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H2FCP response to 24-EVI-01 Joint Workshop on Concepts for the CFI West Coast Truck Charging and Fueling Corridor Project

Additional submitted attachment is included below.

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February 27, 2025

Director Hannon Rasool
Fuels and Transportation Division
California Energy Commission
2526 9th Street
Sacramento, CA 95814

RE: Response to 24-EVI-01, Joint Workshop on Concepts for the CFI West Coast Truck Charging and Fueling Corridor Project, Comments from select Industry Members of the Hydrogen Fuel Cell Partnership.

Dear Director Rasool:
The industry members of the Hydrogen Fuel Cell Partnership (H2FCP) are pleased to submit our comments on the proposed project to establish a hydrogen fueling corridor along Interstate 5, extending from the Mexican border to the Canadian border. This initiative is of critical importance to the advancement of hydrogen fuel cell technology and the realization of zero-emission transportation across the West Coast. Without a comprehensive network of hydrogen fueling stations along this vital corridor, seamless north-south travel across California for fuel cell electric vehicles will remain unfeasible. We are committed to supporting the best possible outcome for this project, ensuring the infrastructure needed for a sustainable, hydrogen-powered future.

Include and enable all classes of FCEVs.
We appreciate the funding of a hydrogen fueling station in California to support medium- and heavy-duty commercial trucks through the US DOT CFI grant program. To maximize the impact of this investment, we recommend focusing the project on the SAE J2601 and J2601-5 fueling protocols, which enable all classes of fuel cell electric vehicles—including light-duty automotive as well as medium- and heavy-duty trucks—to refuel at these stations.

Recognizing that one hydrogen fueling station is not sufficient to support a market the size of California, growing this emerging economy will require a holistic strategy. Fortunately, the California Transportation Commission (CTC), through its SB 671 Clean Freight Corridors Assessment, [1] has laid important groundwork by identifying the need for an initial, minimum viable network of hydrogen fueling stations, with one station approximately every 270 miles—equating to about 15 heavy-duty hydrogen fueling stations along California's major corridors.[2] H2FCP members would greatly appreciate the opportunity to collaborate with California's agencies to further develop the State's approach to achieving the SB 671 initial minimum viable network goals.

[1] California Transportation Commission • SB 671 Clean Freight Corridors Assessment, November 2023, p. 39, https://catc.ca.gov/-/media/ctc-media/documents/programs/sb671/sb671-final-clean-freight-corridor-efficiency-assessment-dor.pdf, accessed February 24, 2025.
[22] One station every 270 miles, is conservative when factoring in station reliability in early years of operations along with lack of decentralized hydrogen supply.

A successful hydrogen fueling network requires adequate funding.
We appreciate the funding provided for the development of hydrogen fueling stations through various programs, such as this CFI grant; however, hydrogen infrastructure remains significantly underrepresented in California's ZEV infrastructure funding. We greatly appreciate that Caltrans and CEC will aggressively pursue funding for hydrogen fueling infrastructure development in the future, in the spirit ofCTC's SB671 work. To that end, we kindly request an update on the status of the US DOT CFI Round 1 application resubmittal where the inclusion of hydrogen is unclear.

Complimentarily, an academic member of H2FCP, Cal State LA Hydrogen Research and Fueling Facility (HRFF) has been selected for the DOT CFI grant Round 1, announced on January 11, 2024, with the allocation of $7.2M that will upgrade the Cal State LA hydrogen station originally built in 2011. The project focuses on innovation and hydrogen workforce development while operating an electrolytic backup LD/MD/HD station. The contract has been submitted to FHWA, but not yet awarded/signed. Is there a way for the California Energy Commission to ask for an update of this Cal State LA project, as it would be highly complementary to the West Coast Truck Charging and Fueling Corridor project?

