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Air Products Comments on the Staff Workshop on the 2023 SB 643 Staff Report

Additional submitted attachment is included below.

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October 30, 2023

Commissioner Patty Monahan
California Energy Commission
715 P Street
Sacramento, California 95814

RE: Air Products' Comments Related to the October 16, 2023, Inaugural SB 643 Assessment Workshop – Docket # 22-HYD-02

Dear Commissioner Monahan:

Thank you for the opportunity to comment on the material presented during the October 16, 2023, workshop regarding the SB 643 Clean Hydrogen Production and Refueling Infrastructure for Medium- and Heavy-Duty Fuel Cell Electric Vehicles and Off-Road Applications staff report. Hydrogen will play a critical role in the clean energy transition – particularly in the transportation, maritime, heavy industry, and power sectors. As was noted in the workshop, hydrogen is receiving focused attention, and the opportunity to expand hydrogen as part of the strategy to achieve California's climate change goals is supported by state and federal agencies. Hydrogen will continue to complement other low and zero emission energy sources, adding to energy diversity and resiliency in a low carbon future.

About Air Products

Air Products is a global company with substantial experience producing, storing, and deploying hydrogen in a safe and environmentally conscious manner. Worldwide and in California, Air Products is the largest hydrogen producer, with over 10,000 metric tons per day of production capacity. Within California, for more than 40 years, Air Products has safely operated hydrogen systems, including 10 hydrogen-production facilities and 30 miles of hydrogen pipelines. Air Products supplies a network of light-duty and heavy-duty hydrogen fueling stations, facilitating the transition to zero emissions transportation.

We are a global leader and expert on the production, storage, transport, and use of hydrogen, and have substantial new, lower carbon hydrogen investments under development today. In fact, Air Products has announced that it will spend $15 billion dollars by 2027 in clean energy investments, including both green and blue hydrogen projects, and we have already committed over $11 billion of that amount. By bringing to bear the financial, technical and execution resources of our existing business, along with others experienced in the hydrogen industry, to focus on future growth and sustainability, we will be able to deploy the levels of capital investment needed to scale the production and distribution of hydrogen, thereby transforming heavy-duty and off-road transportation and heavy industry. Importantly, our model also shows that this clean energy transition can happen within the context of a private competitive market and meet the demands of this segment of the energy transformation, while achieving the lowest cost for the consumer.

California's Leading Hydrogen Market

California is home to one of the nation's largest, well-established competitive hydrogen markets. Much of the hydrogen deployed today in California and across the Unites States is serving heavy industry and transportation already. California leads the global hydrogen economy with policies and programs that support economy-wide hydrogen applications and creates demand and incentives for new production and hydrogen deployment in the traditional (industry) and non-traditional (zero emission vehicle (ZEV), maritime, power) economic sectors.

Scenarios Of Medium- and Heavy-Duty (MDHD) Fuel Cell Electric Vehicle (FCEV) Refueling Infrastructure

The California Energy Commission (CEC) SB 643 staff report discussed 4 scenarios regarding projections for MDHD hydrogen refueling station development in the state. Air Products strongly believes that achieving success in meeting the State's goals requires a flourishing ZEV industry, which includes both successful battery electric vehicle and fuel cell electric vehicle markets. Furthermore, to support those successful markets, the State must proactively plan for and enable them. We do not believe that scenarios that presume a limited MDHD fuel cell vehicle market, such as the IEPR case, are particularly helpful for informing necessary planning for advancing state goals. We appreciate that the Scoping Plan scenario and SB 671 scenarios generally find similar results through separate methods designed specifically around achieving state goals, and encourage CEC to focus on those scenarios and implementing programs to achieve them.

The wholistic, goods-movement approach taken by the California Transportation Commission (CTC) in its SB 671 Assessment provides the most detail in terms of projected number and location of MDHD hydrogen refueling stations. This is in large part due to the underlying assumptions of its recommended Balanced Adoption Scenario, which assumes that battery electric vehicle (BEV) technology will be used predominantly for medium-duty truck short and regional trips and FCEV technology will be predominantly used for heavy-duty truck and long-haul applications. Air Products supports the CTC SB 671 Assessment identification of the Top 6 and 34 Priority Freight corridors, and generally agrees with its recommendation that building the Initial Viable Network would require ZEV infrastructure buildout along the "Top 6" freight corridors. The ARB 2022 Scoping Plan estimates, developed through an entirely separate methodology, in general seem to support the CTC SB 671 Assessment MDHD refueling station projections.

