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August 12, 2024

Ms. Michelle Vater
Supervisor, Freight and Transit Unit
California Energy Commission
715 P Street
Sacramento, California 95814

RE: Air Products Comments to 19-TRAN-02 “Medium- and Heavy-Duty Zero-Emission Vehicles and Infrastructure” Regarding the Five Solicitation Concepts

Air Products Contact:

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Dear Ms. Vater,

On behalf of Air Products, we appreciate the opportunity to provide comments to the California Energy Commission’s (CEC) Docket 19-TRAN-02, Medium- and Heavy-Duty Zero-Emission Vehicles and Infrastructure regarding the five solicitation concepts proposed at the July 16, 2024 CEC Workshop. Air Products strongly supports the commission’s plans to further the goal of a convenient, reliable, and accessible network of charging and refueling infrastructure for zero emission fleets and operators. CEC funding is critical to increase the deployment of fueling infrastructure that will support the deployment of zero-emission medium- and heavy-duty (MDHD) vehicles within California.

Headquartered in Allentown, Pennsylvania, Air Products is a fully integrated industrial gas company, with world class engineering, global manufacturing operations, and global project management and execution capabilities with an expertise in hydrogen. We currently operate six

first-generation hydrogen refueling stations (HRS) serving light duty (LD) vehicles and two fueling stations serving transit agencies in California. In addition, we supplied the equipment used in another ~20 fueling stations that are currently operated by third parties throughout California. Based on our experience in the hydrogen refueling 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 hydrogen in both the light-duty and the emerging medium- and heavy-duty transportation market sectors throughout the state. This obstacle can be solved through appropriate funding opportunities like the five solicitation concepts presented by the CEC.

Through our data and experience from our hands-on global operating experience at over 250 hydrogen fueling station projects in 20 countries (www.airproducts.com/h2fm) with over 11 million vehicle fills since we respectfully provide the comments below. Our team is always available to discuss our response and answer any questions in more detail. Please do not hesitate to contact us.

Concept 1: Charging and Refueling Infrastructure for Transport in California Provided Along Targeted Highway Segments (CRITICAL PATHS) 2.0

Question 1: Is the proposed increased minimum power output per charger from >150kW to >350kW reasonable?

No comment.

Question 2: What are the greatest barriers to developing public MDHD charging/refueling sites at this time? Electrification, permitting, land availability, others.

Answer 2: Funding: Increase MDHD solicitation funding level to 50% of capex minimum per station, especially for those with more capacity. *In combination with LCFS capacity crediting incentives, hydrogen station developers will be more willing to invest in the MD/HD refueling infrastructure needed to support vehicle manufacturers and fleet owners' ZEV obligations under the Advanced Clean Fleet, Advanced Clean Trucks, and other ZEV regulations. Air Products has put a focus on developing hydrogen refueling stations in California given the state's supportive policy and leadership in the transition to zero emission vehicles. This is exhibited by our recent announcement regarding our intentions to build a [network of permanent, commercial-scale, multi-modal hydrogen refueling stations](#) from Northern California to Southern California. We are taking these steps to build-out infrastructure within California to help ensure availability of reliable hydrogen refueling stations with adequate capacity and multiple fueling dispensers with service for medium-, heavy- and light-duty vehicles to enable a timely transition to zero-emissions transportation by OEMs and fleet owners in the state. Federal and state funding support is critical at this early stage for this development to occur at the pace needed to meet state ZEV and climate goals.*

Larger multi-modal stations (4500-6000 kg/day) with more on-site hydrogen storage capacity are more practical for enabling CA's transition to meet its ZEV targets. They also require more capital investment. A MD/HD commercial scale hydrogen refueling station can typically cost between \$8-12 million. In consideration of this, funding dollars per station should align with current HRS capital costs that today are much higher due to the increased station size, capacity, and multi-use design.

Land availability: *Land requirements for siting a multimodal hydrogen refueling station built for reliability to support LD and MD/HD fueling that includes sufficient onsite liquid hydrogen storage capacity requires about 2 – 5-acres of land that is zoned appropriately and located in close proximity to key corridors. Coupled with the high cost of land in California, the proposed one linear mile requirement from a designated corridor's off-ramp as proposed in Concept 1 can be difficult to achieve. Relaxing this off-ramp access requirement to be within five miles of a designated corridor's off-ramp as is allowed under the U.S. DOT Federal Highway Administration's (FHWA) [Alternative Fuels Corridor](#) (AFC) will open additional and potentially even lower cost station site options while still providing fueling infrastructure where it is needed most.*

Question 3. Did certain requirements in the first CRITICAL PATHS (GFO-23-602) prevent potential applicants from submitting projects that would have achieved the goal of public MDHD ZEV infrastructure on priority corridors? Please elaborate.

Answer 3: *Overly prescriptive station design requirements like those proposed under Solicitation Concept 1, CRITICAL PATHS 2.0, such as requiring "minimum 3 heavy-duty hydrogen dispensing platforms for simultaneous refueling (700 bar)" can be prohibitive to station developers. While stations standards are extremely important, the design specifics of a station, including number of dispensers should be determined by the station developer, demand/utilization, and location attributes. **We suggest CEC focus on appropriate station refueling capacity.** Many factors including the site parcel size, projected vehicle demand/utilization, and permitting requirements are key factors for final station design. To build out a robust MDHD hydrogen refueling ecosystem, stations will need the capability to dispense around 4500 to 6000 kg per day of hydrogen.*

Could CEC also provide clarity as to what would qualify as "Make ready" infrastructure that is "eligible as match, but not as reimbursable" for hydrogen refueling stations as referenced in concept 1?

