August 24, 2018

Sam Wade
Chief, Transportation Fuels Branch
California Air Resources Board
1001 "I" Street
Sacramento, CA 95812
Delivered via website

Dear Mr. Wade:

We support the ***Hydrogen Refueling Infrastructure*** (HRI) Pathway as proposed by the California Air Resources Board (ARB) in the [Date] 15-day Notice of Public Availability of Modified Text and Availability of Additional Documents and Information for Proposed Amendments to the Low Carbon Fuel Standard (LCFS) Regulation and to the Regulation on Commercialization of Alternative Diesel Fuels (ADF) (henceforth "15-day Notice"). The reasons for this support have been articulated in prior letters to the docket.

The HRI pathway as proposed is an effective incentive for expanding zero-emission vehicle infrastructure while remaining consistent with the LCFS policy's intent.

We believe the HRI as proposed by the ARB is consistent with Executive Order B-48-18 and the LCFS policy intent. The LCFS was established by Executive Order S-01-07, pursuant to AB32, to reduce the carbon intensity of California's transportation fuels. With Executive Order B-48-18, California announced a target of 5 million ZEVs by 2030 and an eight-year $2.5 billion investment initiative to continue the state's clean vehicle rebates and spur more infrastructure investments. The Executive Order also specifically calls for State entities to collaborate with stakeholders to implement this order, including "expand zero-emission vehicle infrastructure through the Low Carbon Fuel Standard Program."

Reaching California's goals for greenhouse gas and criteria pollutant emission reductions necessitates the acceleration and scaling up of very low-emission options in the transportation sector. This will require consumer choice across all vehicle segments and refueling/recharging modes of use, and will require growth in California's energy infrastructure to accommodate demand from the transportation sector as well as increasing supply from renewable sources. To be successful, a portfolio of ZEV including FCEV, Battery Electric Vehicles (BEV) and Plug-in Hybrid Electric Vehicles (PHEV) will be needed. Of these, FCEVs have the benefit of long range, fast refuel time and scalability, and are a very good ZEV option for those without the ability to charge at home. The refueling model for FCEVs is like that of conventional internal combustion engine vehicles in that it is done at a refueling station. As such, hydrogen refueling station

capacity, coverage, and cost are prerequisites for a successful FCEV market. At the same time, retail hydrogen fueling stations does not benefit from an extensive existing infrastructure it can leverage (e.g., electrical transmission, natural gas pipelines, liquid hydrocarbon fuel distribution assets) in the same way that other alternative fuels do. The initial low utilization of new refueling infrastructure during early stages of the market limits the pace of development and availability of this fuel, and increases the cost relative to traditional transportation fuels, all of which inhibit customer adoption. However, with modest scale in sustained development of hydrogen refueling infrastructure, it has been shown that the cost of hydrogen refueling stations can be reduced by 50% or more. A significant portion of cost reduction in hydrogen refueling stations serving light-duty vehicles can transfer to stations serving heavy-duty vehicles. Therefore, it is our conclusion that it is appropriate and makes sense to take additional action within LCFS to help accelerate the investment and buildout of retail hydrogen fueling stations.

We believe the HRI has benefited from public input during the workshop process and produced a stronger rulemaking as a result. The following list highlights ways in which updates to the HRI Pathway Rules, as written, will effectively accomplish the program's goals, and it provides input for LCFS staff to consider which could help further assure that the HRI effectively meet its intended results:

- **Hydrogen Station Capacity Evaluation Tool**: We agree that an accurate, robust model is needed so that CARB can evaluate station grant proposals and determine station capacity, and that the proposed HyScape model can meet these needs. Recognizing the urgency to provide feedback to CEC and CARB regarding the tool's performance, we have installed and used the tool to model performance of our stations and provide the following feedback regarding its effectiveness:

  - We believe the tool is sufficiently robust, providing a systematic, predictable and transparent method that scores proposed equipment relative to an ideal case. **As such, HyScape should be suitable to meet the anticipated needs of CARB and industry.**

  - During our testing of the tool from 7/24/2018 to 8/14/2018, we identified several areas of improvement related to parameter inputs, operational limits, and inconsistencies. These findings were detailed in a previous communication with CEC and **we believe that all of our concerns have been addressed in the most recent version of the tool.**

  - While we have not had sufficient time to perform a comprehensive evaluation of the tool with all of our designs, we are confident that the tool is ready for implementation. **We encourage CARB to establish a regular review process by which updates to the model can be evaluated and considered for future implementation.**

- **Focus the program on revenue generation to cover operating expenses rather than placing a credit limit based on hydrogen station installation capital costs:** We support the LCFS rulemaking as written, without an HRI credit limit based on the station installed capital costs. As discussed at the most recent hearing, hydrogen stations have significant operating expenses in addition to the initial capital costs. The program rulemaking, as written, effectively separates some basic amount of revenue generation from the pace of ZEV rollout and thereby accomplishes the key objective of the program: helping de-risk private investment to some degree so that retail hydrogen stations are built in advance of cars and the chicken & egg issue is

pulled off the table. If ZEVs are rolled out at the pace expected or faster, then the use of HRI credits will naturally sunset more quickly. If ZEVs are rolled out slower than expected, a hydrogen station operator can at least rely on a minimal amount of revenue from HRI credit generation to help cover its operating expenses.

