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April 28, 2023

Cheryl Laskowski
Chief, Transportation Fuels Branch
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Comments submitted electronically

RE: Comments Related to Draft Tier 1 Simplified Hydrogen Calculator

Dear Dr. Laskowski,

Air Products is pleased to provide comments in support of the California Air Resources Board (CARB) rulemaking for the Low Carbon Fuel Standard (LCFS). We support California's climate goals and believe that Air Products can help California with the energy transition needed to meet these challenges.

Air Products is the only U.S.-based global industrial gas company and the world's largest hydrogen producer and supplier for use in numerous markets, including transportation. Within California, the company safely operates nine hydrogen production facilities, about 30 miles of hydrogen pipeline and currently supplies and operates a network of light-duty and heavy-duty hydrogen fueling stations, facilitating the transition to zero-emission transportation. Air Products has also been selected to be part of the California ARCHES LLC Hydrogen Hub Project.

We are committed to rapidly scaling and decarbonizing global hydrogen supplies to support decarbonization efforts internationally. On July 25th, 2022, Air Products announced[1] that it will spend or commit at least $4 billion in additional new capital for the transition to clean energy over the next five years. In the two years proceeding this announcement, Air Products had announced approximately $11 billion in clean energy investments., bringing its total recent commitment to clean energy investments targeting hard-to-abate economic sectors to $15 billion.

Air Products has consistently supported the creation of a Tier 1 Simplified Hydrogen Calculator ("Calculator") for hydrogen and are very appreciative that CARB has proposed a draft Calculator for public comment. We were hopeful that the initial Calculator release would include more configurations than just steam methane reforming and electrolysis but understand why CARB is not including at this time. We agree that it is important to advance a working Calculator for the most common configurations and then add others as CARB becomes more familiar with those configurations through pathway applications.

We are also pleased that the Calculator includes options for pathways employing renewable electricity and renewable natural gas credits via 'book & claim' to reduce the hydrogen carbon intensity.

[1] Air Products Announces Additional "Third by '30" CO2 Emissions Reduction Goal, Commitment to Net Zero by 2050, and Increase in New Capital for Energy Transition to $15 Billion

Moreover, in our analysis of the calculator, we found generally good agreement between the Calculator the US GREET model which gives us a level of confidence in what CARB has proposed.

The most substantive change needed to improve the usefulness of the Calculator is the addition of emission allocation to steam as a coproduct in the production of hydrogen via steam methane reforming. There are other plant configurations that provide electricity or carbon monoxide as coproducts, but these are less common than steam. While steam methane reformers can be designed to only produce the steam needed for hydrogen production, many are designed to produce additional steam to meet customer demands. In fact, about 90% of our existing plants globally are designed to provide a steam coproduct to customers. Without incorporating the ability to allocate emissions to a steam coproduct, the usefulness of the Calculator with be limited and more Tier 2 applications will be necessary creating administrative burdens to both the hydrogen producer and CARB staff.

Aside from the recommendation to add the capability to allocate emissions to a steam coproduct, we had just a few minor clarifications/suggestions for CARB to consider based on our review of the draft Calculator.

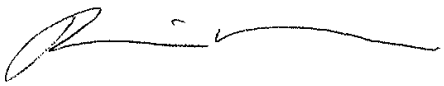
- For steam methane reforming production, we noticed that Calculator shows a higher grid electricity contribution to hydrogen production (4.1 gCO2e/MJ) than what is calculated in US GREET model (3.5 gCO2e/MJ). This is despite the fact that the US grid electricity mix carbon intensity factor in the Calculator is slightly lower than that what is in US GREET. Please clarify what factors are contributing to this observation.
- For gaseous hydrogen truck transport, the carbon intensity contribution in the Calculator is higher than the US GREET model. We were able to get them to match by reducing the typical payload from 400 kg to 340 kg in the US GREET model but would like to understand better the factors that are driving this inconsistency. We believe there should be alignment between the Calculator and the US GREET model at the typical payload of 400 kg.
- The Calculator carbon intensity contribution of dispensing station compression and cooling is higher than in US GREET. It does not appear that the CA Grid mix is being used which would be the appropriate mix for dispensing stations operating in California. Please correct or clarify what is contributing to this difference.
- Are the compound loss factors supposed to represent a cumulative calculation of the transport loss factors? If so, it does not seem that the calculation works mathematically in each case. Please clarify the relationship between these values and add more discussion in the instruction manual.
- With the additional definition and discussion in the instruction manual, please describe what is included in each loss factor. For example, does end use vehicle losses include station dispensing losses? Also, the vehicle losses seem high for a pressurized system. The leakage rate far exceeds the permeability of hydrogen in Type 4 composite storage vessels.
- Please consider changing the term “Transport Stage” to “Supply Chain Stage” as many of the factors describe operations that are not classically considered transport – for example storage and vehicle losses are not transport.

Lastly, in terms of process, we have been supportive of a January 1st, 2024 date for hydrogen to become a regulated fuel under the Low Carbon Fuel Standard in contrast to the mass-based California supply trigger currently in the regulation. However, with the recognition that meeting a January 1, 2024

regulation date requires 2023 application submittal for hydrogen using the Lookup Table values in the current regulation and then resubmittal of these applications early in 2024 using the new Calculator, we suggest that you delay the regulatory trigger date to midyear or year-end 2024 so that only a single set of applications need to be submitted using the new Calculator.

Air Products appreciates the opportunity to provide this feedback. Please feel free to contact me by phone (916-860-9378) or email hellermt@airproducts.com.

Respectfully,



Miles Heller
Director, Greenhouse Gas Government Policy