

Air Products and Chemicals, Inc.
4000 MacArthur Boulevard, Suite 420, East Tower
Newport Beach, CA 92660



www.airproducts.com

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California Air Resources Board
1001 I Street
Sacramento, CA 95814

Comments submitted electronically

RE: Draft Low Carbon Fuel Standard (LCFS) 45-Day Comment Package

Dear Chair Randolph and fellow Board Members,

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 Air Products stands ready to help the State facilitate the energy transition needed to meet these challenges. We are very appreciative that CARB has recognized the substantial role that hydrogen will play to decarbonize transportation by proposing many related improvements to the LCFS in the proposed 45-day package.

Air Products is the only U.S.-based global industrial gas company and the largest hydrogen producer globally, nationally, and in California. The company is a trusted hydrogen supplier for numerous markets, including transportation. Within California, Air Products safely operates 10 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. Air Products has announced¹ that it will spend or at least \$4 billion in additional new capital for the transition to clean energy over the next five years. Air Products had previously 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.

Summary: Key Areas of Support and Improvement

- We support the most ambitious carbon intensity (CI) reduction targets feasible and a robust stepdown of at least 7% prorated for 2024 to send a strong signal to the market once the rule is effective.
- We support the inclusion of the Auto-Acceleration Mechanism but believe the assessment should start in 2026 based on 2025 data.

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](#)

- We strongly support the inclusion of a technology-neutral CI-based book-and-claim approach for hydrogen but suggest that it be used for all transportation fuel regardless of where they are produced, if they are consumed in California consistent with standard LCFS treatment of fuels.
- We appreciate the extension of low-CI electricity book-and-claim to include process energy demand for the full hydrogen fuel value chain but believe the eligibility for all transportation in the current regulation should be maintained and the resource-shuffling and time-matching requirements should apply equally to both hydrogen and electricity.
- We support the additional time provided to hydrogen for the beneficial use of biomethane.
- We applaud the proposed extension of Hydrogen Refueling Infrastructure (HRI) crediting to medium and heavy-duty vehicles, along with additional time for light-duty vehicle stations and look forward to working on language with CARB to accommodate refueling stations that serve all vehicle types.
- We are very pleased with the inclusion of a Tier 1 Simplified Calculator for hydrogen and clarification that hydrogen plants that are not co-located with refineries are eligible under the project-based crediting provisions.

Program Stringency

We urge CARB to be as ambitious as possible in setting the new carbon intensity reduction targets between now and 2045 and align targets with levels no less than what is needed to achieve California's greenhouse gas targets and outcomes established in the 2022 Scoping Plan Update. Setting the target at a 30% CI reduction by 2030 should be the minimum. If additional information becomes available from stakeholders or CARB analysis during the 45-day public comment period to support a larger CI reduction, then we urge CARB to make this change, provided it does not require restarting the rulemaking process and necessitate reissuing the 45-day package notice. CARB should be confident in setting ambitious standards, given the existing robust cost-containment provisions in the regulation, and provide regulated party protection, should low-carbon fuel supplies not develop as quickly as anticipated. As discussed in the 2022 Scoping Plan Update, a statewide carbon reduction target of 48% below 1990 levels by 2030 as well as carbon neutrality by 2045 creates decarbonization targets that need to be supported by the LCFS targets. The transportation sector and fuel production pathways are the largest component of statewide greenhouse gas emissions, accounting for about half of the state's climate footprint, so the LCFS needs to provide a proportional amount of the reductions toward the 48% reduction target.

We support including both the initial 2025 accelerated stepdown of at least 5% and automatic stringency 'ratcheting' mechanism conceptually as proposed in the 45-day package. Based on the most recently published banked credit balance of over 20 million metric tonnes (Q3 2023), a step down of at least 7% is more appropriate. In the ICF International comments submitted to CARB last year, a CI reduction level of between 20% and 25% may still have an associated credit bank build.² A stepdown in the range of 7% to 10% would result in a CI reduction target from 20.75% to 23.75% relative to the current target of 13.75% in 2025 – well within the range of ICF's predicted potential increase in banked

² See attachment at the following link: <https://ww2.arb.ca.gov/form/public-comments/submissions/4306>

credits. We also request that a prorated stepdown occur for the partial year of 2024, as soon as the rule is effective, to send the right signal to the market as early as possible.

