



August 27, 2024

The Honorable Liane Randolph
Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95864

Re: 15-day Changes to the Proposed Low Carbon Fuel Standard Regulation

Investing in regulatory policy is risky and the 15-day proposed changes to the Low Carbon Fuel Standard strongly reinforce this fact.

On behalf of the undersigned, we are pleased to submit the following comments for consideration as the California Air Resources Board (CARB) deliberates the proposed 15-day updates to the Low Carbon Fuel Standard (LCFS). We appreciate the considerable time that staff have committed to developing the LCFS updates. However, the proposed 15-day changes deviate from the prior proposal that simply needed fine tuning to achieve the goals of the LCFS and support implementation of other CARB policies. The departure from a technology-neutral performance standard to one that dictates innovation pathways with extremely specific requirements will have negative consequences impacting the development of hydrogen as an alternative fuel and energy carrier in California.

Need for an Additional 15-day Comment Period

The recent 15-day changes to the regulation package have introduced significant challenges that undermine the progress made during the years leading up to and the release of the initial 45-day comment period. These modifications have not been previously workshopped and seem more political than policy. This is a major concern for this nascent industry as many of the changes undermine years of collaboration with CARB staff to achieve a positive market signal while our existing hydrogen refueling station (HRS) network is struggling with current LCFS market conditions.

The most pressing issue is the imposition of a more stringent and separate renewable content standard for hydrogen compared to other zero-emission fuels. This approach diminishes the benefits of diverse hydrogen production pathways and disregards a holistic, ecosystem-based strategy crucial for hydrogen's role in California's energy future. The LCFS is vital for the deployment and decarbonization of hydrogen. However, the new restrictions risk undermining the program's effectiveness by introducing higher costs and conflicting with sound energy policy.

Moreover, these changes are inconsistent with the broad range of technologies endorsed by the U.S. National Clean Hydrogen Strategy and Roadmap, which are necessary to meet hydrogen production targets and job creation goals through 2050. Without a single workshop to discuss these significant shifts, the state risks setting an energy policy that not only hampers innovation in this emerging field but

also imposes unnecessary costs and barriers to integrating hydrogen into a highly renewable energy system.

Given these substantial impacts, it is imperative to extend the comment period to allow for a thorough review and to ensure that the policy supports, rather than hinders, the development of a robust hydrogen economy.

Carbon Intensity Benchmark

CARB's proposal to accelerate the reduction of Carbon Intensity (CI) benchmarks between 2025 and 2029 represents a positive shift in the program's ambition. In previous comments we supported this acceleration, aimed at eliminating a surplus of credits, including a 9% step down in 2025, with the reduction slope increasing from 20% to 30%. While the benchmarks for 2030 and beyond remain consistent with the initial 45-day notice

Based on secondary market reactions and the current size of the bank, these reductions may still fall short of providing the necessary market signals to drive notable change until later in the decade. When contemplated in the context of the overall proposal, we have concerns that the market signal may not be sufficient to support the costs of the newly proposed requirements. The 1.45% annual declines are too small given ZEV mandates considering the compounding impact they will have on LCFS credit generation (from charging/ hydrogen refueling) and deficit creation (less deficits due to less gasoline demand). Furthermore, with the appropriate CI benchmarks, there is simply no need to impose arbitrary restrictions on fuels throughout the 15-day changes, as the market would manage those details while allowing innovation and technology deployment to drive decisions.

Recommendation: CARB may want to contemplate a 2% annual stepdown between 2025 and 2030 achieving a 32.75% benchmark in 2030. This is less than one auto-adjustment mechanism (AAM) trigger but may send a stronger market signal and achieve the same 2035 benchmark of 52.5%. We do support maintaining the AAM as a backstop.

§ 95481. Definitions and Acronyms

The definition of "Medium-Duty Vehicle" (MDV) is misaligned for vehicle refueling behavior. While there are varying government definitions for MDVs, based on the utilization for this rulemaking it is best to use the Federal Highway Administration Gross Vehicle Weight Rating (GVRW) Category.¹

Recommendation: Increase MDV to mean a vehicle that is rated at 10,001 and 26,000 pounds GVRW. This also requires adjusting the "Light-Duty Vehicle" (LDV) definition to mean a vehicle that is rated at 10,000 pounds or less GVRW.