As previously stated, CEC should consider expanding the required offramp distance from one linear mile of the identified corridor segment's offramp for hydrogen refueling stations to five miles or less from the identified corridor segment. This would be consistent with the U.S. DOT Federal Highway Administration's (FHWA) Alternative Fuels Corridor. With limited land availability and permitting constraints in California, this additional mileage will help to avoid the elimination of viable, well-suited refueling station sites from consideration, especially in

disadvantaged, underserved communities.

Concept 2: Implementation of MDHD ZEV Infrastructure (Blueprints 2.0)

No comments.

Concept 3: Agriculture and Construction Infrastructure

Air Products general comments: *Air Products appreciates CEC's forward thinking towards deploying infrastructure for additional, early market-stage ZEV vocations through this solicitation concept that could enable the deployment of agriculture and construction ZEVs. Given the near-term need to meet current battery charging and hydrogen refueling stations state goals for on-road MD and HD ZEVs—including Advanced Clean Cars II, Advanced Clean Fleets, and to reach the deployment of 200 hydrogen stations by 2025—the state must leverage every resource and program at its disposal to ensure that this monumental transformation happens in a timely manner. Air Products recommends **CEC consider keeping off-road agricultural and construction vehicle funding separate from on-road MDHD infrastructure development.** To further inform funding for this sector and if not already completed, CEC should consider extending a pre-market request for information (RFI) in order to develop a market assessment and list of approved ZEVs and vendors for these two vocations during this early stage.*

Concept 4: ZEV Port Infrastructure

Question 1: Do the requirements for minimum chargers/dispensers align with the funding amounts offered?

Answer 1: *Specific station design requirements such as number dispensers are developed as part of the station design and financial analysis completed by the station developer and is commensurate with the expected port vehicle market demand and hydrogen vehicle storage pressure.*

With state drayage truck transition rules rapidly approaching, directing more funding to port infrastructure is critical. Considering that any project investment will need to support current and future hydrogen MDHD vehicles, the project needs to be well planned and coordinated among the port stakeholders. Besides CEC grant funding, project should qualify for hydrogen station capacity credits supporting the expected ramp up of MDHD hydrogen vehicles operating at the port. Based on the project scope and optimal number of dispensing nodes to ensure refueling resiliency, CEC grant funding allotment for hydrogen will likely need to be greater than the proposed \$6 million or 15% of Concept 4 funding.

Concept 5: Light-Duty Vehicle Hydrogen Refueling Infrastructure

Funding Lane 1 (Refers to light-duty or mixed-use hydrogen refueling stations in San Francisco and Sacramento Counties)**Question 1: Is the proposed reimbursable capital expenditure of \$1.5 million per station adequate to build new stations in San Francisco and Sacramento counties?**

Answer 1: *As stated above, reimbursable capital expenditure per station should be at 50% of capex minimum. The proposed \$1.5 million of funding per station is too low, especially for mixed or multi-use. Today, fit-for-purpose stations with built-in redundancy that will meet customer reliability and uptime expectations require significantly more capital investment. Today, a mixed-use LD/MD/HD commercial scale hydrogen refueling station typically costs between \$8-12 million to develop. In consideration of this, funding dollars per station should align with current HRS capital costs. CEC could also consider including station construction and installation costs as eligible costs for reimbursement like the Carl Moyer Infrastructure Funding Program.*

Question 2: Is the proposed O&M of \$500,000 per station sufficient?

Answer 2: *Air Products recommends that the limited CEC funds available for hydrogen refueling infrastructure be put towards the capital costs of the station to achieve state goals and station targets. **Station reliability should already be a priority requirement to receive funding.** Station reliability problems, in the form of supply shortages and station equipment malfunctions, have hurt consumer confidence in hydrogen for mobility. Larger multi-modal stations enable station developers to address this issue because they can economically incorporate a more resilient design. Multi-modal stations are equipped with more infrastructure, such as compressors, storage tanks, and dispensers, which provide increased redundancy and reduce single points of failure. This means that stations stay online for longer and provide for a better consumer experience. Such safeguards increase station costs but are necessary to ensure resiliency and a timely transition to ZEVs. Additionally, we recommend that claw-back mechanisms be added to the programs so that the state can recoup funds from station projects that do not perform reliably. Such a safeguard will ensure that taxpayer investments are protected and help increase consumer confidence in station reliability. Another protective mechanism is hydrogen station capacity credits as a complimentary funding mechanism that encourages station developers to deploy reliable hydrogen stations.*

Question 3: Should the 50 percent match requirement be adjusted?

Answer 3: *50% match is adequate.*

Regarding eligible project costs, Air Products recommends that CEC re-consider the requirement where project spend cannot begin until award notification occurs for hydrogen refueling station equipment. In the case of hydrogen refueling stations, critical station equipment such as compressor and liquid hydrogen storage tanks can take upward of 20-40 weeks to procure. If

long-lead equipment orders cannot be placed in advance (at 100% of the risk/cost to the recipient/station developer at that time), project timelines and the cost to build stations cannot be reduced, further delaying achievement of state goals. This dilemma in station project development can be eliminated by allowing costs for pre-purchase of critical long lead equipment at station developers own risk and allowing or approving those costs once awarded with proper documentation perhaps under the 'make ready' category. This will ultimately improve station schedules, help developers with station planning and potentially lower costs.

Funding Lane 2: (Refers to \$5 million in O&M funding for planned or operational stations where progress has stalled due to cost constraints)

Question 1: Will the proposed O&M funding of \$500,000 per station be sufficient to continue operation of hydrogen stations?

Answer 2: If CEC proceeds with O&M funding in Concept 5, the funds should only support operational stations and not be directed towards "stalled" stations. Providing O&M funding to progress stalled stations to "on-stream" makes the long-term viability of the station uncertain, especially without continued support.

Question 2: Should the 50 percent match requirement be adjusted?

No comment.