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**Comments on Heavy-Duty Zero-Emission Vehicle Market Trends
Workshop**

Additional submitted attachment is included below.



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June 9, 2020

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 20-IEPR-02
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: IEPR Commissioner Workshop on Heavy-Duty Zero-Emission Vehicle Market Trends Session 2

- **Docket Number 20-IEPR-02**

The Advanced Power and Energy Program (APEP) at the University of California, Irvine submits these comments to the IEPR Commissioner Workshop on Heavy-Duty Zero-Emission Vehicle Market Trends - Session 2, hosted by the California Energy Commission (CEC) on May 20, 2020.

I. Introduction

APEP addresses the development and deployment of efficient, environmentally sensitive, sustainable power generation and energy conversion worldwide. At the heart of this endeavor is the creation of new knowledge brought about through fundamental and applied research, and the sharing of this knowledge through education and outreach. Industry is actively engaged and vital to this effort.

II. Comments

We thank the commissioners for hosting this series of workshops on the heavy duty ZEV market status. These workshops provided a valuable overview of the status of battery electric vehicles (BEVs); however, fuel cell electric vehicles were underrepresented in the panel presentations. BEVs are promising but cannot meet all the needs of the heavy duty sector due to range limitations and charging constraints. Applications that require long range and fast turnaround can benefit from FCEVs due to the fuel storage capacity of FCEVs and the fast refueling times associated with hydrogen stations.

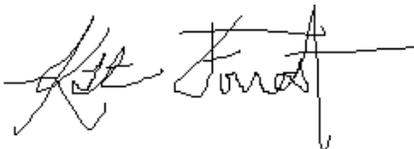
In addition, while BEVs are generally more efficient than FCEVs, the timing of charging can significantly impact the electric grid. Heavy duty BEVs may be prone to charging during peak electricity demand times, so the development of time-of-use, smart charging, or additional stationary storage strategies is important for reducing negative integration impacts. Alternatively, the storage characteristics of hydrogen fuel can alleviate the need for additional grid storage by producing hydrogen when renewable generation is available. Therefore, strategic planning for the use of both BEVs and FCEVs can increase efficiency and ease electric grid management.

FCEVs are close to market-ready. Examples of FCEVs deployed in California within the heavy duty market include:

- Port of Long Beach. Demonstration drayage FCEVs from a Toyota and Kenworth collaboration are being demonstrated at the ports,¹ proving their utility and near-commercial readiness. Within a year of the project, Toyota advanced the state of its Class 8 truck, increasing the vehicle range from 200 miles to 300 miles.² At the end of 2018, the CEC approved an \$8 million grant for a 100% renewable hydrogen station at the Port of Long Beach.³
- Orange County Transportation Authority (OCTA). OCTA has deployed 10 fuel cell electric buses (FCEBs) and established an onsite hydrogen fueling station that can support up to 50 buses.⁴
- SunLine Transit Agency. SunLine has a 20-year history of working with hydrogen buses, encompassing eight generations of FCEBs, and large-scale refueling infrastructure with on-site hydrogen production.⁵

We recommend expanded funding support for research and development in FCEV technology, particularly in cost reduction of the powertrain, that can reduce initial capital cost investments by fleet managers and make the total cost of ownership even more attractive. We further recommend funding support of hydrogen infrastructure, tantamount to that of the CEC grant at the Port of Long Beach, to accelerate market confidence, FCEV adoption, and reduce emissions in the State's most impacted areas. Enhanced focus and funding in these key areas can supplement the analogous support of BEVs and thereby provide a holistic zero emission portfolio in the heavy duty sector.

Sincerely,



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¹ Toyota. April 23, 2019. <https://media.toyota.co.uk/2019/04/toyota-and-kenworth-plan-zero-emission-haulage-with-new-fuel-cell-electric-trucks/>

² Toyota Newsroom. July 30, 2018. <https://pressroom.toyota.com/toyota-doubles-down-zero-emissions-heavy-duty-trucks/>

³ California Energy Commission. "Energy Commission Approves \$8 Million Grant for Hydrogen Fuel Cell Station at Port of Long Beach." <https://www.energy.ca.gov/news/2018-11/energy-commission-approves-8-million-grant-hydrogen-fuel-cell-station-port-long>

⁴ Orange County Transportation Authority. "Hydrogen Fuel Cell Bus," <https://www.octa.net/About-OCTA/Environmental-Sustainability/Hydrogen-Fuel-Cell-Electric-Bus/>

⁵ SunLine Transit Authority. Alternative Fuels Milestones. <https://www.sunline.org/alternative-fuels/milestones>