§ 95482. Fuels Subject to Regulation

The LCFS program must remain technology-neutral to effectively support California's hydrogen economy. Removing LCFS crediting eligibility for hydrogen produced from fossil natural gas undermines the potential for carbon capture and sequestration (CCS), while also assuming that the carbon intensity of the natural gas grid will remain unchanged until 2030. Natural gas-derived hydrogen with CCS is a cost-effective form of clean hydrogen currently being produced in the US. This removal will hinder the

¹ <https://afdc.energy.gov/data/10380>

hydrogen industry's ability to deliver clean, low-cost hydrogen to the market and many end users, in an environment where gasoline and diesel-parity pricing is sought. Additionally, CCS infrastructure paired with biomethane has significant environmental benefits and is a long-term necessity for achieving carbon neutrality.

However, we need time and supporting policy to build the infrastructure and capacity to capture and direct biomethane to centralized hydrogen production facilities. Without appropriate economics adoption of fuel cell vehicles and hydrogen end uses will be delayed as current economics, legal uncertainty with the zero-emission rules, and LCFS market conditions do not support the macro or microeconomic needs to drive the transition. This shift represents a departure from the LCFS program's longstanding commitment to science-based regulation. The elimination of CCS, a proven technology, defies this principle and risks setting a dangerous precedent.

Justifying this change by pointing to the Investment in Infrastructure and Jobs Act does fail to recognize the scale and pace of CARB's adopted mandates and imposes additional costs of approximately \$2-3.50² per kilogram of hydrogen during a market transition from cheaper vehicles and fuels. Delaying transition to hydrogen and fuel cells will prolong the combustion of diesel and the harmful associated emissions to communities along our transportation and goods movement corridors.

The scale of California's Hydrogen Hub does not match the needs to achieve CARB's own regulatory ambition with vehicles, fleets, buses, forklifts, and other end uses – let alone significant enough to end the eligibility of a cost-effective hydrogen production within the LCFS. These projects face significant investor and local permitting hurdles, with development timelines ranging from forty to over sixty months. If these projects do not reach a final investment decision by the end of 2025, they may not come online by 2030. By eliminating CCS from LCFS crediting, CARB effectively removes increasingly lower carbon hydrogen from California's hydrogen economy. This decision narrows the field of low-carbon hydrogen producers, reduces competition, and allows the few green hydrogen producers to charge a premium in the absence of competitive pressure. Instead of promoting competition to drive down hydrogen prices and improve service, this approach stifles market development and undermines California's hydrogen economy before it even begins. Furthermore, this decision also curtails the potential deployment of innovative, non-reforming processes like methane pyrolysis.

The electric sector only has a 60% renewable requirement on retail sales by 2030 that is supported by billions in ratepayer funds annually along with substantial State general fund and special fund expenditures to support the goal – on top of significant, decadal state and federal tax credits. By 2045 retail sales from the electric sector must maintain 60% renewable and the remaining 40% shall be zero carbon by 2045. The California Energy Commission's (CEC) recent California Energy Resources and Reliability Outlook, required by SB 423 (Stern, Chapter 243, Statutes 2021) report highlights the flexibility in energy resources that can contribute to this zero-carbon goal, yet this flexibility is not extended to the hydrogen industry under the proposed LCFS changes. The elimination of natural gas as a feedstock also precedes completion of the SB 1075 (Skinner, Chapter 363, Statutes 2022) report and the Governor's Office of Business and Economic Development's California Hydrogen Market Development Strategy which are intended inform when and how to transition the hydrogen sector. This creates an arbitrary and unnecessary bias against hydrogen, imposing a standard that even the electric sector is not required to

² Dependent on the value of LCFS credits, higher values increase cost of biomethane attributes and vice versa.

meet. Furthermore, these requirements are only on retail electricity, which discounts about 10-15% of energy on the electric grid during the year.

In addition, California ratepayers invest between \$5-6 billion annually in procurement costs to support renewable electricity for the electric sector, as indicated in the annual Padilla Report on Costs and Cost Savings for the RPS Program. This far exceeds the comparatively small investment from California in renewable hydrogen, even when considering the expected federal funds for the hydrogen hub (ARCHES). Given these disparities, imposing additional constraints on hydrogen is both inequitable and counterproductive to California's broader environmental renewable goals.