The LCFS program is most effective when the credit pricing is consistently at a level that incentivizes the innovation and clean fuel supply needed to decarbonize the transportation sector. Enabling the program to make this adjustment automatically through the proposed Auto Acceleration Mechanism (AAM) would be very powerful for accelerating deployment of low carbon fuels. We believe that there will be a strong need for this mechanism in the future as many policies and funding streams outside of the LCFS will contribute to the decarbonization of transportation, which further depresses LCFS credit values. This will translate into reduced investments and less innovation in clean low-CI fuels. For example, there are substantial programs that support battery electric vehicles outside of the LCFS and provide significant incentives for the purchase and use of light duty battery electric vehicles³. Such programs will result in a substantial increase of credits in the LCFS program from the displacement of gasoline with electricity as a fuel. The stringency of the LCFS program will need to be tightened aggressively to sustain the important signal it provides to all clean fuels.

In terms of AAM design, we prefer that the trigger bring stability to the market without price volatility, and that the action taken be predictable and thereby more certainty as market participants project credit balance outlook and value. We support CARB's proposed AAM, but request that the implementation be set one year earlier than proposed to allow faster acceleration of the targets – providing increased stringency to the program if the 2025 stepdown fails to bring the program back in balance. The signal to the market has been diminished based on substantial overcompliance for many years and based on the current and growing bank balance, we foresee this trend continuing unless CARB sets an ambitious CI reduction target. To facilitate the most flexible and effective AAM, we request that CARB change the reference year in 95484 (b) from 2027 to 2026 and reference years in 95484 (c), (d), (e), and (f) from 2028 to 2027.

Hydrogen Book-and-Claim Provisions

Air Products appreciates CARB's willingness to provide a 'book-and-claim' accounting approach for low-CI hydrogen and we strongly support the provision's focus on a technology-neutral, CI-focused metric to establish eligibility for low-CI hydrogen. Focusing on CI is consistent with CARB's longstanding approach under the LCFS and the definition of clean hydrogen set in the Inflation Reduction Act (IRA). To advance the State's transportation decarbonization goals, meet greenhouse gas reduction targets and support the nascent low-carbon hydrogen market, it is essential to capture the CI attribute of hydrogen that is transported in multi-source/multi-use distribution systems, where lower-carbon hydrogen is comingled with conventionally produced hydrogen. A robust book-and-claim system for hydrogen will ensure that the low-carbon attributes of the hydrogen are retained and applied to end-uses where the most environmental benefit can be derived. This sends the necessary long-term signal for low-carbon hydrogen to play a meaningful role in decarbonizing transportation. CARB's design of such a system will serve as a model to other jurisdictions considering or implementing an LCFS program. It is important to get this right.

³ Volkswagen Environmental Mitigation Trust Fund, California Energy Commission EnergIZE Infrastructure Funding Program and Clean Transportation Programs, and the National Electric Vehicle Infrastructure Program

To that end, one key improvement needed is to eliminate the requirement that eligible hydrogen must be supplied to California in a dedicated pipeline as proposed in §95488.8(i)(3)(A). This requirement places an unnecessary constraint on a nascent market and will stifle investments at a time when massive capital outlays are needed to bring low-carbon hydrogen to scale. There are no dedicated interstate hydrogen pipelines to California. As such, this requirement favors only in-state hydrogen pipelines and fails to recognize the value of using hydrogen as a feedstock to renewable fuels produced out of state and imported for use in California. These fuels are actively contributing to decarbonizing California's transportation energy and will become more important as sustainable aviation fuel is further incented in the regulation. In fact, 95488.8(i)(3) specifically indicates the intention that the low-CI hydrogen book-and-claim approach should be applied to hydrogen used in "Alternative Fuel Production", but this proposed eligibility requirement precludes alternative fuel facilities out of state from realizing these benefits. These renewable fuel facilities are located in fuel producing regions across North America, are connected to regional hydrogen pipelines, and are planning to lower their CI by utilizing low-CI hydrogen. For example, we believe that CARB would welcome out-of-state projects whereby a renewable fuel facility that consumes low-zero-carbon intensity hydrogen from a direct connection, delivers those renewable fuels to California. However, a specific geographic limitation directing that the hydrogen be supplied to California would make such a project ineligible, consequently lowering the incentive for producing low-CI hydrogen and forgoing related emission reductions. We urge CARB to adopt a wider worldview that acknowledges the need for a multi-jurisdictional supply chain for low-carbon hydrogen capable in order to displace the existing, equally global fossil fuel supply chain and demonstrate California's leadership in driving decarbonization nationally. Promoting hydrogen energy infrastructure nationally and globally will drive down costs, promote wider adoption and achieve decarbonization more quickly if CARB does not put artificial barriers in place.