The nascent fuel cell electric truck market requires de-risking.
Commercial manufacturers of heavy-duty zero-emission trucks are facing increased risk due to the loss of Private Fleet requirements of CARB's Advanced Clean Fleet (ACF) regulation, resulting in a setback for California's entire zero-emission vehicle program, impacting manufacturers of both hydrogen fuel cell and battery-electric platforms. In particular, hydrogen fuel cells will be essential for meeting the performance and range demands of long-distance freight operations, highlighting the need for continued investment and support in hydrogen infrastructure.[3]

Lessons from the rollout of the light-duty hydrogen network should inform medium- and heavy-duty hydrogen fueling network development.
Based on today's understanding of technology and market development, the success of any single HD hydrogen fueling station depends on a capacity significantly higher than the proposed minimum, 1,000 kg/day. The commercial trucking market has zero tolerance for fueling station outages of any kind, as maintaining truck fleet uptime is critical to operations. A station capacity of 1,000 kg/day is likely to be overwhelmed by market demand, leading to underperformance and risk of downtime . Unlike battery-electric trucks, which face challenges with long charging times, Class 8 hydrogen fuel cell trucks can refuel within 30 minutes, supporting optimal truck uptime. However, if stations are down or unable to meet demand, fueling times increase, negatively impacting fleet operational efficiency, and thus the success of the fleet transition itself. To ensure reliability and meet the needs of the commercial market, hydrogen fueling stations must be designed with sufficient capacity and redundancy.

We recommend aligning the station's capacity closer to the CARB Board approved 2024 LCFS Regulatory Amendments, which set a 6,000 kg/day threshold for generating Heavy-Duty Hydrogen Refueling Infrastructure Credits (HD-HRI), with a preferred capacity of 4,000 kg/day

[3] Hydrogen vs Electric Trucks: An Impartial Analysis of 5 Critical Factors for the Future of Trucking, Tank Transport, https://tanktransport.com/2024/11/hydrogen-vs-electric-trucks/, accessed February 27, 2025.

and above. For background, the current benchmark for heavy-duty hydrogen stations is 4000 kg storage capacity and we have learned that a healthy market pulls larger stations and not vice-versa. Furthermore, the rollout of light-duty hydrogen fueling stations taught us that more and slightly oversized stations are needed for initiating a market, as the larger capacity provides flexibility to manage demand fluctuations and outages. A heavy-duty station with name plate capacity of 1,000 kg/day station is too small, for the market success case, supporting a maximum of 25 trucks per day and would require daily hydrogen deliveries (or even multiple times per day), with increased cost of operations as well restricting fueling during deliveries. That model is more akin to a temporary demonstration project and not a commercial station. If 1,000 kg/day is the goal, then the state would require a network of multiple 1,000 kg/day stations to support a micro-corridor within the larger I-5 project area.

A successful commercial rollout of hydrogen fuel cell trucks is dependent on adequate hydrogen fueling infrastructure implementation.

We are now beginning the commercial rollout of the heavy-duty hydrogen fuel cell-electric truck market. There is an urgency to install hydrogen fueling infrastructure of sufficient density to support this new market. One of the most active truck corridors in the United States exists along I-5, from Los Angeles to the San Francisco Bay Area, where the majority of California's 33,500 drayage trucks operate,[4] making this region an immediate priority. From a market readiness perspective, hydrogen fueling for commercial trucking is severely under resourced, with minimal fueling in Los Angeles and Oakland, and no fueling in Sacramento and the Central Valley, leaving no connectivity between the Bay Area and Los Angeles.[5] Addressing these gaps is essential to establishing a robust and reliable hydrogen fueling network in California.

The capital cost for constructing a single heavy-duty hydrogen fueling station currently ranges from $10 million to $15 million, depending on the station type and configuration, [6] with cost variation depending on the capacity, station archetype (liquid vs. gasesous) and other exogenous factors such as cost of real estate, site development (e.g., utility hookups, etc.) which could significantly contributes to the overall expense, particularly in strategic urban locations. To effectively support the development of a robust hydrogen fueling network, adequate funding, proportional in magnitude, will ensure that California's CFI funded hydrogen station is set up for success in meeting market demands.