It is important to keep in mind that current market conditions do not favor electrolytic hydrogen production. Two key factors contribute to this situation, the first one is electrolyzer capital cost (CAPEX) and second is the time-matching & additionality principles in the 45V credit proposed guidelines. The effect of these two factors multiplies each other exacerbating the issue. On one side, electrolyzer CAPEX on completed projects around the world has proven to be higher than initially expected. The total cost of installed electrolyzers is beyond the initial assumptions of \$2,000/kW, which in a 24 x 7 operation represents from \$6 to \$10/kg on the final hydrogen cost for capital recovery. The risk and uncertainty of hourly time matching and additionality requirements imposed by proposed Internal Revenue Service 45V draft guidelines, and several failed California Assembly Bills, would limit capacity factors and in turn increase hydrogen costs due to lost productivity.

These economic dynamics are exacerbated in California where the electricity costs are significantly higher than neighboring states. In California, electricity operational costs only account for \$6 to \$8/kg on the total cost of hydrogen. In many cases, California produced electrolytic hydrogen could be close to \$20/kg total cost before LCFS credits. The resulting cost would be prohibitive for the adoption of any mobility application. Prematurely taking hydrogen pathways off the table, as proposed in this section, will jeopardize the future of hydrogen mobility success in the state.

CARB should focus on maintaining a technology-neutral LCFS that encourages innovation, competition, and cost-effectiveness, ensuring that all potential low-carbon hydrogen sources can contribute to California's clean energy future.

Recommendation: Do not adopt the 15-day proposed change.

§ 95486.2. Generating and Calculating Credits for ZEV Fueling Infrastructure Pathways.

The 15-day changes propose striking the December 31, 2025, date for applications received. This change undermines the long-lead time planning for development of approximately 50 HRS awarded by CEC Clean Transportation Program and other funding source grants that are relying on the terms of the current rule to help credit their development. Furthermore, CEC grants for hydrogen refueling were designed based on the current HRI pathway when LCFS values were much higher than they are today. This proposed change further adds to the headwinds facing the development and investment in those station awards. Adding this strikeout compounds our concerns of losing those investments.

Recommendation: Do not adopt the 15-day proposed changes. We strongly suggest that the eligibility of the current LD HRI program be extended through the end of 2025 and stations already awarded by the CEC be grandfathered in the current LD HRI program.

§ 95486.3. Generating and Calculating Credits for ZEV Fueling Infrastructure Pathways for Light- and Medium-Duty Vehicles.

We appreciate the strategic pairing of Medium-Duty (MD) with Light-Duty (LD) vehicles, as they often frequent the same fueling locations due to their shared operational focus on serving population centers. This alignment is backed by a white paper from U.S. Auto Manufacturers³, emphasizing the industry's view on MD vehicles and their specific operational needs. In our 45-day comment letter, we proposed—and continue to advocate—that these stations and the HRI credits supporting them should accommodate high-flow refills of 10 kilograms or more per session for vehicles with a gross vehicle weight rating of 26,000 pounds or lower, commonly known as Class 6 vehicles.

However, we are concerned about the low station capacity requirements set at 2,000 kg/day with a 50% derating factor. Under the 15-day changes, this would necessitate building larger stations that would receive fewer HRI credits than the current program for MDV trucks. In effect, CARB is requiring stations to be 40% larger while providing 20% fewer credits. The current program's capacity at 1200 kg/day without derating is sufficient given the appropriate flow rates to refill medium duty vehicles and will go a long way toward building the foundations of a self-sufficient statewide network.

The proposal further restricts credit generation by capping it at 1.5 times the capital expenditures (capex). The original intent of the HRI capacity credit was to offset ongoing operations and maintenance (O&M) costs, thereby reducing costs for drivers. Linking cumulative HRI credits to capex undermines this objective by limiting station providers' ability to (a) support ongoing O&M while maintaining affordable hydrogen prices and (b) continue expanding the station network.