Consider Public Hydrogen Fueling Station Funding Reforms

As the CEC evaluates growth in transportation, Air Products makes the following suggestions, which are informed by recent trends and shifts in the hydrogen fuel cell vehicle and refueling market. These changes will maximize the state's investments by directing funding toward hydrogen fueling stations that are built with the future in mind.

- **Prioritize investing in multi-modal stations**: Multi-modal stations can serve several vehicle types, such as light-duty and heavy-duty vehicles, at a single site. This mimics the existing gas station model, in which passenger vehicles fill up with gasoline at one pump while a big rig refills with diesel at an adjacent pump. The ability to serve multiple markets with a single station increases efficiencies for the station operator, reduces delivery costs for hydrogen supply, increases station reliability and provides convenience for customers driving all types of vehicle classes.

- **Invest in stations with more capacity**: larger stations with more on-site hydrogen storage capacity are more practical for enabling CA's transition to meet its ZEV targets. In contrast, the model of building out numerous smaller stations causes supply chain-related costs to increase significantly, as each station will need its own logistical plan to get fuel delivered, obtain spare parts, and be generally maintained, thus reducing station reliability.
- **Make reliability a priority**: 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. 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.

Heavy-duty, Long-haul Trucking Should Be a Priority: Large Fleet Conversions Drive Cost Reductions

Air Products plans to convert our heavy-duty truck fleet to zero-emission FCEVs. Air Products has a global fleet of 2,000 heavy-duty Class 8 trucks that deliver industrial gas to smaller consumers. We are committed to turning over our fleet to zero emission hydrogen FCEV trucks. Working with our partner Cummins, we are moving forward with this transition to further demonstrate our commitment to becoming net-zero greenhouse gas emissions by 2050 and to inspire other fleet operators to shift their heavy-duty fleets to zero-emission technologies. While light-duty FCEV markets continue to grow, the expanded adoption of FCEVs in medium- and heavy-duty vehicle segments can help support the buildout of hydrogen refueling network and ultimately support the State's ZEV goals. Therefore, development of multi-modal, reliable hydrogen fueling stations and ZEV solutions should be a priority. Accordingly, we encourage the CEC to evaluate policies, incentives, and new market rules to support similar fleet transitions in the heavy-duty transportation sector, including on-going FCEV truck purchase incentives.

Innovative Clean Transit (ICT) Regulation and Fuel Cell Electric Buses (FCEB)

As presented by California Air Resources Board (CARB) staff at the workshop, since ICT adoption in 2018, the number of transit agencies planning or deploying FCEBs has grown from 3 to 42 in 2023. This is in part due to real-world testing of battery electric buses (BEB) by transit agencies on operational service routes that revealed lower than expected vehicle ranges, thus compromising customer service and operational efficiency. FCEBs, on the other hand, offer transit agencies a true 1:1 replacement for diesel buses. In addition, combining municipal transit agency deployment of hydrogen FCEBs with retail consumer light-duty FCEV demand will drive cost benefits for both market segments.

Off-Road/Non-Road Hydrogen Applications

The CEC SB 634 staff report acknowledges that many off-road and non-road applications of hydrogen as a zero-emission fuel are currently in technical demonstrations. These applications and markets provide significant opportunities for hydrogen growth.

Strategically Target the Expansion of Hydrogen: Prioritize Sectors Not Addressed by Electrification and Employ Strategies that Benefit Front-line Communities and Goods Movement Corridors

Hydrogen deployments should be focused in the economic sectors that are not easily decarbonized by electrification, such as industrial complexes, ports, aviation and maritime. Sector targets should include creating demand for hydrogen (and its derivatives like ammonia and methanol) in long-haul, heavy-duty transportation, clean aviation fuel, shipping fuel, ZEV cargo handling equipment at the ports, and zero emission fuels (ZEF) for critical electric resources. Moreover, industrial clusters that include several end-uses and are located in front-line communities and/or goods movement corridors should be prioritized as the CEC analyzes technology, systems, and policies for future hydrogen expansion. For the transportation sector, the SB 634 workshop focused primarily on heavy-duty truck transportation, but based on the 2022 Scoping Plan Update, the hydrogen market for aviation, marine, and other non-road equipment should also be considered in all aspects of CEC energy planning.

