September 13, 2022

Dr. Cheryl Laskowski
California Air Resources Board
1001 I Street Sacramento, CA 95812

Dear Dr. Laskowski,

On behalf of the undersigned organizations and companies, we are pleased to submit the following comments for consideration as the California Air Resources Board (CARB) develops updates to the Low Carbon Fuel Standard (LCFS). The program is one of the strongest carbon markets in the world, driving significant private investment in achieving the carbon intensity (CI) target. The strength of this market signal is working; however, changes must be made to buttress credit pricing to drive investments necessary to achieve California's 2045 carbon neutrality goal. Additionally, the expansion of infrastructure credits for zero-emission vehicle charging and hydrogen refueling is important to achieve CARB's objectives with the developing Advanced Clean Fleets (ACF) rulemaking.

2030 Carbon Intensity Adjustment

We support adjusting the CI to an appropriate level to support the additional deficit necessary to extend the Hydrogen Refueling Infrastructure (HRI) Pathway and the Fast-Charging Infrastructure Pathway to heavy-duty (HD). We look forward to working with CARB staff on analyzing these credits in the context of the final Scoping Plan to better determine the appropriate 2030 CI adjustment. We believe a potential 2045 target, plus 5-year interim targets can help support long-term investments. The 5-year interval fits contextually with CARB's quintennial Scoping Plan cycle.

Hydrogen Refueling Infrastructure Pathway

We appreciate the inclusion of a Heavy-Duty (HD) HRI Pathway in the staff presentation and look forward to refining the details of this proposal for the upcoming LCFS rulemaking. The existing HRI pathway is an effective policy tool that is helping achieve two hundred Light-Duty (LD) hydrogen refueling stations (HRS) as directed by Governor Brown in Executive Order B-48-18, and decarbonize the hydrogen supplied to these HRS. Replicating this tool to HD HRS will similarly help California launch the zero-emission HD market by (a) solving the "chicken-or-egg" problem with HRS development to support hydrogen Fuel Cell Electric Truck (FCET) adoption needed to achieve CARB regulatory requirements for Advanced Clean Fleets (ACF); (b) ensuring stations are appropriately sized to enable growth; and (c) continuing the development of decarbonized hydrogen supply in California and meet the expectations necessary to achieve CARB regulatory requirements proposed in ACF.

We support a separate HD HRI Pathway with an additional 2.5% of deficits from the prior quarter. The HD HRS receiving credits from the HRI pathway should be in California, publicly available, and primarily serve HD fleets. These HRS can be identified as having sufficient physical access (e.g., turning radiuses, fueling lanes, canopy height, and land) for fueling Class 8 vehicles.

Eligibility

In the early stages of FCET deployment, **we believe state incentives should focus on public facilities** that will allow more fleet operators to transition over time and mitigate the additional cost pressures of their transition. There are instances, like Sunline Transit, where there will be a private and public side of the station. We look forward to collaborating with staff and the National Renewable Energy Laboratory (NREL) on developing the tool that will allow appropriate allocation of station capacity in the HRI certification, tracking and crediting at such "public-private" stations.

Crediting Period

We support a crediting period of 15 years as being important for the objective of "long-term operation" which will mitigate the risk to LCFS and market confidence in FCET adoption of stations closing prematurely. HRI crediting naturally sunsets as HRS utilization increases, and we should expect decreasing HRI crediting for a particular station over the 15-year period due to increased deployment of FCEVs and FCETs. There is also potential for the utilization of HD HRS and decrease in HRI crediting to occur more rapidly than at LD stations if commercial fleets motivated by ACF adopt FCET in large increments, creating a step change in utilization at HRS. The 15-year crediting period will partially de-risk the rate of FCET adoption for HRS developers, thereby supporting the early action to build HD HRS that is needed to support that very FCET adoption and will support the continued operation and maintenance of these first-of-kind HD HRS stations during the initial uptake of the ZEV HD fleets.

Max Station Capacity

As proposed with a HRS capacity certification for HRI crediting capped at 3,000 kilograms per day and de-rated 50 percent, the proposal is insufficient to spur investments in stations that are sized to meet CARB's ACF goals. An HD HRS is estimated to cost at least three times more to build and operate than an LD/MD Retail HRS, with a high degree of uncertainty as no stations of this size have yet been built or operated. The cap and de-rating as proposed by CARB staff would effectively limit the maximum HD HRI crediting to 1,500 kg/day capacity,

which is more in line with the needs of an LD HRS where the cap is 1,200 kg/d than an HD HRS where the effective cap needs to be approximately three-times larger to be effective as intended.