Recommendation: We recommend removing the 50% derating for public hydrogen refueling stations and eliminating the capex limit to better support ongoing operations and network expansion. If CARB believes it is necessary to limit crediting, then select either the cap or the derating but not both.

§95486.4. Generating and Calculating Credits for ZEV Fueling Infrastructure Pathways for Heavy-Duty Vehicles.

As stated in our 45-day comments, we truly appreciate the diligence and hard work staff has put in with our organization to develop this pathway and we believe this is critical for the successful deployment of fuel cell electric trucks in compliance with the requirements set forth in CARB's Advanced Clean Fleets regulation. Unfortunately, some of the proposed requirements for Heavy-Duty Hydrogen Refueling Infrastructure (HD-HRI) stations present significant challenges that could undermine the development of a robust hydrogen fueling network in California.

Limiting Crediting

The proposal to apply a 50% de-rating factor for shared HD-HRI stations is also problematic, especially given the accelerated benchmarks. A more reasonable approach would be to advocate for a 25% de-rating factor, considering the revised slope. CARB's goal with the HD HRI proposal is to ensure the state does not put the market in a "chicken-and-egg" scenario, where fleets are waiting for stations and stations are waiting for fleets. Designed to eliminate this conundrum and deploy HD HRS early in the

³ [Necessity for H₂ Refueling Stations for Medium-Duty Fuel Cell Electric Vehicles in the U.S.](#), United States Council for Automotive Research, August 23, 2023

market cycle, our industry made the original HD HRI proposal⁴ in September of 2022 based on the current LCFS compliance curve and determined that under projected market conditions the financial risk of deploying capital was balanced against projected HRI program income.

The proposal further restricts credit generation by capping it at 1.5 times the capital expenditures capex. The original intent of the HRI capacity credit was to offset ongoing operations and maintenance O&M costs, thereby reducing costs for drivers. Linking cumulative HRI credits to capex undermines this objective by limiting station providers' ability to (a) support ongoing O&M while maintaining affordable hydrogen prices and (b) continue expanding the station network.

While we applaud CARB's efforts to accelerate the pace of decarbonizing the state's transportation sector, the unintended consequences put the deployment of previously planned HD HRS at risk. CARB has made two arguments against adjusting the 50% discount. The first is that the price of the LCFS "will" increase and developers will see ample revenue from this outcome. In the eyes of developers, a significant increase in the LCFS price may or may not happen. HD HRS are (very) costly investments and aligning commercial fleets with take-or-pay agreements to ensure a return on capital at this point in the market cycle is exceptionally challenging. Unless developers are given the right program signal from CARB in the form of an acceptable HRI discount, many planned HD HRS developers simply will not act, HD HRS will not get built and the market will be facing the chicken-and-egg scenario this program was designed to avert. We would further note that the proposed amendments go to great lengths to support the ARCHES program. ARCHES' primary market development segment is transportation where they propose 5,000 HD fuel cell trucks for the program and over 50 HD HRS. Given this goal, HD HRS deployments supported by the HD HRI are critical to the program's success.

The second argument made by CARB is a concern of giving "too much away" to developers in the form of HRI credits. This is a fair concern and one we shared leading to the development of a derating mechanism; however, CARB has already addressed this by placing a cap on HD HRI program revenue for each asset. Given the cap, any concern of over-paying developers is moot. If in fact LCFS prices rise as CARB intends, developers will hit the cap (sooner), if prices fail to rise then developers may (or may not) reach the cap and are left with 10 years of HD HRI credits and the risk associated with this market-based program. A 25% discount would better align with the program's goals of HD HRS deployments and promote deployments which support the state's decarbonization goals.

Recommendation: The proposed 50% derating factor and capex credit limit should be reevaluated to ensure they do not undermine station development and ongoing operations. If CARB believes it is necessary to limit crediting, then select either the cap or the derating but not both. They serve the same purpose but when paired they deteriorate the value proposition of investing in a HD HRS.