Focus on Decarbonizing Port Complexes and Prioritize Benefits for Nearby Front-Line Communities

Targeting ports, and goods movement more generally, will focus hydrogen systems solutions on heavily impacted front-line communities that experience some of the worst air quality due to goods movement in and near port complexes. Providing port-specific recommendations, incentives, and enabling solutions to reduce or eliminate diesel and bunker fuels related to goods movement will immediately and dramatically improve air quality, preserve and expand regional skilled jobs, and enable scaling of hydrogen to bring overall costs down. Additionally, a focus on these transportation needs (long-haul trucking, rail, ships, drayage, aviation) will position the state, via its ports, as a global zero emission fuel provider and enable existing international agreements between California Port Authorities and International Ports to provide hydrogen, ammonia and other ZEFs for international shipping needs.

Prioritize Ports and Maritime Industry in CEC Transportation Energy Planning

Some of the most severe air quality impacts are to communities living and working in and around the port complexes, which often host heavy industry, aviation, and power production. As the CEC looks across the transportation sector to expand hydrogen, ports should be kept top of mind, especially when it comes to potential incentives. Any incentives should be deployed in a manner that maximizes emission reductions in the frontline communities that surround the ports, goods movement corridors and other heavy industry, as these communities are disproportionately impacted by the criteria air pollutants emitted by those economic sectors.

Port greening has co-benefits with the potential to expand hydrogen infrastructure and deployment to neighboring industries with similar environmental objectives. Providing incentives for the ports and their hydrogen providers to increase production, fueling, bunkering, and delivery of hydrogen in these regions will have a high impact and result in immediate, dramatic air quality improvements. Furthermore, it will position the ports for energy diversity, resiliency and create international market advantages as green ports accommodating zero-emission shipping lines. Equally important, targeting ports and the industrial sites near ports as a priority investment in the energy transition will create hundreds of new skilled jobs in locations where jobs may be lost due to reductions at refineries and other industries.

Clean Hydrogen Production

While Air Products is encouraged that the CEC refers to a definition of clean hydrogen that is consistent with the federal definition, the SB 643 assessment should not be limited to this. As the term "clean" hydrogen is not used in the enabling SB 643 legislation, it is unclear why the report assessment and analysis refers to only clean hydrogen. Zero emission FCEVs are replacing diesel in many cases and their fuel used should not be limited in the near-term to only clean hydrogen. The environmental benefits of replacing high emitting vehicles are required immediately to meet air quality standards particularly in impacted communities along goods movement corridors. Limiting the fueling supply to enable this transition in the near-term will undermine speedy emission reductions.

All Strategies for New, Low Carbon Hydrogen Production Capacity are Needed

Because hydrogen growth will serve to displace diverse energy sources including imported energy, it is important to look to all supply options. As the leading hydrogen supplier in California and globally, Air Products recognizes that creating a reliable supply of hydrogen for new end uses in this report requires local and global investments. We are doing our part and have committed ~$15 billion by 2027 to expand the supply of new low carbon hydrogen to serve the California and global markets, which include the following announced projects:

