

BOARD MEETING DATE: October 6, 2023

AGENDA NO. 7

PROPOSAL: Execute Contract to Develop and Demonstrate a Portable Liquid Hydrogen Fueling System for Medium- and Heavy-Duty Equipment Applications

SYNOPSIS Large equipment with high power demands used in long range applications requires high-capacity hydrogen power systems when converted to zero-emission. Gaseous hydrogen fuel storage is not technically viable to meet power demands. Liquid hydrogen storage has a higher energy density and is needed to meet higher power demands. Zero Emission Industries, Inc. (ZEI) will design, build, and demonstrate a portable and rapidly deployable liquid hydrogen fueling system for marine or locomotive applications. This action is to execute a contract with ZEI to develop a portable liquid hydrogen fueling system in an amount not to exceed \$1,175,000 from the Clean Fuels Program Fund (31).

COMMITTEE: Technology, September 15, 2023; Recommended for Approval

RECOMMENDED ACTION:

Authorize the Chair, or on the Chair's behalf, the Executive Officer, to execute a contract with Zero Emission Industries Inc. (ZEI) to develop and demonstrate a portable and rapidly deployable liquid hydrogen fueling system in an amount not to exceed \$1,175,000 from the Clean Fuels Program Fund (31).

Wayne Natri
Executive Officer

AK:MW:VP:MH

Background

Large off-road equipment such as marine vessels and locomotives with high power demands, high utilization, and longer routes require the use of onboard liquid hydrogen (LH2) storage instead of gaseous hydrogen fuel storage. Thus, there is a need to develop

technology for rapid LH2 fuel dispensing for marine and locomotive applications. This project will develop, build, and demonstrate a first-of-its-kind LH2 bunkering and dispensing system.

This novel system will capture and re-use hydrogen boil-off gas, increasing system efficiency and financial viability while allowing for flexible deployment that follows relevant land-based and marine codes and standards. The system will help with the deployment of zero-emission marine vessels and locomotives and will be portable to avoid monopolizing valuable space while simultaneously enabling the bunkering and dispensing of liquid hydrogen. In addition, the system can be stored remotely and only moved when needed. Compared to a permanently installed hydrogen fueling station, this LH2 bunkering system is estimated to cost ten times less, can be used at multiple port terminal berths, and enables immediate deployment of LH2-powered vessels and locomotives by eliminating on-site construction timelines.

Proposal

ZEI proposes to design, build, and demonstrate a portable zero boil-off liquid hydrogen bunkering system capable of supplying a week's worth of fuel to a vessel, locomotive, or equivalent equipment (~ 3500 kg) in under two hours. The system will be self-contained, capturing boil-off hydrogen gas then compressing and storing the hydrogen to provide power to an onboard PEM fuel cell to run the system. ZEI will also demonstrate the technology with the project partners at one or more California Ports to fuel locomotives, fuel cell shore power, or cold ironing systems.

South Coast AQMD funding will be used towards developing, building, testing, validating, and demonstrating the portable liquid hydrogen refueling system. This action is to execute a contract with ZEI that does not exceed \$1,175,000 from the Clean Fuels Program Fund (31).

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 South Coast AQMD. 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 CEC, Southern California Gas Company (SoCalGas), ZEI, and Crowley Maritime.

Benefits to South Coast AQMD

Projects to support development and demonstration of zero-emission vehicle technologies and supporting infrastructure are included in the Technology Advancement Office Clean Fuels Program 2022 Plan Update under the category “Hydrogen and Fuel Cell Technologies and Infrastructure.” This project is to develop and demonstrate portable liquid hydrogen fueling system technology for goods movement and off-road operations. Implementation of this project is consistent with the 2022 AQMP which relies on zero-emission technologies to achieve National Ambient Air Quality Standards for ozone and PM2.5. Additionally, this project assists in reducing diesel PM, which is a carcinogen, by advancing hydrogen fuel cell technologies and infrastructure. The successful demonstration of the portable liquid hydrogen fueling system will serve as a model to build confidence among end-users, increase demand for fuel cell technologies in marine and locomotive operations, and reduce costs to enable the feasible transition of vessels and locomotives to zero-emission technologies.

Resource Impacts

The total cost for the proposed project is \$7,468,750, of which South Coast AQMD’s proposed contribution will not exceed \$1,175,000 from the Clean Fuels Program Fund (31), as summarized below.

Proposed Zero Emission Port Demonstration Project Costs

Source	Funding Amount	% of Total Cost
CEC	\$5,250,000	70
SoCal Gas	\$500,000	7
ZEI	\$300,000	4
Crowley Maritime	\$243,750	3
South Coast AQMD (proposed)	\$1,175,000	16
Total	\$7,468,750	100

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 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.