

BOARD MEETING DATE: November 1, 2024

AGENDA NO. 4

**PROPOSAL:** Execute Contracts to Develop Data-Based Planning Tool for Medium- and Heavy-Duty Truck Charging Networks, Fleets, and Power Grid Systems and to Investigate Benefits of Electric Vehicle-to-Home Technology on Air Quality

**SYNOPSIS:** In April 2024, the University of California, Riverside's Energy, Economics and Environment Research Center (UCR/E3) proposed to develop a planning tool to assist fleet owners, charging infrastructure developers, and other stakeholders to deploy medium- and heavy-duty (MD/HD) battery electric trucks and charging infrastructure. Also, in August 2024, the University of California, Irvine Advanced Power and Energy Program (UCI APEP) proposed to investigate electric vehicle-to-home (V2H) technology that enables electric vehicles to transfer energy to homes and estimated emission reductions. These actions are to: 1) execute a contract with UCR/E3 to develop a data-based planning tool for the deployment of MD/HD trucks and charging infrastructure in Southern California in an amount not to exceed \$300,000 from the Clean Fuels Program Fund (31); and 2) execute a contract with UCI APEP to investigate the emission reduction benefits of V2H technology in an amount not to exceed \$220,548 from the Clean Fuels Program Fund (31).

**COMMITTEE:** Technology, October 18, 2024; Recommended for Approval

**RECOMMENDED ACTIONS:**

1. Authorize the Executive Officer to execute a contract with University of California, Riverside's Energy, Economics and Research Center (UCR/E3) to develop a data-based tool for the deployment of medium- and heavy-duty (MD/HD) trucks and charging infrastructure in Southern California in an amount not to exceed \$300,000 from the Clean Fuels Program Fund (31); and

2. Authorize the Executive Officer to execute a contract with University of California, Irvine Advanced Power and Energy Program (UCI APEP) to investigate the emission reduction benefits of electric vehicle-to-home (V2H) technology in an amount not to exceed \$220,548 from the Clean Fuels Program Fund (31).

Wayne Natri  
Executive Officer

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### **Background**

In April 2024, the UCR/E3 proposed the development of a planning tool designed to assist fleet owners, charging infrastructure developers, utility companies, regulators, and other key stakeholders in deploying MD/HD battery electric trucks and charging infrastructure. UCR/E3 is a multidisciplinary research collaboration focused on addressing the challenges of growing energy demand in an economical and sustainable manner. This study will complement other related research projects funded by South Coast AQMD by providing specific planning guidance to charging infrastructure developers and fleet owners. It is anticipated this tool will help support the implementation of South Coast AQMD charging infrastructure incentive programs.

In addition, in August 2024, UCI APEP proposed to investigate the emission reduction benefits of the V2H technology that enables electric vehicles to transfer energy to homes. UCI APEP is a program that addresses the development and deployment of efficient, environmentally sensitive, sustainable power generation and energy conversion worldwide. The deployment of electric V2H technology has the potential to reduce NOx and PM2.5 emissions by shaving peak usage period generation loads that occur during high electricity usage time periods when renewable power is supplemented by fossil based generating resources. In addition, the V2H capability will demonstrate a clean alternative to supportive residential power during outages instead of using diesel combustion backup generators. This study will investigate and quantify the impact of electric V2H in reducing NOx and PM2.5 emissions in the South Coast Air Basin (Basin) and advancing regional air quality in 2030, 2035, and 2045.

### **Proposal**

The proposed UCR project will utilize electricity grid data and truck operation metrics to create a spatio-temporal optimization model. This model will identify optimal locations for charging stations in Southern California and desert areas, assess the capacity of nearby electrical substations to support infrastructure development, and determine whether grid upgrades are needed. Furthermore, the model will calculate the ideal battery size for trucks and optimize charging schedules to align with time-of-use

electricity pricing, enhancing both cost-effectiveness and operational efficiency for truck fleets. The model is built on large-scale, real-world data, including Global Positioning System trajectories of trucks and the hosting capacity of electrical substations. The project team will first complete the development for the module on charging infrastructure in Spring of 2025. The module will allow the potential infrastructure incentive funding participants to evaluate the grid capacity when proposing or selecting the charging sites to minimize the needs for grid upgrade. The project team will complete the development for the other modules, including truck charging schedule, grid upgrade planning, and others as stated above within two years. The tool will bridge the gap between the different entities involved in electrifying MD/HD trucks, providing comprehensive data to support decision making, promoting coordinated development, and reducing misalignment.