- Sustainable Aviation Fuel in Los Angeles County: Air Products invested in a $2.5 billion expansion project with World Energy to develop North America's largest sustainable aviation fuel (SAF) production facility in Paramount, California. The project transitions a legacy oil refinery to a total SAF capacity of 340 million gallons annually. This included an expansion of Air Products' existing hydrogen pipeline network in Southern California.
- An Air Products green hydrogen facility based in Casa Grande, Arizona, just outside Phoenix, will be onstream in 2023 and will produce zero-carbon liquid hydrogen for the transportation market.
- An Air Products green hydrogen investment of about $500 million in a large-scale facility to produce zero-carbon hydrogen at a greenfield site in Massena, New York. The facility will be powered by 94 MW of low-cost, zero-emissions St. Lawrence River hydroelectric power.
- A green hydrogen facility developed jointly by Air Products and The AES Corporation of approximately $4 billion to build, own and operate a green hydrogen production facility in Wilbarger County, Texas. This proposed mega-scale renewable power to hydrogen project includes approximately 1.4 gigawatts of wind and solar power generation, along with electrolyzer capacity capable of producing over 200 tonnes per day of green hydrogen, making it the largest green hydrogen facility in the United States.
- An Air Products $4.5 billion blue hydrogen clean energy complex in Louisiana, which represents the company's largest investment ever in the United States and will permanently sequester more than five million tons of carbon dioxide (CO2) per year. This project will capture 95% of the facility's CO2 emissions and produces blue hydrogen with near-zero-carbon emissions.
- An innovative net-zero-carbon hydrogen Air Products production complex in Alberta, Canada, totaling $1.6 billion, which achieves net-zero emissions through the combination of advanced hydrogen reforming technology, carbon capture and storage, and hydrogen-fueled electricity generation.
- The world's largest green hydrogen project developed by Air Products with regional partners will utilize more electrolyzer capacity than has been deployed throughout the

world to date. This multi-billion-dollar project in Neom will unilaterally serve to scale global electrolyzer production capacity and manufacturing, helping to bring down the costs of this important technology.

CEC's SB 643 Report Should Promote a Diverse Set of Hydrogen Production Technologies and Resources

SB1075 directs that "the commission shall study and model potential growth for hydrogen and its role in decarbonizing the electrical and transportation sectors of the economy". Therefore, SB 1075 is in fact more expansive, and directs growth for hydrogen in both the electricity and transportation sectors. The SB 643 report should be consistent by allowing for different pathways of production. Because hydrogen as a transportation fuel can deliver ZEV solutions today for heavy-duty long-haul transportation, aviation, shipping, and drayage, all of which are hard-to-abate sectors that typically use fossil crude or fossil feedstocks, building out the supply chain and end use demand to enable this global transition should be a priority.

While the staff report acknowledges that standardized definitions of hydrogen are under development through the SB 1075 process, the report could clarify how the CEC plans to coordinate its SB 643 assessment with other state agency efforts as well as Governor-led hydrogen initiatives.

Evaluate Global Markets as Part of the CEC Hydrogen Growth Energy Strategy

The CEC is in a unique position in that it has the charge to evaluate and plan California's comprehensive energy strategy. Hydrogen advances important state energy objectives around decarbonization, energy diversity and resiliency, air quality improvements and jobs. Recognizing this, hydrogen deployments in non-traditional economic sectors are receiving more focus and support, including new valuable federal tax incentives and a national hydrogen hub strategy designed to expand deployment in non-traditional end-uses and create market lift-off.

California's energy policies in the past recognized the impact that our economy and our energy policies have on regional, national, and international energy supply – and vice versa. Policies like Cap-and-Trade, the LCFS, and the RPS were designed with a recognition of impacts beyond our borders. As such, the CEC SB 643 report and other planning efforts need to ensure that characterizations of hydrogen attributes, such as carbon intensity and renewable content, do not hinder the transnational trade in hydrogen.

In addition, according to CEC data, California imports 75% of its crude oil, more than 90% of its natural gas, and over two-thirds of all energy, including electricity. Replacing these fossil fuels and energy sources will require an all-of-the above strategy including, expanding in-state resources as a priority, and supporting regional, national, and international hydrogen and hydrogen derivatives supply chains. We encourage the CEC to recognize hydrogen's role in the global energy economy, the impact of the state's efforts on the global supply of hydrogen and to analyze and recommend market incentives to ensure that there is a robust, reliable supply of hydrogen in place to supplant the use of diesel, crude, oil, and natural gas in key sectors. This will enable a cost-effective expansion of hydrogen and position California competitively in the global hydrogen economy.

CEC Should Take a Technology-Neutral Approach to Hydrogen and Other Emerging Topics

A full and fair evaluation of the complete array of hydrogen technologies, throughout the supply chain, will lead to the conclusion that we can more deeply and quickly decarbonize many sectors of California's economy than we currently assume. An incomplete evaluation, however, including one that only looks at limited solutions, such as electrolysis or pipeline transport of hydrogen, is more likely to lead to suboptimal outcomes, higher costs, and longer timeframes for achieving California's climate goals.

