

**DOCKETED**

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**Air Products Comments to Medium- and Heavy- Duty Zero  
Emission Vehicles and Infrastructure RFI**

*Additional submitted attachment is included below.*

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April 13, 2023

Mr. Hannon Rasool  
Director, Fuels and Transportation Division  
California Energy Commission  
715 P Street  
Sacramento, CA 95814

**RE: Request for Information 19-TRANS-02**

Air Products Contact:

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Dear Mr. Rasool,

On behalf of Air Products, it is our pleasure to respond to the California Energy Commission's (CEC) Request for Information (RFI) on a Potential Solicitation for Medium- and Heavy-Duty Charging and Hydrogen Refueling Infrastructure Projects on Designated Corridors. As a leader in hydrogen refueling, Air Products strongly supports the commission's plans to further the goal of a convenient and accessible network of medium- and heavy-duty (MD/HD) vehicle charging and refueling infrastructure for fleets and operators. We appreciate the opportunity to provide feedback on a potential corridor-based MD/HD zero-emission vehicle (ZEV) infrastructure solicitation.

Headquartered in Allentown, Pennsylvania, Air Products is a fully integrated company, with world class engineering, global manufacturing operations, and global project management and execution capabilities. We currently operate six first-generation hydrogen (H<sub>2</sub>) fueling stations serving light- duty (LD) vehicles and one fueling station serving transit buses in California. In addition, Air Products supplied the equipment used in another ~40 fueling stations that are currently operated by third parties throughout California.

Based on our experience in the H2 fueling business over the past 20+ years, Air Products believes access to hydrogen and hydrogen fueling stations is the most significant obstacle to the rapid adoption of fuel cell vehicles in both the light-duty and the emerging medium and heavy-duty transportation market sectors throughout the state. This obstacle can be solved through project partnership opportunities like this one with the CEC.

The Air Products team is available to discuss this RFI response and subsequent questions in more detail. Please do not hesitate to contact us. We respectfully provide the following comments to the questions in the docket:

**Q: Is there interest in developing such projects?**

**Air Products response:** **There is high interest in developing the hydrogen fueling infrastructure needed to support medium- and heavy-duty zero-emission transportation in California.** The status of hydrogen fueling station development in California, specifically MD/HD stations, per the [Hydrogen Fuel Cell Partnership update \(https://h2fcp.org/sites/default/files/Q4-2022-Retail-H2-Fueling-Station-Network-Update.pdf\)](https://h2fcp.org/sites/default/files/Q4-2022-Retail-H2-Fueling-Station-Network-Update.pdf) (Dec 2022) shows only three (3) stations in operation to date indicating there is a strong need to provide funding opportunities such as this to achieve the state's targets for meeting the Advanced Clean Transportation (ACT) regulations. The proposed funding program is an ideal way to accelerate progress towards meeting these requirements through collaboration with active station developers with viable plans to progress the build-out of this needed infrastructure in coordination with vehicle manufacturers. Thus, Air Products, as a qualified hydrogen refueling station (HRS) developer, operator, and supplier, believes multimodal stations that can serve a range of vehicle classes from light to MD/HD strategically placed along all key freight corridors, ports, and high traffic corridors will be the most expedient and efficient approach to achieving the state's emissions reduction goals.

We are aware of the progress needed to meet state ZEV goals thus we continue developing plans for multimodal stations that can support the MD/HD vehicle market as exhibited by the two hydrogen refueling stations we are currently able to accelerate through the support of the EnergIZE program. Those sites are in Visalia and Paramount, California. For example, the Visalia HRS will bring clean fuel infrastructure to a disadvantaged community, and provide access, equity, and clean air benefits for this important community. It will be a public retail station with the capability to fuel approximately 120 trucks per day and designed specifically to support peak heavy-duty fueling windows. The site should achieve high utilization, by virtue of its location adjacent to a heavily trafficked truck corridor, State Route 99, which will see many early adopters of heavy-duty hydrogen fuel cell trucks. The Paramount HRS is also in a disadvantaged community and will deliver scale and reliability for fueling along an important drayage corridor that serves traffic to/from the San Pedro Bay Ports complex. With the support of the EnergIZE program, we are advancing these clean hydrogen projects today and view both as prime examples of the great strides state funding support can provide.

