

BOARD MEETING DATE: May 2, 2025

AGENDA NO. 3

**PROPOSAL:** Execute Contract to Evaluate Performance and Emissions of a Linear Generator

**SYNOPSIS:** Linear generators have emerged as an alternative power generation technology that can support and accelerate charging infrastructure deployments. Due to their unique operating characteristics and fuel agnostic capabilities, additional studies are needed to assess the long-term performance, applications, efficiencies, and emission profile of this technology. Institute of Gas Technology (GTI Energy) has proposed to demonstrate a commercially ready linear generator fueled with renewable fuels. The linear generator will be installed at California State University, Long Beach's central plant and supply electrical and thermal load to the university campus. This action is to execute a contract with GTI Energy to assess the performance and efficiency and evaluate emissions from a Mainspring linear generator using renewable fuels in an amount not to exceed \$660,000 using the Clean Fuels Program Fund (31).

**COMMITTEE:** Technology, April 18, 2025; Recommended for Approval

**RECOMMENDED ACTION:**

Authorize the Executive Officer to execute a contract with GTI Energy to assess the performance and evaluate emissions from a Mainspring linear generator using renewable fuels at California State University, Long Beach, in an amount not to exceed \$660,000 from the Clean Fuels Program Fund (31).

Wayne Natri  
Executive Officer

AK:MW:VP:SC:HL

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**Background**

In 2019, linear generators were introduced to South Coast AQMD as an alternative power generation technology to diesel generators that may achieve low emissions without an aftertreatment system. Initially, linear generators were regulated under

South Coast AQMD Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines. However, due to the unique operating capabilities of linear generators, and to allow for specific considerations for this technology, Rule 1110.3 – Emissions from Linear Generators was developed and adopted by the Board in November 2023.

Linear generators are increasingly being used for power generation solutions for medium and heavy-duty charging depots where sufficient grid support is not available in the near term. This alternative power generation technology produces electricity by driving magnets through copper coils in a linear motion. This unique operation creates the potential for ultra-low emissions with high electricity generation efficiency and the ability to operate on a wide variety of fuel types, such as renewable natural gas, biogas, and hydrogen. Additional studies are needed to assess linear generator performance and the full emissions profile.

On December 4, 2024, the Institute of Gas Technology (GTI Energy) was awarded a \$3,999,896 CEC grant to demonstrate a Mainspring linear generator at California State University, Long Beach (CSULB). Under this project, a Mainspring linear generator will be evaluated on its performance, efficiency, and emission profiles, using different fuels and under various operating conditions.

### **Proposal**

GTI Energy's study will demonstrate a fuel-flexible Mainspring linear generator producing 250kW of peak power utilizing renewable fuels such as a blend of dimethyl ether and liquid propane gas along with blends of hydrogen and renewable natural gas. The generated electricity will be integrated into the CSULB's central plant electrical distribution system. The project team plans to implement onsite modifications to capture waste heat for the university's year-round re-heat needs for their ventilation systems. This may potentially enhance the system's overall energy efficiency to at least 80 percent. The project team will also measure the criteria and toxic air pollutants emissions which will include particulate matter and polycyclic aromatic hydrocarbons. The Propane Education & Research Council will provide the propane needed for this project and support the emissions measurement effort. The Utilization Technology Development will provide the technical assistance needed for energy efficient improvement through waste heat recovery.

### **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 a waiver in the best interests of South Coast AQMD. Specifically, these circumstances are B.2.d.(8): Research and development efforts with educational institutions or nonprofit organizations. GTI

Energy is a nonprofit organization that develops innovative solutions for low-carbon, low-cost energy systems.

**Benefits to South Coast AQMD**

Projects supporting EV charging infrastructure are included in the Technology Advancement Office Clean Fuels Program 2024 Plan Update under “Health Impacts, Fuel and Emissions Studies.” The research and support for infrastructure is a key component to electrifying the transportation sector. The deployment of heavy duty EVs within the South Coast Air Basin (Basin) region has created a need for large amounts of grid power to support charging infrastructure and linear generators have been used to provide interim power solutions until grid power is available. Understanding the toxic and criteria pollutant emissions from in-use linear generators on multiple fuel sources and fuel blends is of particular interest to South Coast AQMD as more linear generators are deployed in the Basin to provide power generation to buildings and to supplement the grid electricity in heavy duty battery EV charging applications.

**Resource Impacts**

South Coast AQMD’s funding for the evaluation, emissions and performance of the Mainspring linear generator with GTI Energy shall not exceed \$660,000 from the Clean Fuels Program Fund (31).

<b>Funding Source</b>	<b>Funding Amount</b>	<b>Percent</b>
CEC	\$3,999,896	79
Propane Education & Research Council	\$127,008	2.5
Utilization Technology Development	\$190,500	3.5
CSULB (in-kind)	\$61,308	1
Mainspring Energy, Inc.	\$30,000	1
South Coast AQMD ( <i>requested</i> )	\$660,000	13
<b>Total</b>	<b>\$5,068,712</b>	<b>100%</b>

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