Establishing the HD HRI crediting structure balances two important objectives: (1) stations with sufficient capacity to support commercial fleets adopting FCET (overcoming the “chicken-or-egg" dilemma by offsetting low initial utilization of station capacity needed for ZEV FCET adoption), while (2) expanding fueling station network coverage for convenient and ubiquitous access to hydrogen fuel by maximizing the number of stations supported through HD HRI crediting within the 2.5% of deficits from the prior quarter.

In our collective experience, **station capacity of at least 6,000 kg/d should be encouraged through HD HRI crediting** to serve the much larger fueling needs of HD FCET. However, simple eligibility for certification of this capacity as in the existing HRI pathway could make the number of stations supported by HD HRI crediting too few. In effect, a mechanism is needed to render a portion of the station capacity “*Non-Credited*” for HRI, in order to support stations being right sized with crediting eligibility up to 6,000 kg/d (*Station Capacity Certification Limit*).

We have analyzed and recommend CARB consider three possible ways to accomplish the intended balance. Based on our analysis, these three approaches would create similar HRI crediting potential as hydrogen fuel sales increase and HRI crediting decreases. **Common amongst these approaches is the *Station Capacity Certification Limit* of 6,000 kg/day; differing is the mechanism to render a portion of the certified capacity *Non-Credited*.** In all these approaches, a station can be built with more or less capacity than the *Station Capacity Certification Limit*.

Approach: De-Rating

In the CARB staff proposal, the HD HRI crediting is “de-rated” according to the following order of operations. First, the station capacity is certified, up to the *Station Capacity Certification Limit* (proposed at 3,000 kg/day). Second, the fuel sales quantity is reported on a quarterly basis. Third, the remaining station capacity is calculated as the difference between the certified capacity and fuel sales quantity. Fourth, the HRI crediting basis is calculated as the remaining station capacity multiplied by the de-rating factor (proposed at 50%).

In geometric shapes, the HRI crediting potential may be visualized in the figure below. This approach, as with the existing HRI pathway, begins the decrease “off-ramp” in HRI crediting immediately as hydrogen fuel sales increase, while the de-rating creates an area of *Non-Crediting* (grey) that limits the potential HRI crediting (orange) such that more stations and fueling network coverage can be supported within 2.5% of deficits from prior quarter.

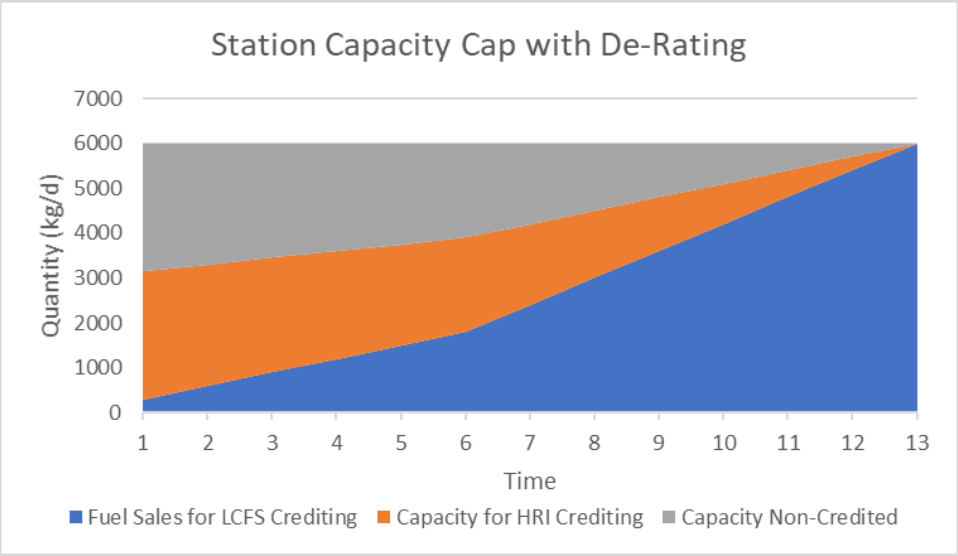

Figure 1: Station Capacity Certification Limit at 6,000 kg/d with de-rating at 50 percent