- **OEM station approval:** we recommend modifying the requirement that "[a]t least three OEMs have confirmed that the station meets protocol expectations, and their customer can fuel at the station" (Sec. 95486.2(a)(4)(D)) to require that the station owner has confirmed that the fueling interface conforms to SAE International J2601: 2016, Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles (www.sae.org), or the most recent version of the standard published and promulgated by the SAE, and has been tested per CSA HGV 4.3: 2012, Test Methods for Hydrogen Fueling Parameter Evaluation and related devices, or the most recent published version of the standard, and confirmed by either (1) a 3rd party Nationally Recognized Test Lab (NRTL) as approved by CARB, or (2) the U.S. Department of Energy Hydrogen Station Equipment Performance (HySTEP) device as practicable, or an equivalent process for fueling interface confirmation.

- **Renewable Power Usage in Production, Distribution, and Dispensing:** Electrical power is an important input in all aspects of hydrogen production, compression, liquefaction, distribution, and dispensing. Electricity is the primary input when hydrogen is produced by electrolysis from water, but electrical power is also a significant source of energy for compression, liquefaction, pumping, and refrigeration of hydrogen produced by any method. Therefore, it is important that the LCFS regulations recognize renewable electricity as such whenever it is used in a hydrogen pathway.

  For example, in proposed Sections 95481, 95486, and 95488, the credits available for improvements in the CI of electricity used for the production of hydrogen by electrolysis should also be available for improvements in the CI of electricity used for compression, liquefaction, distribution or dispensing.[1] Further, the *Time-of-Use* pathway definition (rather than *Smart Electrolysis* definition) should be restored to include electrical power used in all hydrogen production pathways.[2] Lastly, the Book-and-Claim Accounting should be allowed for use for all aspects of hydrogen production.[3]

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[1] **Section 95481.(a)(124)** "Renewable Hydrogen" means hydrogen derived from (1) electrolysis of water or aqueous solutions using renewable electricity; (2) catalytic cracking or steam methane reforming of biomethane; or (3) thermochemical conversion of biomass, including the organic portion of municipal solid waste (MSW). Renewable electricity, for the purpose of renewable hydrogen production by electrolysis ***or for hydrogen compression, liquefaction, distribution or dispensing,*** means electricity derived from biomass, including the organic portion of MSW, solar thermal, photovoltaic, wind, geothermal, fuel cells using renewable fuels, electricity generated from a small hydroelectric facility of 30 megawatts or less, biogas, ocean wave, ocean thermal, and tidal current.

[2] **Section 95486.1(f)(2):** ***Time-of-Use Pathways*** for Hydrogen Production. An entity can generate credits, in addition to credits generated pursuant to subsection (1), above, for improvements in the CI of electricity used for electrolysis***, or for hydrogen compression, liquefaction, distribution or dispensing,*** to produce hydrogen due to time of use smart electrolysis pursuant to section 95488.5 and the credit calculation in section 95486.1(c)(2)(B), where: Electricity is the total quantity of low-CI electricity supplied to the electrolyzer for hydrogen production***, or used for hydrogen compression liquefaction, distribution or dispensing***.

[3] **Section 95488.8(i)(1):** *Book-and-Claim Accounting for Renewable or Low-CI Electricity Supplied as a Transportation Fuel or Used to Produce Hydrogen.* Reporting entities may use indirect accounting mechanisms for renewable electricity to reduce the CI of electricity supplied as a transportation fuel or for hydrogen production through electrolysis***, and for hydrogen compression, liquefaction, distribution or dispensing***, provided the conditions set forth below are met:

Similar changes would follow in Section 95488.1, Section 95488.5, Section 95488.10(a)(4) and Section 95491. Without these changes, a hydrogen producer has very limited incentive to improve renewable content within a given pathway.

- **Deadline to Open:** as drafted, the regulation requires that "a station must be operational within 24 months of application approval." (Sec. 95486.2(a)(4)(F).) We believe this deadline is an appropriate requirement to develop approved stations, but suggest that it should not result in a forfeiture of HRI credits when delays are caused by permitting agencies and not by the applicant. Permitting delays that exceed 30 days should be excluded from the 24-month period.

In closing, we believe the HRI can be effective for accelerating the build out of hydrogen refueling stations and reducing the carbon intensity of hydrogen supply, consistent with Executive Order B-48-18 and Board Resolution 18-17, and the LCFS policy intent.

Thank you for your consideration.

For further information on this proposal, please contact the company representatives listed below.

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