We find no statement in Appendix E as to the rationale behind this requirement. In fact, the rationale for providing a book-and-claim approach for low-CI hydrogen is expressly to "facilitate and spur the use of low-CI hydrogen in support of California's decarbonization efforts." Renewable liquid fuels have played, and will continue to play, a key role in California's decarbonization efforts – and there should be no distinction between those produced in-state or those imported. CARB should encourage the development of all low-CI hydrogen supply that help lower the CI of liquid fuels, provided that the fuels are consumed in California. This is consistent with science, the design of the LCFS, and delivers real reductions of greenhouse gas emissions. We request that CARB modify §95488.8(i)(3)(A) as follows:

"Low-CI hydrogen is injected into a dedicated hydrogen pipeline physically connected to California a distribution system or a production facility that provides transportation fuel to California."

§95488.8 (i)(3) also limits the use of a low-CI hydrogen book-and-claim approach to hydrogen used directly as a transportation fuel and hydrogen that is used to produce alternative fuels. As long as hydrogen is still an eligible feedstock for project-based crediting in §95489, low-CI hydrogen book-and-claim should be available to all transportation fuels consumed in California, including conventional fuels. We request CARB make this improvement to enable more emission reductions across a broader array of transportation fuels and further spur investment in low-CI hydrogen. We recommend modified language in §95488.8(i)(3) as follows:

"Book-and-Claim Accounting for Pipeline-Injected low-CI Hydrogen Used in FCV and Alternative Transportation Fuel Production. Indirect accounting may be used for low-CI

hydrogen used in FCVs or to produce alternative transportation fuel for transportation purposes provided the conditions set forth below are met:..."

We note that the low-CI hydrogen book-and-claim requirements are appropriately applied to low-CI hydrogen in the gaseous phase that is commingled in pipelines – including hydrogen conveyed as a liquid before pipeline injection as a gas. CARB has indicated in discussions that liquid hydrogen (or hydrogen derivatives like ammonia) of varying CIs that are mixed in transport and distribution systems can be volumetrically balanced, similar to other liquid alternative fuels like ethanol, renewable diesel, and biodiesel, and that this can be accommodated via the fuel pathway and existing accounting systems without amendment to the regulation. We request CARB clarify, consistent with past discussions with staff, that a book-and-claim approach for commingled liquid hydrogen or liquid hydrogen derivatives in these systems is not needed, and that the necessary provisions are included in the existing regulations to enable such an approach.

We appreciate the explicit clarification in §95488.8(i)(3)(B) that biomethane book-and-claim can be used to reduce hydrogen CI but request CARB to confirm that other renewable feedstocks or production technologies can be used to lower the carbon intensity and produce eligible hydrogen as long as the proposed CI thresholds are validated via approved fuel pathways. We do not see this precluded in any way in the proposed language. Such feedstocks could include bio-offgases or renewable ammonia.

We note that §95488.8(i)(3)(C) safeguards against resource shuffling and encourages new projects that provide eligible hydrogen. We support this requirement but want to clarify that the term “expand” used in the provision is not narrowly interpreted to mean that every project must increase the amount of hydrogen produced. Instead, we encourage an interpretation, that it refers to an expansion in the production of lower carbon hydrogen that meets the CI thresholds established in §95488.8(i)(3)(B). It is quite possible that existing facilities not producing eligible hydrogen will be modified to produce low-CI eligible hydrogen without a net increase in total hydrogen produced. We request that such projects are eligible consistent with past discussions with CARB staff.

Lastly, we note that the new low-CI hydrogen book-and-claim provision includes a requirement to report the contracted price of hydrogen to CARB in unredacted invoices. We support the need for robust tracking of hydrogen volumes to ensure the quantity and environmental attributes of the hydrogen tracked via book-and-claim is verifiable but find no rationale for including hydrogen pricing. In fact, sharing information on the contracted hydrogen price creates the possibility of irreparable harm to both Air Products and its customers. Even in situations where data is published in an aggregated fashion, the limited supply of this hydrogen from a handful of entities would likely lead to competitors deducing this proprietary information and leveraging that information to their advantage in bidding processes. We urge CARB to strike the requirement to report this information in 95488.8(i)(3)(E).