However, as proposed, the combination of *Station Capacity Certification Limit* of 3,000 kg/day along with de-rating at 50% provides neither sufficient support to investments in station development, nor support for the station capacity we believe is needed to meet CARB's ACF goals. **If the de-rating approach is taken, we urge CARB to establish the *Station Capacity Certification Limit* at 6,000 kg/d with de-rating at 50% (Figure 1).**

Furthermore, the de-rating mechanism may create practical difficulties for "multi-duty stations" serving both LD and HD vehicles, especially in the allocation of station capacity between the two different HRI pathways, and in reporting hydrogen fuel sales according to vehicle class (i.e., into the correct HRI pathway). The fundamental difference between the LD HRI Pathway (not de-rated) and the HD HRI Pathway (if de-rated) would increase the importance of accurate allocation of HRS capacity when certifying a "multi-duty" HRS into both the LD HRI and HD HRI Pathways (see comments below). Second, in practice it would not be possible for HRS operators to accurately report hydrogen sales quantity by vehicle class.[1] **We therefore urge the CARB to consider one of the two alternatives below, neither of which uses "de-rating" of the HD HRI crediting** as the mechanism to create a "non-credited" portion of the certified station capacity.

Approach: Crediting Band

A *Maximum HRI Crediting Limit* can be used to appropriately limit the maximum potential HRI crediting for a hydrogen refueling station, without de-rating, while supporting the recommended station capacity certification limit of 6,000 kg/d. With this approach, the HRI crediting basis is calculated as the lesser of (a) the difference between the certified station capacity and fuel sales quantity, or (b) the *Maximum HRI Crediting Limit*. In geometric shapes, the HRI crediting potential may be visualized as a "band" in the figure below. This approach provides more stable HRI crediting potential during the initial increase of capacity utilization – thereby supporting market confidence for continued operation of hydrogen stations serving FCET adoption – before the

[1] Hydrogen fuel sales can be tracked at each dispenser, by fueling lane, and often by vehicle tank capacity and configuration according to the fueling protocol. But vehicle classes are defined by size/mass of the vehicle, with likely diversification of hydrogen tank configurations and fueling protocols, which makes correlating hydrogen sales with vehicle class imprecise and difficult.

decrease “off-ramp” in HRI crediting with further increasing fuel sales occurs. The *Maximum HRI Crediting Limit* creates an area of *Non-Crediting* (grey) that limits the potential HRI crediting (orange) such that more stations and fueling network coverage can be supported within 2.5% of deficits from the prior quarter.

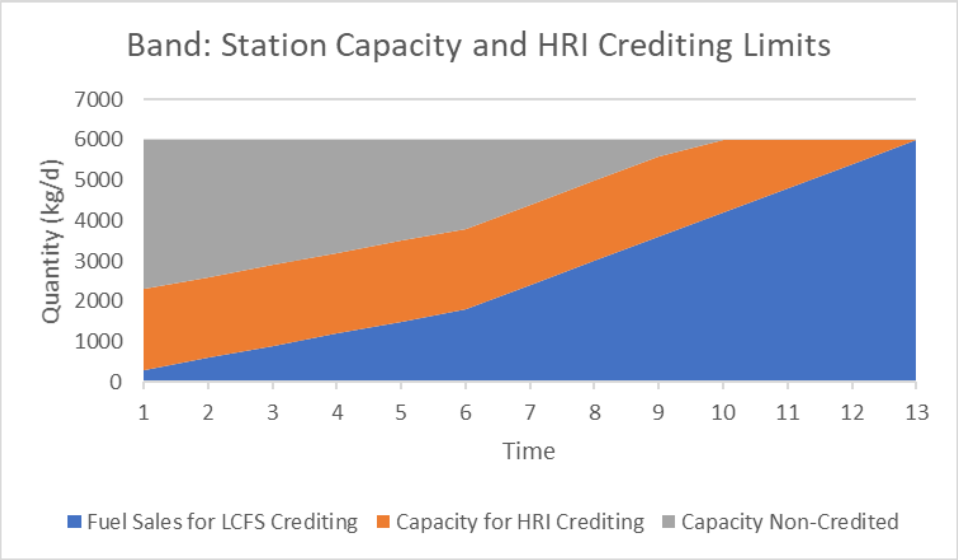

Figure 2: Station Capacity Certification Limit at 6,000 kg/d with Maximum HRI Crediting Limit at 2,000 kg/d