This is a good start but much more is needed; thus, the Air Products team is evaluating, and progressing additional sites along State Route 99, the San Pedro Bay ports (I-710) area, and other key freight corridors (e.g., I-10 and I-15) within the state. We are carefully evaluating these and other sites, considering their proximity to, or location in disadvantaged or low-income communities and regions that will benefit from the clean infrastructure to transition old, polluting MD/HD equipment to zero-emission hydrogen fuel cell vehicles and will bring clean fuel infrastructure access, equity, and clean air benefits to these areas.

Thus, state funding can provide much needed support to aid station developers in lowering or offsetting project capital spending that will carry forward when the station achieves open retail status when station utilization is low initially. Funding support is particularly important when looking at total system costs where some developers like Air Products are also investing in much needed clean hydrogen production and distribution required to support operation of hydrogen refueling stations and provide market confidence. The addition of CEC funds to support hydrogen refueling station equipment costs will provide the lift needed to offset high initial costs and investment for hydrogen station infrastructure.

**Q: Minimum chargers, dispensers, capacity?**

**Air Products response: Based on data from studying our own hydrogen fueling service in a variety of applications coupled with publicly available MD/HD market studies, Air Products recommends two to three heavy duty dispensers for a 250kg/hr (or ~4.5 -6 TPD) station with co-located light duty dispensers to serve vehicles such as pickup trucks and medium duty vans (future proofing the network for public fleets such as police cruisers, etc.)** This liquid hydrogen based multi-modal hydrogen station design will adequately meet MD/HD ZEV requirements. Consideration should be given towards redundancy in equipment, preventative maintenance schedules, locally available spare parts, and highly trained technicians which are all necessary to achieve the level of performance for user satisfaction and industry standard uptime consistency. At this early adoption stage, it is critical to drive towards replicating the incumbent diesel fueling experience, thus, multimodal designs can support the necessary pressure and flow rate for heavy duty fueling while meeting required HRS specifications.

**Q: Ideas regarding designated corridors and building out the infrastructure – planning for a recurring solicitation.**

**Air Products response: Commercial hydrogen fueling infrastructure can readily support the medium- and heavy-duty market along key corridors where hydrogen will have technology, range, and performance advantages relative to battery electric vehicles (BEV), but government funding is needed in this nascent market. Hydrogen is already being recognized in studies as the long-term solution to MD/HD zero-emission transportation.** Medium and heavy-duty vehicle transportation market assessments consistently identify the market limitation of battery electric vehicles and where hydrogen fuel-cell vehicles provide a superior performance advantage over battery vehicles. In charting the future to zero-emission MD/HD mobility, there is need to develop hydrogen zero-emission mobility sooner at scale. We agree with the CEC that major hydrogen fueling projects and corridors need to be planned, funded, and executed to enable zero-emission MD/HD transportation that will help to achieve state emission goals. We applaud the CEC for recognizing the high potential for hydrogen in the Accelerated Hydrogen Fueling Infrastructure Scenario in the Senate Bill (SB) 671 Clean Freight Corridor Efficiency Assessment.

**Q: Well thought out business plans will be important:**

- Can contracts supporting those plans be secured in time for submittal during the application phase?

**Air Products response: It is important to point out that what sets hydrogen fueling apart from BEV charging is its ability to fuel vehicles across a broad range of OEMs (Original Equipment Manufacturers) flexibly, as well as its ability to support the required range and fill times where these vehicles would naturally travel.** At this early juncture, the “If you build it, they will come” model is a necessary step to

seed the market for vehicle adoption across a broad range of users (not just those with large, dedicated fleets). For example, Air Products plans to operate up to 40 of its own hydrogen fuel cell trucks for distribution of Industrial Gases in California. These trucks are domiciled across four (4) major terminals within the state. However, those trucks traverse and deliver products to end customers well beyond those terminals across California. Availability of public fueling is a major determinant in our ability to deploy those vehicles broadly while maintaining a reliable supply of products to customers in many industries.