Low-CI Electricity Book-and-Claim Provisions

Air Products strongly supports CARB’s proposal in §95488.8(i)(1) to extend the existing book and claim accounting approach for low-CI electricity to include the process energy associated with other components used to process and distribute hydrogen, like liquefaction and compression. By looking beyond just the production of feedstock hydrogen, this proposal will enable greater carbon reduction ambition in California policies. Extending book-and-claim provisions to process energy will not only

incentivize bringing more renewable production on-line but will also enable hydrogen to further lower its CI and help California decarbonize cars, trucks, buses, and other combustion-dependent equipment. While Air Products supports the extension of low-CI electricity book-and-claim to process energy demand in the hydrogen value chain, we do not believe that the use case of low carbon hydrogen produced in this manner to produce transportation fuel should be eliminated. Because hydrogen is an important feedstock in the manufacture of either renewable biofuels or conventional transportation fuels (under the project-based crediting provisions), and the expectation that these fuels will be used for decades, CARB should encourage all emission reductions possible in all fuels used for transportation in California. Substantive emission reductions can be encouraged, along with renewable electricity growth, by continuing to enable hydrogen CI to be lowered via low-CI electricity book-and-claim for all fuels used in California. We request retention of the end-use flexibility provided in the current regulation by modifying the following provisions as indicated:

Modify proposed provision 95488.1 (i)(1): *as follows:*

“... for hydrogen production ~~through electrolysis~~ and processing for transportation purposes (including hydrogen that is used in the production of ~~as a transportation fuel~~), or for direct air capture projects, provided the conditions set forth below are met:....”

Modify proposed provision 95488.8 (i)(1)(C) as follows:

“For direct air capture projects or for hydrogen used as a transportation fuel (including hydrogen that is used in the production of a transportation fuel), low-CI electricity must meet the following criteria: ...”

While the California Public Utilities Code is referenced in the regionality requirement provision §95488.8(i)(1)(C)(1), we understand that the initial clause of this provision “*The low-CI electricity must be supplied to the grid within the local balancing authority where the electricity is consumed*” is intended to apply to hydrogen production and associated renewable power outside of the state of California. Please add the parenthetical “(or local balancing authority for hydrogen produced outside of California)” similar to what is provided in 94488.8(i)(1)(A).

Lastly, while we are supportive of the new resource shuffling and quarterly time-matching requirements applied to the low-CI electricity book-and-claim provisions for hydrogen in §95488.8 (i)(1)(C)(3) and (4), respectively, we note that these same new requirements are not imposed on electricity used as a transportation fuel in 95488.8(i)(1)(A). We propose that both electricity and hydrogen supplied as transportation fuels should be treated equally with regards to eligibility and recordkeeping provisions and suggest that both fuel requirements be aligned with the new restrictive standards. Alternatively, hydrogen could retain the current eligibility and recordkeeping requirements that are already aligned with electricity supplied as a transportation fuel.

Biomethane Book-and-Claim

Air Products appreciates CARB’s proposal to provide additional time to allow biomethane use for hydrogen in a book-and-claim scenario and enabling avoided methane crediting in the calculation of the CI. We do also note and appreciate that these new restrictions do not apply for projects initiated during

the balance of this decade which incentivizes early action on projects that will accelerate decarbonization. However, we still believe that none of these requirements should be imposed for hydrogen supporting zero-emission solutions – even in 2045 as proposed. Eliminating these proposed requirements will not only continue to incent beneficial use of biomethane wherever it can be cost-effectively developed, but also help lower the CI of hydrogen to enable broad use of low carbon hydrogen across many transportation sectors, especially large off-road equipment like locomotives, marine, and aircraft, consistent with the 2022 Scoping Plan through 2045. The use of low-CI hydrogen in fuel cell vehicles is fully aligned with California’s goals of phasing out combustion in the transportation sector. In fact, placing constraints on biomethane that is used to produce low-CI hydrogen for fuel cell vehicles advantages electricity over hydrogen even though both support zero emission transportation. We request that CARB not impose any new requirements for biomethane book-and-claim used in the production of hydrogen.