Furthermore, hydrogen supply and delivery agreements should be based on actual demand rather than the nameplate capacity of the station, as it is unrealistic to secure supply solely on the maximum capacity of the infrastructure. To encourage market growth, building excess station

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[4] https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-fleets-regulation-detailed-drayage-truck-requirements, accessed 2/26/25.

[5] The Los Angeles hydrogen truck market region faces significant challenges, with only three public heavy-duty hydrogen fueling stations that have limited capacity (1,600 kg/day) and a handful of private, temporary fueling sites supported by Nikola's HYLA infrastructure arm. However, Nikola's recent filing for Chapter 11 bankruptcy raises concerns about the reliability of these sites. In Oakland, the newly developed First Element Fuel hydrogen fueling station is not yet fully operational, further highlighting infrastructure gaps. A critical geographic gap exists in the Sacramento region and Central Valley, which have no commercial hydrogen fueling options.

[6] This cost is based on real-world experience developing HD hydrogen fueling stations and is higher than the $8.6 million - $12.6 million estimate in the California Transportation Commission, SB 671 Clean Freight Corridors Assessment, https://catc.ca.gov/-/media/ctc-media/documents/programs/sb671/sb671-final-clean-freight-corridor-efficiency-assessment-dor.pdf, December 2023, p. 46, accessed February 24, 2025.

capacity should be incentivized, allowing for scalability as demand increases. Linking supply contracts directly to station capacity introduces unnecessary financial exposure and operational risk. Therefore, supply agreements should be decoupled from station capacity to ensure flexible, demand-driven fueling solutions that support market development while maintaining financial viability.

A successful rollout of hydrogen fueling infrastructure requires partnership.
Hydrogen fueling is highly technical, requiring careful planning and coordination to ensure successful deployment of infrastructure. Historically, California's hydrogen fueling grant funding programs were developed through workshops between the CEC and industry members to achieve the best possible outcomes. The H2FCP is willing to coordinate with the CEC to apply similar collaborative approaches for this project, and as a start, we offer the following technical guidance.

- It is crucial to ensure interoperability across light-, medium-, and heavy-duty vehicles by adhering to the SAE J2601 standard including the following requirements.
    - Compliance with the SAE J2601-1 Cat D standard.
    - The capability to easily and cost-effectively upgrade to the SAE J2601-5 standard for fast-fill hydrogen dispensing, supporting the upcoming certification of high-flow heavy-duty hydrogen dispensers.
- To ensure optimal performance and longevity of fuel cell vehicles, hydrogen fueling stations should adhere to the SAE J2719 standard, which specifies the required fuel quality for commercial proton exchange membrane (PEM) fuel cell vehicles and has been adopted by the State for retail hydrogen fuel[7]
- To guarantee transparency and reliability, third-party validation of station operability, including connectivity to the H2FCP Station Operational Status System (SOSS), should be supported.
- The inclusion of both 70 MPa and 35 MPa fueling pressures will accommodate existing and emerging vehicle manufacturers, as well as transit buses, ensuring a comprehensive and future-proof hydrogen infrastructure.

Tangential to the technical requirements for hydrogen storage and dispensing, a majority of hydrogen station components are manufactured outside the United States, therefore Build America, Buy America Act requirements may be challenging to comply with. This is an additional area where our members can provide education.

[7] California Energy Commission, Clean Transportation Program Final Project Report: Measurement and Standards Requirements for Hydrogen and Biodiesel Uses as a Transportations Fuel, https://www.energy.ca.gov/sites/default/files/2021-05/CEC-600-2020-042.pdf

In closing, we thank the California Energy Commission and Caltrans for your continued leadership and commitment to advancing zero-emission transportation. Establishing a comprehensive hydrogen fueling corridor along Interstate 5 is a crucial step toward achieving California's clean energy, air pollution reduction, and decarbonization goals. We appreciate the opportunity to provide input and stand ready to partner with your agencies to ensure the successful deployment of this infrastructure. Together, we can accelerate the transition to a hydrogen-powered future. Thank you for your consideration and support.

Sincerely,

David Park
Director of Industry Affairs