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HARBOR ASSOCIATION
OF INDUSTRY & COMMERCE

March 17, 2021

Subject: Need for consideration of H2 fuel cell technology for long haul HD drayage trucks

Dear Chair Randolph:

The Harbor Association of Industry & Commerce (HAIC) is a non-profit industrial and commercial trade association that serves as a united voice on transportation, energy, environmental, and land use issues affecting the harbor business communities. In response to the California Air Resources Board (CARB) December 9 working group meeting on planned drayage truck rules, we submit the following comments.

1. We would like to see a clear distinction between short-haul and long-haul heavy-duty (HD) trucks.
2. Allow for the accommodation of H2 fuel cell (H2) Zero-Emission Vehicle (ZEV) technology as one of the options for long haul trucks in upcoming drayage truck rulemaking and incentive programs.

We understand that ARB is proposing that all new trucks in the ARB drayage truck registry be ZEV starting January 1, 2023. This schedule is aggressive and could exclude H2 ZEV technology from being used, given current publications about H2 technology readiness status over the next 2-3 years. A significant fraction of drayage trucks are long haul trucks, as presented in HAIC's January 28, 2021, letter to ARB. For long haul trucks, H2 technology is recognized as an important ZEV option, potentially the best option. The purpose of this letter is to discuss the benefits of H2 technology and the need to adjust the schedule during the transition period (2023-2025) to allow H2 technology to be included, given that H2 technology is likely to be the best technology for long haul trucks in the future. The 2035 schedule for 100% ZEV drayage trucks can still be met. Because both battery electric and H2 technology options require significant investment in infrastructure that will last 10-30 years, it is necessary to make careful decisions from the start about the best ZEV technology to install.

Both battery electric and H2 technology have been evaluated and tested in the past for long-haul applications, and both result in substantial GHG reductions. Whereas battery electric technology involves a battery-powered vehicle where the battery is charged periodically, H2 technology is analogous to current diesel technology, where the vehicle runs on H2 fuel and is refueled periodically (with much longer distances between fueling than for battery charging). Both technology types have zero emissions and can be run on renewable power. However, unlike electricity for charging, hydrogen fuel can be stored.

There are publications indicating that H2 technology will not be ready until 2025 or later, whereas battery electric technology will be ready sooner (although not for long haul applications). However, it is critical to not preclude H2 technology for long haul HD trucks for the following reasons (as discussed further in Attachment A):

- Obvious benefits of H2 technology for long haul applications: H2 technology allows for a longer vehicle travel range before fueling, faster fueling, and other key benefits.
- Recent advances in clean H2 generation: It will soon be possible for H2 to be produced economically from renewable power, just as batteries can be charged using renewable power.

- Battery-electric technology poor performance for long haul trucks: Battery-electric trucks are limited to a range of about 250 miles, resulting in severe operating limitations and implying that multiple charging stations and multiple operating interruptions will be needed to accommodate these trucks.
- Need for infrastructure investments to be made wisely for the long-term: It is necessary for infrastructure investments to be carefully planned, given that infrastructure can last from 10 to 30 years (whereas truck turnover is every 3-10 years).
- Recognition of H2 benefits and advances by technical experts in government and industry: The ideas expressed herein are echoed by technical experts in government and industry from California, the federal government, and around the world. These experts cannot be all wrong, and it is important for CARB to heed the message the technical experts provide.
- Broad applicability of H2 technology to decarbonize industrial sources: Decisions about H2 technology need to be made strategically, given that H2 technology is likely to be used for GHG reduction throughout the economy, not just in the transportation sector. Hence, H2 technology will part of the solution to global warming no matter what. We assume that CARB would want to contribute to that progress, starting with the transportation sector.

We ask CARB to consider H2 technology in all phases of drayage truck rule development and particularly in the selection of rule deadlines for long-haul HD trucks.

Infrastructure selection and implementation needs to precede fleet turnover. We consider that infrastructure decisions need to be made with long-term GHG emission and operating considerations in mind. It does not make sense for Port facilities and associated businesses to install battery-electric infrastructure now if facilities will be asked to install H2 fuel cell charging infrastructure later. Nor does it make sense to have two rounds of HD truck replacement within the next 8-12 years. Financial resources are limited and must be used efficiently. Hence, it is essential that H2 technology be considered in drayage truck rule development for long haul trucks.