In a parallel concept to what is proposed in the 45-day package for hydrogen produced and processed using low-CI electricity, we request that CARB clarify that biomethane book-and-claim provisions can be used to displace fossil methane used both as a reactant in the stoichiometric conversion to hydrogen and for the thermal energy needed to catalyze the reaction. We believe that the combined reactant and thermal energy demand for fossil methane should be considered “production” for the purposes of biomethane book-and-claim provisions. Please confirm.

Hydrogen Refueling Infrastructure (HRI) Credits

Air Products strongly supports the expansion of crediting to medium and heavy duty (MHD) vehicles and continued crediting for light duty (LD) vehicles. The current HRI program, in combination with other California incentives, has been very effective in promoting the build-out of zero-emission vehicle infrastructure. It is important that CARB build on this success by expanding the program to the truck and bus markets. This expansion will complement CARB’s ambitious goals under the Advanced Clean Truck (ACT) and Advanced Clean Fleet (ACF) regulations and help advance the state’s goals for zero-emission vehicles in line with Executive Order N-79-20.

We previously supported the requirement that LD hydrogen refueling stations (HRS) be located in designated disadvantaged communities, as it is important to continue incentivizing the build out of LD hydrogen refueling stations beyond core market areas in the state to bring hydrogen Fuel-Cell Electric Vehicle (FCEV) accessibility to a larger share of the state’s population. We also support CARB’s proposal to extend location eligibility to other low income and rural areas, as this additional coverage will further promote accessibility and connectivity throughout the state.

Air Products appreciates the flexibility in provisions in 95484.2(a)(1), (a)(7), and 95486.3(a)(1) to allow the dispenser owner or designee to apply for HRI credits. However, we recommend that CARB add a provision for executive officer review and discretion to negate such an arrangement if said arrangement is found to circumvent the 1% deficit cap for a single entity or any other relevant provision for HRI crediting. A company applying for credit should not be able to exceed the deficit cap simply by diversifying the credit claims via multiple commercial arrangements and registered entities.

We support the proposed location requirements for MHD fueling stations as written but seek clarity that the 1-mile distance requirement is based on a radius for the proposed location relative to the criteria and not a 1-mile driving distance.

We appreciate CARB providing an option for private MHD stations to receive HRI credits in support of the Advanced Clean Fleets regulation and we support the lower credit cap for these stations. Providing some crediting for private stations, but a higher level of crediting for public stations, strikes a good balance in the two use cases and will drive investments in the infrastructure necessary for meaningful fleet conversion.

Consistent with past crediting windows, we believe that for both LD and MHD vehicles going forward, a full 15-year crediting period should be allowed. This will help ensure continued station support through 2045 in support of CARB's carbon neutrality goals.

Air Products believes that multi-modal stations which include fueling for both LD and MHD vehicles, utilizing shared compression, storage and dispensing equipment will play an important role in California's hydrogen fueling network. Clarity is needed in the regulation or in guidance as to how the provisions in the separate LD and MHD sections apply. We have drafted language that we believe provides an approach for stations with combined fueling capabilities (in italics below) and propose that it be added to the regulation. Moreover, there is a misalignment in the Energy Economy Ratio (EER) value split and the new HRI provisions as MD vehicles are coupled with LD vehicles in Table 5 for EERs, but are coupled with HD vehicles for the purposes of HRI crediting which apply a credit calculation formula employing an HD EER. Please clarify what tracking or recordkeeping is necessary to assign the correct EER value for HRI crediting.

Proposed combined LD and MHD HRI crediting language – add new § 95486.3 (a)(7) as follows:

(7) Requirements to Generate HRI Credits for Combined ZEV/LD and MHD Hydrogen Refueling Stations.

Application for ZEV/LD-HRI crediting capacity to MHD-HRI Refueling Capacity must submit an application to the Executive Officer to generate additional credits based on the increased dispensing capacity and number of light-duty dispensing units at a MHD hydrogen HRI station. A hydrogen station that fuels ZEV/LD and MHD vehicles will follow the requirements of the current MHD section 95486.3 (a)(1) through (6) with the exception of subsections 95486.2(a)(3)(A), 95486.2(a)(7)(I), 95486.3(a)(4)(G), and 95486.3(a)(4)(G)1, and 95486.3(a)(5).

(A) Whenever section 95486.3(a)(7) is the HRI crediting pathway, calculation of estimated potential HRI Credits will be calculated as the sum of subsections 95486.2(a)(2)(F) and 95486.3(a)(2)(F) for HRI pathway applications received on or before December 31, 2025. Beginning January 1, 2026, the Calculation of Estimated potential HRI credits will be calculated as the sum of subsections 95486.2(a)(7)(D) and 95486.3(a)(5).