Station Location Limitations

The requirement that HD-HRI stations must be located within five miles of any Federal Highway Administration (FHWA) Alternative Fuel Corridor is highly restrictive and overlooks critical freight routes such as drayage routes. This requirement could inadvertently limit the redundancy of the fueling network and eliminate high traffic points in the freight system which are essential for reliable service. There is no sound rationale for this restriction. While many refueling activities occur near freight

⁴ <https://www.arb.ca.gov/lists/com-attach/8-lcfs-wkshp-aug18-ws-AmhVJIM+VnwHLABh.pdf>

corridors, not all do, and refueling should not be constrained by proximity to these corridors. CARB staff currently has the authority to accept or reject HRI credit applications, which should be based on the merits of each proposal rather than an arbitrary distance requirement. For example, the Otay Mesa border crossing—one of the busiest freight corridors—is not within five miles of a designated clean corridor, yet it sees over a million truck crossings annually. This is a clear example of how such a rule could undermine the strategic placement of HRS.

Recommendation: We recommend Executive Officer discretion on requirements for HD-HRI station placement outside of the five-mile limit.

Disqualifying Early Investments

The proposal to disqualify stations permitted before January 1, 2022, from HRI crediting further impacts the eligibility of existing heavy-duty stations. These stations are the ones most in need of support, especially given the current low demand. Imposing such restrictions could jeopardize the economic viability of these stations, which are crucial for bridging the gap until more infrastructure is built. This approach contradicts the goal of fostering a sustainable hydrogen network. If they are able to meet the requirements of the proposal they should be credited.

Recommendation: We also suggest revising the eligibility criteria to include stations permitted before January 1, 2022, to November 1, 2021.

HyCap Capacity Methodology

Additionally, the method for calculating station refueling capacity using the HyCap model or an equivalent methodology approved by the Executive Officer needs standardization and additional work. Without a consistent methodology, the program may face unintended consequences, such as discrepancies in capacity estimation that could skew the allocation of credits and affect the overall effectiveness of the HRI program.

Recommendation: Continue to work with station developers and the National Renewable Energy Laboratory to develop standardization for a second 15-day proposal.

The provision requiring that HD-HRI stations must not impose any obstacles, such as access cards or PIN codes, to dispense fuel could unintentionally hinder the adoption of hydrogen technology. Training and onboarding are critical for fleet operators who frequently rotate drivers and ensuring that drivers are comfortable with new fueling technology is essential. Security measures, such as access cards, should not be seen as barriers as long as the stations remain accessible to customers.

Recommendation: Redefine publicly available to recognize security features intended to keep the general public safe but allows access for customers.

§ 95486.3 and §95486.4. – Crossover Concerns

Renewable Content Requirement

The proposed requirement that HRS achieve 40% renewable content before 2030 and 80% thereafter is inequitable. This requirement should be technology-neutral, aligning with the renewable content of the grid at that time to ensure fairness across different energy sectors. Applying this mandate exclusively to

hydrogen places the industry at a competitive disadvantage compared to other energy sources that receive significant federal, state, and ratepayer subsidies. This is particularly concerning given the lack of a pathway for hydrogen to generate Hydrogen-Renewable Identification Numbers (H-RINs) under the federal Renewable Fuel Standard (RFS), further economically disadvantaging hydrogen compared to renewable natural gas and electricity. While the industry is committed to increasing renewable content, such a stringent and exclusive requirement is costly and discriminatory.

Regarding the renewable content requirement, the mandate that stations must have 40% renewable content before 2030 and 80% thereafter is overly stringent and should be technology-neutral, aligning with the renewable content of the grid at that time. This alignment ensures fairness across different energy sectors and avoids placing undue burdens on the hydrogen industry (see comments above on this policy).

Recommendation: Hydrogen should not be required to be more renewable than the grid, meaning 60% renewable content by the end of 2030 and in 2045 100% renewable and clean.

Credit Generation and Market Growth Implications

The restriction limiting HRI credits to 2.5% of deficits in the prior quarter, with a further limitation of 1% for any single applicant, is another restrictive measure that could significantly limit the program's impact. It is crucial to assess what these caps mean in terms of the number of stations and ensure they do not stifle network growth. Companies willing to take early risks in this market should not be disincentivized from building and deploying future stations.

Recommendation: Eliminate the 1% cap for a single entity.

