BOARD MEETING DATE: April 5, 2019 AGENDA NO. 3

TITLE: Execute Contracts to Conduct Natural Gas Engine and Vehicle Research Projects

SYNOPSIS: The DOE, National Renewable Energy Laboratory (NREL), CEC and SCAQMD partnered to launch a research effort to increase efficiency of natural gas engines for medium- and heavy-duty engines and vehicles. In September 2018, NREL issued an RFP to solicit proposals to conduct natural gas engine and vehicle research projects to achieve these goals. Staff identified four proposals that align well with AQMP priorities to reduce NOx and PM emissions from transportation sources. This action is to execute contracts in an amount not to exceed $1,700,000 from the Clean Fuels Program Fund (31) to cost-share these four projects.

COMMITTEE: Technology, March 15, 2019; Recommended for Approval

RECOMMENDED ACTIONS:
Authorize the Chairman to execute the following in an amount not to exceed $1,700,000 from the Clean Fuels Program Fund (31):

a. A contract with Cummins Inc. in an amount not to exceed $250,000 to develop a natural gas specific combustion design and demonstrate it on the 12 to 15-liter engine displacement range;
b. A contract with US Hybrid Corporation in an amount not to exceed $500,000 to develop and demonstrate a fully integrated and optimized natural gas, plug-in hybrid Class 8 vehicle;
c. A contract with Southwest Research Institute in an amount not to exceed $475,000 to develop and demonstrate a hybrid medium-duty truck using advanced technology natural gas spark-ignited engine; and
d. A contract with Gas Technology Institute in an amount not to exceed $475,000 to develop a production intent spark-ignited natural gas engine.

Wayne Nastri
Executive Officer

MM:NB:JI:JL

Background
According to the Department of Transportation, vehicles transport 11 billion tons of freight annually. And as the transportation sector continues to grow, diversified and cost-effective solutions are necessary to ensure resiliency and affordability, while meeting increasing energy demands. Based on DOE's projections, natural gas is poised to play a key role as a versatile, low-emission fuel and is an increasingly attractive alternative to conventional diesel fuel on a nationwide basis.

To help advance natural gas vehicle technologies, DOE, NREL, CEC and SCAQMD partnered to launch a research effort to increase efficiencies from natural gas medium- and heavy-duty engines and vehicles. These efforts will complement DOE's Vehicle Technologies Office research efforts initiated in FY 2017.

In September 2018, as part of this ongoing effort, NREL issued an RFP offering funding of approximately $37 million for projects focusing on: (1) reducing the cost of natural gas vehicles; (2) increasing vehicle efficiency; and (3) advancing new innovative medium- and heavy-duty natural gas engine designs. Nine projects were selected for funding through this solicitation. Upon review of the funded projects, staff has identified four projects that align well with AQMP priorities to reduce NOx and PM emissions from transportation sources.

Proposal
Cummins Inc.
Cummins Inc. will address natural gas engine emissions and efficiency improvements by developing a natural gas specific combustion design utilizing high tumble charge motion and cooled exhaust gas recirculation (EGR). The engine will be integrated on a global heavy-duty base engine platform in the 12 to 15-liter displacement range, enabling up to 20 percent reduction in system costs. The technical targets of the project include demonstrating a ten percent improvement in cycle average and peak brake thermal efficiency over the commercially available product and maintaining 0.02 g/bhp-hr NOx capability with reduced aftertreatment cost.

US Hybrid
US Hybrid Corporation will address total cost of ownership by developing and demonstrating a fully integrated and optimized natural gas, plug-in hybrid Class 8 vehicle that will employ the 9-liter Cummins-Westport L9N commercialized engine certified to the 0.02 g/bhp-hr optional low NOx standard, a commercialized parallel hybrid-electric powertrain, and a 40 kilowatt hour liquid-cooled high-power density lithium-ion battery pack. The project includes a 24-month demonstration in port drayage operations to quantify emissions and performance improvements and will implement a GPS-based predictive geo-fencing hybrid control architecture to ensure zero emissions operation at ports.

Southwest Research Institute

Southwest Research Institute (SwRI) along with Isuzu will address natural gas engine emissions and efficiency improvements by developing and demonstrating a hybrid medium-duty truck using advanced technology natural gas spark-ignited engine. Developing a pent-roof cylinder head for the Isuzu 4HK engine is expected to enable the use of elevated levels of exhaust gas recirculation dilution to yield a high-efficiency engine meeting future NOx regulations. Integrating a hybrid drivetrain will further the vehicle level efficiency gains.

Gas Technology Institute (GTI)

GTI along with its partners, Westport Fuel Systems, McLaren Performance Technologies, Southern California Gas Company (SoCalGas) and Utilization Technology Development, will address natural gas engine and vehicle availability by developing a production intent spark-ignited natural gas engine, optimized to achieve 0.02 g/bhp-hr optional low NOx standard and meeting U.S. EPA's 2027 MY greenhouse gas targets. Upon completion, the engine will be demonstrated in a Class 6 vocational vehicle.

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 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 proposed projects will include in-kind contributions and cost-share by DOE and CEC.

Benefits to SCAQMD

The proposed projects are relevant to the SCAQMD's priorities to reduce NO_x and PM emissions from transportation sources in order to achieve federal ambient air quality standards and protect public health. Projects to support development and demonstration of advanced technologies are included in the *Technology Advancement Office Clean Fuels Program 2019 Plan Update* under the categories of "Engine Systems". The four selected projects include technology intended to lead to a pathway of production engines as well as medium- and heavy-duty vehicles that improve efficiencies and lower criteria pollutant emissions. Increasing natural gas engine options for different applications in the marketplace will help accelerate fleet turnover.

Resource Impacts

The total estimated cost for the proposed projects is up to $26,950,784. SCAQMD's total proposed cost-share shall not exceed $1,700,000 from the Clean Fuels Program Fund (31).

Proposed Projects	SCAQMD Funding *(requested)*	DOE	CEC	SoCalGas	Proponent Cost-share	Total Project Cost
Cummins	$250,000	$3,069,349	$680,651	$0	$6,996,626	$10,996,626
US Hybrid	$500,000	$473,162	$1,020,975	$0	$858,869	$2,853,006
SwRI	$475,000	$3,525,000	$0	$0	$4,200,000	$8,200,000
GTI	$475,000	$1,975,537	$0	$750,000	$1,700,615	$4,901,152
Total	**$1,700,000**	**$9,043,048**	**$1,701,626**	**$750,000**	**$13,756,110**	**$26,950,784**

Sufficient funds are available in the Clean Fuels Program Fund (31) for this proposed project. The Clean Fuels Program Fund (31) is established as a special revenue fund resulting from the state-mandated Cleans 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.