(B) Whenever section 95486.3(a)(7) is the HRI crediting pathway, the estimated cumulative value of HRI credits generated for the station in the prior quarter must be less than the difference between 1.5 times the initial capital expenditure reported pursuant to section 95486.3(a)(6)(C)(1) and the total grant revenue or other funding for capital, operational and maintenance expenses reported pursuant to section 95486.3(a)(6)(C)5 and (C)6 in the prior quarter. The capital and operational expenditure cap may be additive for shared station equipment supporting LD and MHD fuel dispensing.

1. The estimated value of HRI credits, for the purpose of this determination, shall be calculated using the number of ZEV/LD and MHD credit generated for the station in the quarter and the average LCFS credit price for that quarter published on the LCFS website. Credits will be calculated as the sum of 95486.2(a)(5) and 95486.3(a)(5) for the HRI pathway application.

(C) Whenever section 95486.3(a)(7) is the HRI crediting pathway, calculations of HRI Credits for Combined ZEV/LD and MHD Hydrogen Refueling Stations will be calculated using the equations found in Sections 95486.2(a)(5) for the light-duty portion of the refueling station and 95486.3(a)(5) for the medium/heavy-duty portion of the refueling station for the HRI application received before December 31, 2030. These two credit calculations will be additive.

Section 95486.3.a(4)(H) caps HD HRI credits to initial eligible capital expenditure reported and cumulative value of MHD-HRI credits earned. CARB should ensure sure that on-site hydrogen production costs are not included in the capital calculation, which would create an unlevel playing field. §95486.3 (a)(6)(B)(1) would create a situation that favors on-site hydrogen generation vs. the more efficient centralized hydrogen production and distribution approach. Operations and maintenance costs should be included in the MHD HRI payback metric as these are differential to the costs associated with electric vehicle charging.

It is our understanding that the grant revenue being referenced in 95486.3.a(4)(H) is related to specific grants or funding revenue related to station construction and station operations and maintenance costs. Please confirm that any value for the production of hydrogen upstream of the station provided by the Inflation Reduction Act under sections 45V or 45Q is not considered “grant revenue or other external funding” for the purposes of this calculation for HRI credits.

References in proposed §95486.3 (a)(4)(G) (see below) – should be (a) and not (b). The HRI section in Appendix A-2 inadvertently references the FCI provisions.

“(G) The estimated cumulative value of MHD-HRI credits generated for the station in the prior quarter must be less than the difference between 1.5 times the initial capital expenditure reported pursuant to section 95486.3(a)(6)(B)1 and the initial grant revenue or other funding reported pursuant to section 95486.3(ba)(6)(B)5 and section 95486.3(ba)(6)(B)6 in the prior quarter”

Hydrogen Tier 1 Simplified Calculator and CalGREET4.0 Model

Consistent with the proposed change to extend low-CI electricity book-and-claim to both production and process energy under 95488.8(i)(1), please update the Tier 1 simplified calculator to provide the necessary inputs and CI calculations to accommodate this proposal.

The emissions factor for liquid hydrogen storage and dispensing (cell E19 on CA-GREET4.0 sheet) is higher than the gaseous hydrogen factor. Does this result come from the CA-GREET4.0 model? Please provide more information on how that factor was determined. It’s significantly higher than what we would expect for power consumption at a liquid hydrogen fueling station, so it is important to understand the assumptions behind the factor.

Air Products suggests that it would benefit all users of the model to build into the CA-GREET4.0 sheet, or the instruction manual, information on how to use the CA-GREET4.0 full model to calculate the emission factors given in the Tier 1 calculator. There would be two benefits to this: (1) increased awareness/confidence the Tier 1 calculator is consistent with CA-GREET4.0; and (2) providing a starting point for pathway applications which need to propose modifications to CA-GREET4.0 for Tier 2 applications of complex pathways. We recommend including this additional information.

We note the substantial decrease in the California average grid electricity CI used as a transportation fuel from a value of 93.75 gCO₂e/MJ to 81 gCO₂e/MJ in Table 7-1. A similar value should be applied as a default in the Tier 1 Simplified Hydrogen Calculator to grid connected electrolysis units that are deployed in California as this is incremental grid demand similar to direct supply of electricity to charging. This would place hydrogen and electricity supply to zero-emission vehicles on a more level playing field.