The proposed UCI project will leverage a current United States DOE (U.S. DOE) project that is demonstrating the first United States mass market V2H deployment with the Kia EV9 at a new connected microgrid communities' development in the Basin and also quantify the benefits of electric V2H in reducing the emissions of NOx and PM2.5 from the project. The project will: a) analyze energy use reduction for different use cases of V2H and its ability to shave peak energy in 2030, 2035 and 2045; b) identify and assess the associated reductions in NOx and PM2.5 emissions; c) establish the associated air quality and health benefits; d) address V2H as a backup power resource during grid outages as an alternative to combustion backup generators, leveraging a recently completed South Coast AQMD project that evaluated the air quality impact of backup generators in the Basin; and e) address guidelines and recommendations for policy making.

### **Sole Source Justification**

Section VIII.B.2. of the Procurement Policy and Procedure identifies provisions under which a sole source award may be justified. The request for sole source award is made under provision B.2.d.(8): Research and development efforts with educational institutions or nonprofit organizations. The University of California, Riverside (UCR) is an educational institution, and the E3 Research Center currently has 37 affiliated UCR faculty from departments or schools of Electrical and Computer Engineering, Computer Science and Engineering, Statistics, and Public Policy. Its research areas include critical infrastructure systems and smart cities, machine learning and optimization, water, energy, climate and food, with some of the research projects on grid analyses funded by U.S. DOE, National Science Foundation, CEC and others. The University of California, Irvine (UCI) is also an educational institution and the APEP currently has 22 affiliated UCI faculty and staff. APEP conducts research in the areas of Energy Systems Integration and Impacts, Renewable Fuels, Energy Storage, Fuel Cell Science and Technology, and Combustion Science and Technology with some of the research projects on the first United States mass market V2H deployment funded by the DOE.

### **Benefits to South Coast AQMD**

Projects to support the development and demonstration of MD/HD ZEV technologies and supporting infrastructure are included in the Technology Advancement Office Clean Fuels Program 2024 Plan Update under the categories “Zero Emission Infrastructure” and “Electric / Hybrid Technologies.” The proposed tool will help improve the deployment process for the charging infrastructure by providing grid data-insight and also assist the fleet owners in more strategic infrastructure planning when electrifying the fleets and operating the battery electric trucks. The tool will address the common obstacles and challenges faced by infrastructure developers and fleet owners, helping accelerate the transition to battery electric technology in the MD/HD trucking sector. The implementation of this project is consistent with the 2022 AQMP, which relies on MD/HD ZEV technologies to achieve NAAQS for ozone and PM2.5 in the Basin.

Projects that support the development and demonstration of electric vehicle technologies like electric V2H are included in the Technology Advancement Office Clean Fuels 2024 Plan Update under the categories “Stationary Clean Fuel Technologies” and “Fuel and Emission Studies” and “Electric / Hybrid Technologies.” The proposed investigation will provide a better understanding of the emission benefits that electric V2H technology can have on regional air quality, how much of an impact it can have on peak power shaving at power plants, and how effective it will be in advancing regional air quality in 2030, 2035 and 2045.

### **Resource Impacts**

South Coast AQMD’s support of the development of the data-based planning tool for MD/HD Charging Networks, Fleets, and Power Grid Systems shall not exceed \$300,000 from the Clean Fuels Program Fund (31). UCR and AmpTrans, Inc. will each contribute \$150,000 of in-kind support to this project.

South Coast AQMD’s support to investigate the impact of V2H technology on the regional air quality of the Basin shall not exceed \$220,548 from the Clean Fuels Program Fund (31). The DOE will contribute \$120,000 and the UCI APEP will contribute \$30,000 as in-kind support to this project.

Sufficient funds are available from the Clean Fuels Program Fund (31). 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.