

BOARD MEETING DATE: October 3, 2014

AGENDA NO. 2

PROPOSAL: Execute Contract to Develop Ultra-Low Emission Natural Gas Engine for On-Road Class 4 to 7 Vehicles

SYNOPSIS: The Gas Technology Institute (GTI), Ricardo, Power Systems International and the Southern California Gas Company have proposed to collaborate to develop an ultra-low NO_x natural gas engine suitable for Class 4 to 7 vehicles. The engine to be developed would target a source category that is amongst the top ten contributors to the NO_x emissions inventory in the South Coast Air Basin. This action is to execute a contract with GTI to develop the ultra-low natural gas engine at a cost not to exceed \$750,000 from the Clean Fuels Fund (31), with an estimated total project cost of \$1,800,000.

COMMITTEE: Technology, September 19, 2014; Recommended for Approval

RECOMMENDED ACTION:

Authorize the Executive Officer to execute a contract with GTI to develop an ultra-low NO_x natural gas engine from the Clean Fuels Fund (31) in an amount not to exceed \$750,000.

Barry R. Wallerstein, D.Env.
Executive Officer

MMM:AO:RC

Background

Medium- and heavy-duty on-road diesel vehicles are currently amongst the top ten sources of NO_x emissions in the South Coast Air Basin. These source categories are still projected to be one of the largest contributors to the NO_x emissions inventory, even as the legacy fleet of older and higher polluting vehicles are retired from operation and replaced by vehicles meeting the most stringent 2010 emission standards. The development of ultra-low emission natural gas engines would significantly reduce emissions from this on-road source category and assist the region in meeting federal

ambient air quality standards in the coming years. Additionally, the ability to develop an internal combustion engine that emits 90% lower NO_x emissions, relative to current standards for heavy-duty vehicles, would approach NO_x emissions associated with operating an equivalent all-electric heavy-duty vehicle when also factoring in emissions associated with electricity production. This order of magnitude reduction to 0.02 g/bhp-hr constitutes near-zero NO_x emissions.

Proposal

The objective of this project is to develop an ultra-low NO_x natural gas engine suitable for on-road applications in the Class 4 to Class 7 vehicle weight rating range. This vehicle segment includes delivery, emergency, transit and other small heavy-duty applications. The project team includes GTI, Ricardo, Power Systems International (PSI) and the Southern California Gas Company (SoCalGas).

GTI is a not-for-profit technology development and deployment organization that collaborates with government and industry to address energy needs. Their breadth of experience includes managing research, development and demonstration projects including those involving technologies for ultra-low NO_x emissions from reciprocating natural gas engines. Two of their more notable projects, both funded by CEC, include the recent launch of a 12-liter natural gas engine with Cummins Westport that uses compressed natural gas with spark ignition, cooled exhaust gas recirculation and a three-way catalyst as well as development of 6.7 liter engine technology.

Ricardo is a global, multi-industry consultancy for engineering, technology, project innovation and strategy with a long history of providing engineering services for vehicle and engine manufacturers. Ricardo employs over 2300 professional engineers, consultants and staff and will further augment the automotive engine development and production expertise to the project team.

PSI is a leader in the design, engineering and manufacture of emissions-certified, alternative-fuel and conventional power systems. PSI provides integrated turnkey solutions to leading global original equipment manufacturers predominantly in the industrial and off-road markets; however, they are currently expanding their horizon to include on-road applications as part of their product portfolio. PSI has been a leading engine manufacturer since 1985 and has sold over 40,000 engines in 2012 for use in power generators, forklifts, aerial lifts, industrial sweepers, aircraft ground support, and agricultural and construction equipment. Entry into the on-road vehicle market is a natural extension of their current business.

SoCalGas has been delivering natural gas to its customers for more than 140 years. It is the nation's largest natural gas distribution utility, providing safe and reliable energy to 20.9 million consumers through 5.8 million meters in more than 500 communities. The company's service territory encompasses approximately 20,000 square miles in diverse

terrain throughout Central and Southern California, from Visalia to the Mexican border. For this proposed project, SoCalGas shall serve as a funding contributor as well as providing project oversight and guidance.

This project team proposes to collaborate to develop an 8.8L natural gas engine that will target a NO_x emissions level 90% below current CARB certification standards. The 8.8L engine is close in displacement to the 8.9L ISL G engine being offered by Cummins Westport, and at first glance would seem to overlap the market segment addressed by this product offering. However, the 8.8L engine proposed as part of this project will be based on a significantly different engine architecture that would make it better suited for vehicles that have slightly lower weight rating than those served by the Cummins Westport product. The Cummins Westport product has a base engine architecture that is derived from a diesel engine, which has the characteristic of being a low-speed, high-torque engine suitable for the lower end of the Class 8 vehicle market. The 8.8L engine being proposed by GTI would be based on a gasoline engine architecture, which would provide the characteristics of being a higher-speed and lower-torque engine that could be suitable for lighter vehicles that would span the Class 4 to Class 7 weight rating. The lower torque characteristics of the proposed 8.8L engine will also allow for an engine with a smaller and lighter footprint that should reduce the cost to the end-user and provide easier packaging within the vehicle, which in turn should increase the market uptake of the product relative to a comparable engine with diesel-derived roots.

Sole Source Justification

Section VIII.B.2 of the Procurement Policy and Procedure identifies four major provisions under which a sole source award may be justified. This request for a sole source award is made under provision B.2.d.: Other circumstances exist which in the determination of the Executive Officer require such waiver in the best interest of the SCAQMD. Specifically, these circumstances are: B.2.d.(1) Project involving cost sharing by multiple sponsors. The multiple sponsors contributing financially to this project include Ricardo, PSI and SoCalGas.

Benefits to SCAQMD

The proposed project supports the implementation of advanced alternative fuel technology that could potentially be used to further reduce NO_x emissions from on-road medium- and heavy-duty vehicles. The proposed project is included in the *Technology Advancement Office 2014 Plan Update* under “Engine Systems.”

Resource Impacts

The total cost for this project, as reflected in the table below, is estimated to be \$1,800,000, of which SCAQMD’s proposed cost-share from the Clean Fuels Fund (31) would not exceed \$750,000.

Project Partners	Funding Amount	Funding %
Ricardo	\$50,000	3%
PSI	\$750,000	42%
SoCalGas	\$250,000	14%
SCAQMD (Requested)	\$750,000	41%
Total	\$1,800,000	100%

Sufficient funds for this proposed project are available from the Clean Fuels Program Fund, established as a special revenue fund resulting from the state-mandated Clean Fuels Program. The Clean Fuels Program, under Health and Safety Code Sections 40448.5 and 40512 and Vehicle Code Section 9250.11, establishes mechanisms to collect revenues from mobile sources to support projects to increase the utilization of clean fuels, including the development of the necessary advanced enabling technologies. Funds collected from motor vehicles are restricted, by statute, to be used for projects and program activities related to mobile sources that support the objectives of the Clean Fuels Program.