California has lofty climate goals, and the State has been the leader in green technology. We appreciate CARB's efforts in the rulemaking process and ask the Board to consider these comments on the need to consider H2 fuel cell technology for long-haul drayage trucks. Thank you for your attention on this matter, and we look forward to working with you to achieve a greener California.

Sincerely,

Henry Rogers
Executive Director
Harbor Association of Industry & Commerce

HAIC Letter on H2 Fuel Cell Technology, DRAFT February 23, 2021
Attachment A: Detailed Description of H2 Fuel Cell Technology Benefits and Advancements

Obvious benefits of H2 technology for long haul applications:

H2 fuel cell technology is more beneficial than battery electric technology for long haul applications (over 200 miles range between charging events) for the following reasons [***1,2,3,4***]:

- Longer range before fueling.
- Faster fueling.
- Minimal impact on truck load limitations.
- Performance similar to current diesel technology and truck mechanical specifications met.
- Fuel widely available--Charging stations can be set up anywhere.

Because of these benefits, it is important for ARB to consider H2 technology on an equal or higher footing than battery electric technology for long haul HD truck applications.

Recent advances in clean H2 generation:

While most H2 is currently generated from steam methane reforming (SMR) using natural gas as the fuel source, future H2 production will be from renewable power (like battery electric ZEV technology), using an electrolyzer to convert power into H2 fuel. When produced from renewable power, H2 has an extremely low carbon intensity, equivalent to a 95% reduction compared to the standard transportation fuel, based on ARB Low-Carbon Fuel Standard (LCFS) documents. Recent advances in H2 technology [***3,4***] have led to predictions that renewable H2 cost will decline significantly over the next five to ten years and will be comparable to SMR H2 cost ($ per mile comparison). For long haul applications, the total cost of ownership of a hydrogen fuel cell truck is expected to breakeven with and then decrease below that of a battery electric truck over the next decade [***4***].

Clear distinction between short haul and long haul trucks in battery electric performance:

For ranges greater than about 200 miles, it is not practical to use battery electric technology due to the battery weights becoming a significant contribution to the total vehicle weight and the need for frequent returns to home base to charge the truck [***2,4***]. Therefore, it is important to consider H2 technology for long haul trucks, including long haul trucks that go directly into the Ports, for example as part of bulk cargo operations.

Recognition by technical experts in government and industry:

The H2 technology benefits and recent advances have been recognized by experts in government and industry. At the federal government level, DOE and NREL have published extensive studies showing that H2 is the preferred option for long haul truck trips, for the reasons noted above [***5,6***]. The H2@Scale initiative was created by the DOE to support and fund research and development of the hydrogen market on a national level [*7*]. In Europe, there are several recent publications touting the benefits and advances of H2, as well as industry collaboration programs such as the Green Hydrogen Catapult and H2Accelerate program [***8,9,10***]. Several important truck manufacturers are investing heavily in H2 technology, with pilot demonstration projects, including Toyota, Volvo, Daimler, Hyundai, Navistar, and GM [***2,11,12,13,14***]. Biden's recently announced climate action plan includes provisions for H2 technology research and implementation to "ensure that the market

can access green hydrogen at the same cost as conventional hydrogen within a decade" [***15***]. The experts cannot all be wrong, and CARB needs to reconsider any truck regulations that do not allow for H2 technology to be fully implemented in the long run or that divert available funds from H2 infrastructure.

Broad application of H2 technology to decarbonize industrial sources:

The reason that Biden's team and others have recognized the importance of H2 technology is that this technology is widely applicable for both transportation and industrial sources [***3,4***], unlike battery electric technology which is limited to the transportation sector and also has other severe limitations. In addition to the poor performance relative to H2 technology with regards to shorter range and longer charging times, battery electric technology involves lithium, which has supply limitations, and generates hazardous waste from used batteries. Conversely, H2 technology creates the potential for clean energy storage from renewable sources, through conversion into H2 fuel for later use.

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