We urge you to take a technology-neutral and performance-based approach in your evaluation of hydrogen, including an evaluation of:

- Current hydrogen supplies and how they can be deployed to support California's comprehensive energy goals, including feedstock replacement for additional decarbonization.
- Maintaining a technology-neutral approach also aligns with federal incentives including the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) – neither of which dictate a specific production technology.
- We strongly urge you to avoid creating any arbitrary and limiting definitions or exclusions for hydrogen based on production technology, feedstock, or other categorizations that don't necessarily influence emissions reduction outcomes or air quality improvements. This would only serve to limit opportunities to reduce emissions in the State. A comparison and evaluation of decarbonization strategies, including for hydrogen, should be based on carbon intensity.

Potential For Hydrogen to Enable A More Renewable Grid

The CEC and Other Agencies Should Identify and Prioritize the Most Beneficial Uses for Low Carbon Hydrogen and its Derivatives

Hydrogen is the most viable energy source that can decarbonize a significant portion of the economy such as heavy-duty transportation (i.e., transit buses, trucks, shipping, rail, aviation), and heavy industry (chemicals, cement, power, steel, aluminum, and iron). When used as a fuel or energy carrier in these sectors, it produces very low or no direct emissions, significantly improving local air quality. In a complement to renewable electricity, hydrogen also provides important grid reliability, resilience and energy storage characteristics that will support the continued growth of renewable generation.

As the CEC considers the state energy strategy and the expanded role of hydrogen, the framework for rapid development of new projects should include highlighting the role for hydrogen solutions in the power sector, including in the forthcoming SB 423 evaluation of firm zero carbon resources, and guide the CPUC Integrated Resource Planning (IRP) and procurement strategies to enable private sector investment in hydrogen solutions for SB 100 compliance. This would include clean resource adequacy procurement, strategic reserve investments in hydrogen, directives to load-serving entities to procure hydrogen baseload capacity, procurement directives for hydrogen as long-term storage solutions (e.g. PG&E's third-party partnership to develop a hydrogen fuel cell project to improve grid resiliency at substations as approved by Commission Resolution E-5261), consideration of distributed generation and grid resiliency in the IRP and procurement orders for electric LSEs that include hydrogen fueled equipment.

Conclusion

California is a global leader in the green economy with renewable and low carbon energy markets that drive state, national and international policies. The CEC SB 643 assessment process examining low-carbon hydrogen production, application of hydrogen in the on-road and off-road/non-road transportation sectors and the potential for hydrogen to support a renewable electrical grid, will help produce a comprehensive effective energy framework, critical to an affordable, safe, reliable hydrogen system. This new hydrogen system must prioritize climate and air quality benefits, energy diversity and resiliency, protect frontline communities and grow our skilled and trained workforce. State programs can provide important market signals for hydrogen that enable a balanced hydrogen market, compelling expansion of our robust green economy and continued support for private sector investments.

California is moving toward the next phase of economy-wide decarbonization for hard-to-abate sectors, which now includes expanding hydrogen to a wider, non-traditional end-user base. Air Products urges you to consider in future assessments the principles of a competitive market and appropriate state incentives to support new hydrogen production and demand in this context. Competitive markets with technology-neutral and performance-based (carbon intensity) metrics will facilitate immediate meaningful environmental benefits, drive costs down, and will deliver real projects with verifiable emission reductions, quickly, safely, and reliably.

As the state's largest hydrogen producer and systems operators, the only U.S.-based global hydrogen provider, and an international leader in low carbon hydrogen deployment, we look forward to working with the CEC to further assess clean hydrogen production, its use in the MDHD on-road and off-road/non-road transportation sectors and potential grid applications in the power sector through this SB 643 assessment.

Thank you again for the opportunity to comment. If you have any questions, please feel free to contact me or Joe Gagliano (gaglianoj@airproducts.com).

Respectfully,

Eric Guter
Vice President
H2fM and Clean Hydrogen