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June 24, 2022

Rajinder Sahota
California Air Resources Board (CARB)
1001 I Street
Sacramento, California 95814

RE: Air Product's Comments on Draft 2022 Scoping Plan

Dear Ms. Sahota:

Thank you for the opportunity to comment on the Draft 2022 Scoping Plan. We appreciate the thorough public process and staff work that has gone into developing this draft Scoping Plan, and we look forward to continuing to work with you and CARB as you finalize and then implement the plan to achieve carbon neutrality in California.

Air Products is Investing in a Diversity of Global Scale Clean Hydrogen Solutions

Air Products is a U.S.-based industrial gas company and the world's largest hydrogen producer and supplier for use in numerous markets, including transportation. We are committed to rapidly scaling and decarbonizing global hydrogen supplies, in order to support rapid decarbonization efforts in California and internationally. In just the last two years, Air Products has announced about $12 billion in clean energy investments, including:

- The world's largest green hydrogen project by far ($7 billion), requiring more electrolyzer capacity than has been deployed throughout the world to date. This project alone will serve to scale global electrolyzer production capacity and manufacturing, helping to bring down the costs of this important technology.

- An innovative $1 billion net-zero carbon hydrogen production complex in Alberta, Canada, which achieves net-zero emissions through the combination of advanced hydrogen reforming technology, carbon capture and storage, and hydrogen-fueled electricity generation. Air Products recently won the Best Carbon Management Initiative Award for this project at the 2021 *Chemical Week* Sustainability Awards.

- A $4.5 billion blue hydrogen clean energy complex in Louisiana, which represents the company's largest investment ever in the United States and will sequester more than 5 million tons of carbon dioxide (CO_2) per year. This project

will capture 95% of the facility's CO_2 emissions and produce blue hydrogen with near-zero carbon emissions.

- A green hydrogen facility based in Casa Grande, Arizona just outside Phoenix which is expected to be on-stream in 2023 and will produce zero-carbon, liquid hydrogen for the transportation market.

- A $2 billion major expansion project with World Energy to develop North America's largest sustainable aviation fuel production facility in Paramount, California. The project will expand the site's total fuel capacity to 340 million gallons annually, and among other investments, includes an extension and capacity increase of Air Products' existing hydrogen pipeline network in Southern California. The project is scheduled to be onstream in 2025.

The Scoping Plan and Related Policies Can Foster More Rapid Private Sector Investment in Clean Hydrogen Solutions

Air Products, and the hydrogen industry more broadly, are rapidly moving from conventional production to decarbonized hydrogen solutions. California can best support the rapid development of additional projects like this by:

- Creating an even playing field for hydrogen, alongside electrification and other solutions, that is performance-based:

    - Provide equal access to state incentive dollars for all zero-emission vehicle (ZEV) technologies, including fuel cell vehicles, hydrogen stations, and green hydrogen supply projects.

    - Avoid defining or classifying hydrogen based on technologies or geography, and rather make any eligibility or other criteria for hydrogen based on carbon intensity. For example, Air Products supports the broad definition of green hydrogen referenced in the draft Scoping Plan, which includes biomass and other renewable hydrogen options, alongside electrolysis. We further note that blue hydrogen can be made with a similar carbon intensity as green hydrogen and should be incentivized accordingly.

- Scale demand side markets for hydrogen in the transportation sector, industrial sector, and power sector. Specifically, Air Products supports proposals to:

    - Strengthen the Low Carbon Fuel Standard (LCFS) through 2030 and beyond, to continue driving investments in low carbon fuels.

    - Adopt Hydrogen Refueling Investment crediting for heavy-duty vehicles under the LCFS. This program has been successful in fostering private

sector investment in larger, more reliable hydrogen fueling stations for light-duty vehicles and can help to rapidly scale infrastructure for heavy-duty ZEVs, as well.

- Support deployment of low-carbon hydrogen in the transportation sector through the related LCFS proposals identified in the December workshop. Also expand crediting opportunities for low-carbon hydrogen and its derivatives, like low-carbon ammonia, by expanding coverage of the LCFS to new transportation sectors like aviation and shipping.

- Provide long-term visibility into the availability of incentives for heavy-duty fuel cell vehicles, including exempting fuel cell vehicles from the large-fleet cap proposed under the HVIP program.

- Leverage the State's climate change programs – including the LCFS, Cap-and-Trade, and new policies that may be developed pursuant to Senate Bill 596 (Becker – net-zero emissions in the cement sector) or otherwise – to develop markets for decarbonized hydrogen in the refining sector, cement and other industrial applications, and to decarbonize gas power plants.

- Streamline project permitting, including for the development of greenfield hydrogen refueling stations or conversions of gas stations to hydrogen refueling stations.

California Needs a Diversity of Clean Energy Sources and Technologies, Including for Hydrogen

Air Products is fully committed to developing world-scale solutions to address climate change. No individual technology will be able to do so, however, and the world – and California – will need multiple solutions to address this critical challenge. That is why Air Products pursues a diversity of low-carbon solutions such as green hydrogen and blue hydrogen in locations and circumstances where a specific approach, technology and product makes sense.

