in-kind .

Project Summary for Public Posting

Project Name: Fast Track Fuel Cell Truck Project "Fast Track"

Project Applicant: Gas Technology Institute (GTI)

Project Partners: Transportation Power Inc. (TransPower), Total Transportation Services Inc. (TTSI), Bill Signs Trucking, Inc. (BST), Frontier Energy, Center for Sustainable Energy, Hydrogenics Inc., Loop Energy Inc., Peterbilt Motors Inc.; and OneH2 Inc.

Project Description: GTI and its technology partner, TransPower will deploy a total of five fuel cell- electric hybrid trucks in Southern California, operated by two major truck fleet operators in a phased roll- out The three trucks deployed in the first phase will be operated for 15-18 months at the Port of Los Angeles, by Total Transportation Services Inc (TTSI). Two additional trucks, using new Peterbilt trucks and a more advanced fuel cell, will be deployed in a second phase and will be operated for 12 months throughout the San Diego and Los Angeles regions by Bill Signs Trucking Inc. (BST). The trucks will be supported by charging and mobile hydrogen fueling infrastructure located at the Ports of Los Angeles and San Diego, much of which is already planned or in place. Frontier Energy will coordinate training, data collection and reporting and Center for Sustainable Energy will coordinate local community outreach.

Expected Emissions Reduction: The annual GHG emission reductions that are associated with the proposed project are expected to be 77 metric tons CO₂e/year for each truck deployed. Since the proposed fuel cell on-road truck will not produce any criteria pollutant emissions in a tank-to-wheel scenario, the weighted surplus emissions reductions of toxic criteria pollutants is calculated to be 0.073 tons/year.

Disadvantaged Community: The proposed project will benefit disadvantaged communities near the Ports of Los Angeles and San Diego, and other disadvantaged communities through which the trucks will operate.

Funding Requested: \$5,081,478

Total Cost including Requested Funding and Match Amounts: \$6,775,693 Total Project including \$786,531 In-kind and \$907,685 Cash Match Funding.

Fuel Cell Drayage Truck and Intelligent Transportation Systems Demonstration

Project Name: Fuel Cell Drayage Truck and Intelligent Transportation Systems Demonstration

Name of applicant and project partners:

Applicant: South Coast Air Quality Management District

Industry Partners: Kenworth/General Motors, Toyota, University of California-Riverside/Volvo Group North America, US Hybrid

Fleets: TTSI, Toyota Internal/External Pilot Customers

Other Project Partners: AirProducts, NREL, South Bay COG

Amount of funding requested: \$12,000,000

Total cost of project including requested funding amount and match amounts that are proposed:
\$25,793,784 (\$13,793,785 match)

Expected emission reductions in criteria, toxic and GHG: 926.736 in MT/year of GHG reductions; .505 in ton/year of NOX reductions; .026 in ton/year of ROG reductions; .022 in ton/year of PM10 reductions; and .965 in ton/year of weighted emissions reductions.

Whether the project is to be located within or provide benefits to a disadvantaged community.

End user TTSI's fleet hubs are located in communities between the 91st and 100th percentile for pollution burden in California.

Brief description of proposed project:

South Coast Air Quality Management District (SCAQMD) is proposing a unique project to take a much-needed step toward seeing true commercialization of fuel cell electric vehicles (FCEVs) for the drayage industry, supporting hydrogen infrastructure, as well as the next iteration of geofencing technologies that will maximize emissions reductions from near-zero emission vehicle technologies in disadvantaged communities (DACs). Guided by extensive commercialization research, our team has successfully engaged three major global original equipment manufacturers (OEM), including: an international OEM leader in intelligent transportation systems (ITS) and two of the foremost FCEV manufacturers and integrators. These vehicles will support the diverse geographic and operational challenges across the state's interconnected goods movement system with a specific focus at the Ports of LA and Long Beach, and include: fuel cell electric (Kenworth-General Motors and US Hybrid-Dongfeng) trucks, state-of-the-art renewable hydrogen infrastructure (Toyota), and plug-in diesel hybrid electric with ITS (Volvo Group North America with University of California-Riverside).

Highlighting the commercial path of this portfolio, the principal contractors are major heavy-duty truck OEM's including Kenworth, Toyota, US Hybrid, and Volvo Group North America. This is significant because major OEMs can bring the necessary engineering resources, manufacturing capability, and a distribution/service network to support the future commercialization of these demonstration vehicles, further helping these advanced vehicle technologies achieve cost parity and penetrate the market. Our partnership also includes a confirmed end-user fleet who is experienced with the specific challenges and opportunities associated with early technology integration efforts and has routes in DACs within the state, as well as a partnership with the National Renewable Energy Laboratory for data collection. The goals of the fuel cell and ITS technology development are to reduce criteria and greenhouse gas emissions, protect public health, and reduce dependence on fossil fuels. SCAQMD is committing staffing, significant cost share, and fleet demonstration oversight to support this groundbreaking commercialization initiative. These pooled resources will validate and drive to market economically viable solutions to the criteria pollutant and greenhouse gas (GHG) emissions challenges associated with goods movement in the South Coast Air Basin.