With this crediting band approach, right-sized stations up to 6,000 kg/d can be supported without the practical difficulties of de-rating, along with expanding fueling station network with an equivalent area of *Non-Crediting* station capacity. A benefit for market confidence in FCET adoption is the longer period of stable HRI crediting potential supporting station operations before off-ramp occurs. **If the crediting band approach is taken, we urge CARB to establish the *Station Capacity Certification Limit* at 6,000 kg/d with *Maximum HRI Crediting Limit* at 2,000 kg/d.**

Approach: Capacity Re-Certification

A single opportunity to re-certify station capacity as utilization increases can be used to appropriately limit the potential HRI crediting for a hydrogen refueling station, without de-rating, while supporting the recommended station capacity certification limit of 6,000 kg/d. With this approach, an *Initial Station Capacity Limit* and also a *Re-Certification Station Capacity Limit* are set, along with a *Re-Certification Eligibility* trigger. The HRI crediting basis is calculated as (a) until hydrogen sales reach the *Re-Certification Eligibility* trigger, the difference between the certified station capacity up to the *Initial Station Capacity Limit* and fuel sales quantity, then (b) after hydrogen sales reach the *Re-Certification Eligibility* trigger, the difference between the certified station capacity up to the *Initial Station Capacity Limit* plus *Re-Certification Station Capacity Limit*.

In geometric shapes, the HRI crediting potential may be visualized as a “step” in the figure below. The lower *Initial Station Capacity Limit* creates *Non-Crediting* area (grey) for an initial period with the HRI crediting potential (orange) declining as fuel sales increase (blue), while the opportunity for a single re-certification up to the combined *Initial Station Capacity Limit* plus *Re-Certification Station Capacity Limit* can support the intended full station capacity certification up to 6,000 kg/d such that more stations and fueling network coverage can be supported within 2.5% of deficits from the prior quarter.

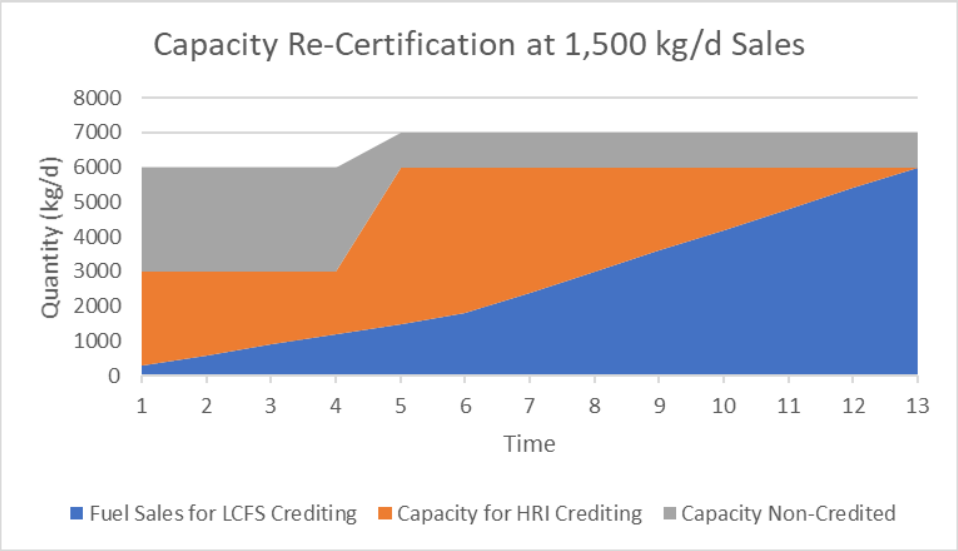

Figure 3: Initial Station Capacity Certification Limit at 3,000 kg/d with Re-Certification Station Capacity Limit at an additional 3,000 kg/d, and the Re-Certification Eligibility trigger at 1,500 kg/d.

This approach is similar to the provision in the existing HRI provision allowing for re-certification of station capacity once hydrogen fuel sales reach at least 50% of the certified capacity; the difference in allowing re-certification to a higher capacity than the *Initial Station Capacity Limit* recognizes the importance of supporting larger capacity stations to serve FCET through a two-stage process. This approach can effectively encourage economies of scale with single larger stations rather than inefficiencies of multiple smaller stations at the same location. **If the capacity re-certification approach is taken, we urge CARB to establish the *Initial Station Capacity Certification Limit* at 3,000 kg/d, the *Re-Certification Station Capacity Limit* at an additional 3,000 kg/d, and the *Re-Certification Eligibility* trigger at 1,500 kg/d which is 50% of the maximum *Initial Station Capacity Certification Limit.***

Tracking and Quarterly Reporting

The necessary data on hydrogen sales and station availability are self-reported by HRS operators to CARB in quarterly LCFS reporting and also are shared through the Station Operational Status System (SOSS) that is maintained and operated by the California Fuel Cell Partnership. **We support expanding the SOSS system to include HD HRS.** We understand that CARB does not currently validate the information provided by station operators through SOSS regarding H2 sales and station availability; this may be an option going forward.