- **Should extra points be given to mixed use stations utilizing both ZEV technologies?**

**Air Products response: Natural benefits in construction and deployment shared costs will already incentivize this to occur, but standalone deployments should not be penalized.** An impact on scoring may lead to a narrowing of potential sites making it harder to deploy hydrogen at sites where utility or other barriers prevent BEV charging.

**Q: Public fueling requirement:**

- **How to best balance infrastructure use to be available for public and light-duty refueling/charging?**

**Air Products response: A liquid hydrogen-supplied multimodal station design with both LD and MD/HD capabilities can best balance and capture MD/HD fleets including fuel cell, dual-fuel, and hydrogen internal combustion engine (ICE) vehicles as well as serve LD vehicles.** In this early stage, station operators need to be available to trucks, buses, coaches, and vocational vehicles as well as to provide fueling options for LD vehicles to supplement the primary HD market. This all-inclusive strategy will help accelerate the regional hydrogen economy by providing options for all fleets and individual users. It is critical not to lose sight of the importance of such mixed-use designs in continuing to meet all core codes and standards that govern station safety by providing and following requirements for design, installation, and operation.

- **Are there services or business structures available to optimize station utilization in a multiuse case?**

**Air Products response: A multimodal station leverages a single set of downstream equipment to service both MD/HD fueling and LD fueling.** The station will be available for LD and HD/MD vehicles to fuel simultaneously, whereby utilization of one vehicle type will not prevent fueling of another vehicle type, maximizing utilization.

**Q: Schedule Requirements:**

- **Time frames for events that may impact the developers' schedules, such as permitting, supply chain delays, and grid upgrades.**

**Air Products response: Time frames for permitting coupled with long lead times for some components within the hydrogen station supply chain can negatively impact station on-stream time. It is important for funding agencies to recognize these constraints and to work with developers to allow flexibility in required station on-stream time.** Ensuring funded projects are supported by qualified developers with the necessary credentials and experience in working with local authorities having jurisdiction (AHJ) or permit agencies and utilization of review and approval processes will help to smooth the permitting process. Obtaining third-party certifications for the hydrogen fueling system is another means to provide confidence and keep schedules reasonable. Air Products has done this and is already working towards more rapid approvals by standardizing its station equipment package across fueling station designs.

**Q: Standard MD/HD equipment:**

- For electric charging equipment we are considering the EnergiIZE Eligible Electric Equipment list to be a guide for applicants.
- Hydrogen stations must be capable of dispensing 350 or 700 bar and be certified to ASME, ASTM, and NFPA standards.

**Air Products response:** We support the hydrogen station requirements stated above.

**Q:** Please share the potential risks and mitigations staff should be aware for the concept ideas presented today.

**Air Products response:** Underfunding the initial phases of MD/HD hydrogen refueling infrastructure risks delaying the potential economies of scale needed to reduce hydrogen refueling station equipment costs. Since a multi-modal HRS costs significantly more than LD HRS, CEC should consider increasing the initial grant funding amount beyond the \$20MM proposed. Outlining a multi-phase, multi-year funding approach like that of GFO-19-602 for LD HRS may be beneficial for providing more certainty for industry investing in MD/HD HRS infrastructure.

**Additional comments:** In mapping out the ZEV future for the state, it is important for the CEC to recognize hydrogen fuel cell vehicles in the mix of medium-heavy-duty transportation vehicles and to provide support that will enable qualified station developers like Air Products to deliver the scale and reliability of fueling across corridors and communities currently underserved by zero emission fueling infrastructure. Again, we appreciate the CEC's willingness to consider our comments and look forward to future interactions.