Station Construction Timeline

The requirement that stations must be constructed within 24 months or risk application cancellation is too rigid. Given the complexities and potential delays in station construction, this timeline could result in the cancellation of viable projects and further deter investment. HRS have not received the same legislative support for streamlining and interconnection that charging infrastructure has enjoyed over the years. While we have worked diligently to advance our own legislative efforts, these remain incomplete, and the timing of station openings is far less predictable than for charging stations. HRS relies heavily on HRI credits to secure financing, and the risk of losing HRI approval due to permitting delays, supply chain issues, or construction setbacks introduces too much uncertainty for investors.

Recommend: Providing an extension process subject to Executive Officer approval.

Concerns Over Private Depot Crediting

As previously expressed, we continue to assert that private depots should not be overbuilt and capacity crediting for private fleets is counterproductive to the purpose and intent of HRI. It hinders effective utilization of resources and undermines the efficiency of the infrastructure. Private depots carry no risk since they control their own demand. The purpose of the HD HRI program is to eliminate the risk of underutilization and promote the installation of HD HRS absent adequate bilateral contracts that would secure offtake and return on capital invested. Should CARB want to extend crediting to private depots, it should be limited and restricted to public transit fleets only. We want to reiterate that the purpose of the

HD HRI program is to eliminate the risk of underutilization and promote the installation of HD HRS absent adequate bilateral contracts that would secure offtake and return on capital invested.

Recommendation: Should CARB want to extend crediting to private depots, it should be limited and restricted to public transit fleets only.

§ 95488.1. Fuel Pathway Classifications.

The classifications list different fuel pathways for hydrogen but does not list biomass gasification to hydrogen. The omission of renewable hydrogen from biogenic sources also slows our efforts to capture methane emissions. In 2016, the Legislature adopted, and Governor Brown signed the Short-Lived Climate Pollutant Strategy requiring deep emissions reductions. According to the 2020 Lawrence Livermore “Getting to Neutral” analysis, there are fifty-six million bone dry tons of organic waste produced per year and “gasifying biomass to make hydrogen fuel and CO₂ has the largest promise for CO₂ removal at the lowest cost and aligns with the state’s goals on renewable hydrogen”. The State has also funded projects to utilize forest waste for hydrogen generation (through the Department of Conservation) to help meet its wildfire reduction and clean energy goals, but this proposal would exclude those projects from permit streamlining and other incentives. This policy package should be expanded to ensure these facilities qualify for fuels production thus incentivizing development with as much offtake as possible.

Recommendation: Include biomass gasification in this section.

§ 95488.8. Fuel Pathway Application Requirements Applying to All Classifications.

The proposed approach to indirect accounting for low- CI electricity, biomethane, and low-CI hydrogen only includes electrolytic hydrogen production. The 2022 Scoping Plan describes the need and utilization of hydrogen across sectors, modelling that approximately half of all hydrogen in 2045 would come from biogenic sources. Allowing all hydrogen production to utilize low-CI electricity for production and processing further deliver on California’s goals to deeply decarbonize the economy. Relegating these benefits to a singular hydrogen production pathway limits the benefits to the environment and economy by restricting this decarbonization and crediting benefit to electrolytic hydrogen that as we have discussed faces headwinds in the absence of specific electric sector policies and grid access that will allow it to be produced cost-effectively and control the RECs associated with electric procurement.

Recommendation: With a focus on carbon intensity and the absolute necessity to develop decarbonized hydrogen production from a variety of biogenic feedstocks to mitigate the detrimental impacts of methane emissions and biomass, CARB should not limit these provisions to electrolytic hydrogen only.

Conclusion

While we appreciate the intention to create a robust and reliable hydrogen fueling infrastructure, the 15-day proposed changes creates restrictions risk undermining this goal. A more flexible and balanced approach is needed—one that promotes competition, supports existing infrastructure, and aligns with California’s broader energy and climate changes goals without imposing unnecessary burdens on the hydrogen industry.

After years of workshops, we are concerned that this late in the rulemaking there are substantial problems that will stifle the renewable and clean hydrogen industry in California. It is imperative that CARB urgently revise and issue an additional 15-day proposal that will enable hydrogen investments in the state in support of our zero-emissions end use regulations. We appreciate CARB staff's work on the development of the proposed rule and their commitment to improving the LCFS. We are committed to working with CARB to get this regulation to the point where we can fully support adoption in November.

Thank you,

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