Multi-Duty Stations

We support two separate pathways: The existing LD HRI pathway and newly proposed HD HRI pathway with an additional 2.5% from the previous quarter's deficit. In cases where the HRS station serves a mixed fleet of LD through HD, we will work with NREL to develop a new or updated tool to certify and monitor the stations. It is our understanding that this work is underway and should line up with the regulatory timeline envisioned by CARB at the workshop.

Capital, Operating, and Maintenance

HRI should not be capped at capital expense but allow for supporting ongoing operating and maintenance. The current HRI pathway has appropriate controls and mechanisms which should be carried over to the HD

pathway to prevent "over-crediting." The workshop questions relating to capital, operations, and maintenance are preliminary and business confidential. We will facilitate direct conversation between developers and CARB staff to provide clarity on these specific questions based on their experience and knowledge.

LD HRI Update

The Governor's Executive Order, Advanced Clean Car II, and the Scoping Plan have substantially increased the ambition of California's goals. This indicates the need for significantly more retail LD/MD refueling infrastructure by 2035 and 2045 respectively. To facilitate the necessary station numbers to meet the demands of class 5 and below we will need LD/MD retail stations to serve commuters, contractors, street parkers, and those who live in multi-family housing that refuel at LD/MD retail stations today. **With these goals in mind, we suggest extending the LD HRI credit beyond 2025, to 2035.**

Hydrogen Pathways

We encourage CARB to allow/account for decarbonization and renewable energy throughout the production, distribution and dispensing pathways. In distribution, recent announcements indicate that hydrogen tube trailer distribution will be an early adopter of FCETs. In production and dispensing, renewable power is being used for compressors, pumps and refrigeration. We should account properly for this decarbonized energy in the carbon intensity of pathways certified by those facilities, distribution, and refueling stations.

Additionally, process energy used in hydrogen production that uses power-purchase agreements or directed biogas for low-carbon energy should be credited properly within the pathways like production feedstocks. While many hydrogen fuel providers enter into power purchase agreements for renewable electricity for process power today, the LCFS does not recognize this in the calculation of hydrogen pathways

> Per the current regulation: *§ 95488.8. Fuel Pathway Application Requirements Applying to All Classifications*
>
> > *(h) Renewable or Low-CI Process Energy. Unless expressly provided elsewhere in this sub article, indirect accounting mechanisms for renewable or low-CI process energy, such as the use of renewable energy certificates, cannot be used to reduce CI. To qualify as a low-CI process energy source, energy from that source must be directly consumed in the production process as described in (1) and (2) below:*
>
> To provide equal benefit to fuels, we recommend that the use of renewable energy credits (RECs) qualify for all fuel pathways in both feedstock and process energy applications.
>
> By allowing for RECs to be used for feedstocks but not for process energy, the regulation significantly limits the potential to have the lowest possible CI fuels for consumers. This disproportionally affects hydrogen supply as the contribution to CI of process energy in the forms of compression, refrigeration, liquefaction, pumping, and distribution is significantly higher than for other fuel options.

To address concerns about traceability, tracking, and reporting of these RECs across different regions, we suggest parity with the Renewable Portfolio Standard's REC retirement process to hold the reporting entities accountable for their pathway compliance.

Conclusion

We appreciate CARB staff's consideration and commitment to improving the Low Carbon Fuel Standard. Successful adoption of battery and fuel cell electric vehicle technologies requires changes in LCFS to buttress market pricing and encourage deployment of fueling and charging infrastructure for zero-emission fleets. The undersigned associations and companies will continue to work in developing the vehicles, infrastructure, and low-carbon, zero-carbon and renewable hydrogen needed to build this market and reduce emissions. We look forward to collaborating with our partners in the charging community in pursuit of parity and conformity to streamline understanding of the infrastructure pathways.

Thank you,

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