BOARD MEETING DATE: February 1, 2019 AGENDA NO. 3

PROPOSAL: Execute Contract to Develop Optimal Operation Model for Renewable Electrolytic Fuel Production

SYNOPSIS: The University of California Irvine (UCI) through its Advanced Power and Energy Program is developing a roadmap for deployment of renewable electrolytic hydrogen production facilities in California. This project leverages resources to develop a hydrogen generation model to optimize dispatch and operation of facilities, including impacts on air quality. This action is to execute a contract with UCI in an amount not to exceed $100,000 from the Clean Fuels Program Fund (31).

COMMITTEE: Technology, January 18, 2019; Recommended for Approval

RECOMMENDED ACTION:
Authorize the Chairman to execute a contract with the University of California Irvine in an amount not to exceed $100,000 from the Clean Fuels Program Fund (31) for development of an optimal operation model for renewable electrolytic fuel production.

Wayne Nastri
Executive Officer

MMM: NB:SH

**Background**
The University of California Irvine (UCI) through its Advanced Power and Energy Program (APEP) is conducting a CEC-funded study to develop a roadmap for deployment of renewable hydrogen production facilities in California, with the goal to assess cost-effective electrolysis pathways for the production of renewable hydrogen. The National Renewable Energy Laboratory (NREL) initiated a DOE-funded project for optimizing an integrated renewable electrolysis system. While this ongoing effort will provide perspective on the current and future cost as well as performance of renewable electrolytic hydrogen production, it does not address optimal dispatch and operation of the facilities in detail. The proposed project leverages expertise and resources through NREL and adds a comprehensive analysis of a rapidly developing electrolysis

technology, which portends to serve as one of the most promising pathways for the production of renewable hydrogen. The developed model will provide air quality impacts by optimized electrolysis facilities.

**Proposal**

The proposed project will analyze three hypothetical scenarios of model electrolysis projects, including project location, production capacity, efficiency, source of electricity, footprint, dynamic operation characteristics, capital cost, operating cost and other parameters.

- A project, located in the Moreno Valley, receiving power from local solar and wind resources and producing renewable hydrogen will be assessed. Economic, air emissions and air quality impacts will be compared between a case in which hydrogen from the electrolysis system is injected into the natural gas grid and an alternative case in which hydrogen is liquefied and delivered by truck for use as a vehicle fuel.
- A project, located near downtown Los Angeles, will be assessed in which carbon dioxide (CO2) from a food waste anaerobic digester is combined with electrolytic hydrogen to create renewable methane using grid electricity.
- The 50 MW Five Points solar project near Bakersfield, owned by UCI, will be assessed for dispatching some or all of the solar electricity production to produce renewable hydrogen or methane (using CO2 from dairy biogas) via electrolysis for pipeline injection with product gas piped to Southern California.

Based on the modeling and analyses defined above, the project will extract findings on optimal economic dispatch of the model projects and air quality impact based on the quantities of renewable hydrogen injected onto the gas system, as well as directed to fuel cell electric vehicle (FCEV) fueling.

**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.(8): Research and development efforts with educational institutions or nonprofit organizations. UCI is an educational institution and APEP is an umbrella organization that addresses the broad utilization of energy resources and the emerging nexus of electric power generation, infrastructure, transportation, water resources and the environment. Built on a foundation established in 1970 with the creation of the UCI Combustion Laboratory and the 1998 dedication of the National Fuel Cell Research Center, APEP focuses on education and research on clean and efficient distributed power generation and integration.

**Benefits to SCAQMD**
The proposed project provides the implementation roadmap of renewable electrolytic hydrogen production facilities that could be used to further reduce NOx and other criteria pollutant emissions from existing sources within the South Coast Air Basin. Specifically, the injection of renewable hydrogen into the existing natural gas system represents a key pathway towards reducing GHG emissions by displacing the corresponding volume of fossil-derived natural gas. For mobile sources, electrolysis facilities could allow a more economic hydrogen supply for FCEVs.

**Resource Impacts**
The total cost for the proposed project is $500,000, of which SCAQMD's proposed contribution will not exceed $100,000 from the Clean Fuels Program Fund (31), as summarized below.

| Proposed Partners | Funding Amount | % of Project |
|---|---|---|
| UCI/CEC (match funding) | $350,000 | 70 |
| NREL/DOE | $50,000 | 10 |
| SCAQMD (*requested*) | $100,000 | 20 |
| **Total** | **$500,000** | **100** |

Sufficient funds 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.