Intrastate Jet Inclusion as Deficit-Generating Fuel

Air Products is supportive of actions to further the state’s decarbonization goals and stimulate additional credit demand in the LCFS program. To this end, we are supportive of including intrastate jet fuel as an obligation-generating fuel. This will spur demand for cleaner jet fuel and possibly hydrogen for aviation in the future consistent with Governor Newsom’s target of 20% sustainable aviation fuels by 2030 and the full transition to clean aviation fuels by 2045 as presented in the 2022 Scoping Plan Update scenario.

Project-Based Crediting

Air Products appreciates CARB’s amendments throughout §95489 to clarify that hydrogen production facilities not co-located with a petroleum refinery can generate credits under the refinery investment credit and renewable hydrogen provisions. This is an important clarification and provides equitable treatment between third-party hydrogen production and production embedded in refinery operations.

We urge CARB to reconsider retaining the opportunity for renewable hydrogen to be eligible for project-based crediting beyond 2040. While CARB anticipates a substantial phase-down of petroleum refining, it will be important to preserve some emission reduction opportunities for the refining capacity that remains, as recognized in the 2022 Scoping Plan Update, and preserving the renewable hydrogen option recognizing the role that hydrogen can play to ensure that residual petroleum refining helps meet CARB’s decarbonization goals for the transportation sector. We note the exemption from phase-out provided for Carbon Capture and Sequestration (CCS) and renewable hydrogen has a similarly important role to play. There is still refining capacity anticipated in 2045 so enabling crediting to at least 2045 will continue to promote emission reductions at these facilities.

Additional Language and Technical Suggestions and Clarifications

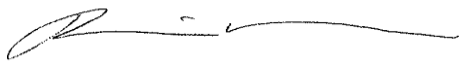
- We appreciate the improvements proposed for the renewable hydrogen definition but suggest some additional changes to ensure that all conversion technologies and potential feedstocks are captured, including renewable ammonia used as a feedstock to produce hydrogen.

“§95481 (a) “Renewable Hydrogen” means hydrogen derived from (1) electrolysis of water or aqueous solutions using renewable electricity; (2) catalytic cracking, partial oxidation, autothermal reforming, oxidation or steam methane reforming of biomethane or other biogenic or renewable feedstocks hydrocarbons; 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, means electricity derived from sources that qualify as eligible renewable energy resources as defined in California Public Utilities Code sections 399.11-399.36.”

- There is a reference to hydrogen in the Low CI electricity as a fuel section – §95488.8 (i)(1)(A) - which was not deleted like other similar references. We believe this reference is no longer needed given the new section related to hydrogen as a fuel.
- We request that CARB consider including information on how many credits are generated via smart charging and smart electrolysis in the quarterly summary spreadsheet posted on-line – distinct from other charging and electrolysis credit-generation pathways. This information will help the market understand the opportunity for incremental credit generation associated with these pathways.
- 95488.10 (a)(4) should acknowledge that low-CI electricity can also be used for process energy for hydrogen used as a transportation fuel – and not just for the “hydrogen production via electrolysis” – consistent with 95488.8(i)(1).
- Air Products supports phasing down electric forklift crediting based on existing fleets that effectively transitioned to electrification where credits under the LCFS are understood to have little to no impact on the rate or magnitude of the transition (i.e., electrification is the baseline for new purchases/replacements and no longer should be considered an opt-in source eligible to generate LCFS credits). This is a durable principle that can be applied to other sectors when the transition is sustainable. However, we do not believe that adjusting the Energy Economy Ratio (EER) is a valid way to do this and are concerned about the precedent this will set for other vehicle classes. The CI targets in the LCFS regulation are anchored in the CI of the base fuels – gasoline and diesel. The EERs that are used in the credit generation calculation should likewise always be calculated relative to the conventional fuel vehicles that are being replaced. This helps ensure proper crediting for the vehicle turnover that is needed to comply with various ZEV regulations and mandates.

Air Products appreciates the opportunity to provide this feedback on the 45-day package and we would be happy to meet with CARB to discuss any of these topics further. Please feel free to contact me at hellermt@airproducts.com.

Respectfully,



Miles Heller
Director, Greenhouse Gas, Hydrogen, and Utility Regulatory Policy