In California, all forms of hydrogen make sense, as does support for both in-state and out-of-state projects. For example, hydrogen produced today using conventional steam methane reforming technology and natural gas provides over a 30% improvement in carbon intensity when compared to conventional transportation fuels[1] and zero criteria and toxic vehicle exhaust emissions – bringing much needed air quality and health benefits to disadvantaged communities. These benefits can be realized now while hydrogen is transitioned to lower carbon over the time horizon of this Scoping Plan Update. In terms of out-of-state projects, according to CEC data, the state already relies on imported energy to supply nearly one-third of its electricity, more than 70

[1] Union of Concerned Scientist "How Clean Are Hydrogen Fuel Cell Electric Vehicles" Fact Sheet (September 2014)

percent of its crude oil, and 90 percent of its natural gas. Altogether, more than two-thirds of California's overall energy requirements are met from imported resources.

While the state has some world-class renewable energy resources, according to the 2021 Joint Agency SB 100 Report, the state will need to sustain "record breaking" clean energy build rates for 25 years, just to achieve its SB 100 goals. The draft 2022 Scoping Plan suggests significantly more clean energy will be needed to achieve carbon neutrality in the State. The California Public Utilities Commission has identified a need for new out-of-state renewable energy resources in its recent Integrated Planning Report, and the California Independent System Operator is planning for transmission to accommodate several gigawatts of renewable energy imports into the State.

California will very likely have to continue relying on imported energy to meet its clean energy goals for electricity and other sectors – even in a clean energy future. The State's approach to hydrogen should not foreclose opportunities to import clean hydrogen into the State, which will likely be required to meet California's climate and clean energy goals quickly and cost effectively.

Hard to Electrify Sectors Don't Have to be "Hard-to-Abate"

Many sectors that will require clean hydrogen to decarbonize are often referred to as "hard-to-abate" sectors. While we seem to have convinced ourselves of this as a matter of conventional wisdom, they are really no more difficult to decarbonize than other sectors, at least conceptually. We know how to decarbonize industry and heavy-duty and off-road transportation, and the technologies to do so – hydrogen and its derivatives, as well as carbon capture and sequestration (CCS) and gasification – are largely available today.

We can plan for decarbonizing these sectors and enable the solutions to do so. In addition to some world class renewable energy resources, California also has world-class geology to support CCS, which should be brought to bear in the State's fight against climate change, as well as a critical need to manage and utilize waste biomass from the forests and other organic waste streams, which hydrogen-related efforts can support.

We appreciate that the draft 2022 Scoping Plan highlights starts to do just that, specifically showing how enabling non-electrification solutions can lead to rapid climate benefits. For example, *all four modeled alternatives achieve deep decarbonization of the refining sector within eight years when CCS is allowed.* The Scoping Plan scenarios, and California on whole, could achieve similar transformative outcomes in other sectors, as well, if the state focuses on low carbon molecules, like hydrogen, as well as low carbon electrons. We encourage CARB to further explore how solutions like CCS, hydrogen, and its derivatives like ammonia and sustainable aviation fuel could lead deeper and more rapid greenhouse gas reductions in other sectors, as well, including the power sector, cement, shipping, and fertilizer.

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

We are confident that 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 energy and climate goals and be further decarbonized themselves.

- End use applications for hydrogen and its derivatives, including methanol, ammonia, and synthetic fuels such as renewable methane or sustainable aviation fuel.

- An array of clean hydrogen solutions and technologies, based on carbon intensity, including lower carbon hydrogen (utilizing CCS), green hydrogen from both electrolysis and biomass gasification, and negative carbon solutions by pairing biomass gasification with CCS.

Most of all, as referenced above, 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 outcomes. 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 clearly based on lifecycle carbon intensity.

More Cross-Sectoral Analyses Needed than Just Electricity and Electrolysis

As you evaluate hydrogen strategies and technologies, we urge you to consider a wide array of cross-sectoral impacts. Too often, discussions of hydrogen as a cross-sectoral issue have limited focus on electrolysis as an asset for the electricity grid. Electrolyzers are certainly a promising strategy to put excess clean electricity to beneficial use, but overgeneration alone, likely occurring during a relatively small fraction of hours of the year, is insufficient to justify electrolyzer projects or drive the market for electrolysis and green hydrogen forward.

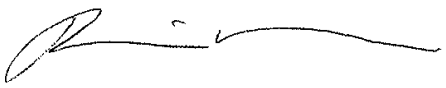
Indeed, more promising cross-sectoral assessments may look at the opportunity for low-carbon hydrogen to pair with CCS at industrial facilities, including cement plants, and for biomass gasification (especially if it's paired with CCS and potentially co-located with

other industrial decarbonization efforts) to support State priorities related to organic waste, forest management, and avoided agricultural burning in the Central Valley.

As illustrated in the Lawrence Livermore National Laboratory Report, *Getting to Neutral,* the cross-sectoral opportunities for waste biomass and hydrogen are vast. The report finds that deploying biomass gasification with CCS to manage existing organic waste streams and developing offtake markets at scale to utilize the resulting hydrogen, can quickly and cost-effectively lead to emissions benefits that would be greater than taking every passenger vehicle off California's roads. Based on this analysis, no other integrated climate strategy may offer such emissions benefits.

Thank you again for the opportunity to comment on the draft 2022 Scoping Plan. We look forward to continuing to work with you throughout the 2022 Scoping Plan process and beyond to successfully achieve carbon neutrality in California. If you have any questions, please feel free to contact me at hellermt@airproducts.com.

Respectfully,



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