CALIFORNIA HYDROGEN BUSINESS COUNCIL

Hydrogen Means Business in California!

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California Air Resources Board
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RE: 2022 Scoping Plan Update – Draft Scenario Inputs Technical Workshop

The California Hydrogen Business Council (CHBC)[1] welcomes the opportunity to comment on the California Air Resources Board (CARB) 2022 Scoping Plan Update –Draft Scenario Inputs Technical Workshop. The scenario inputs proposed for the 2022 Scoping Plan Update are illustrative of CARB's efforts to incorporate stakeholder feedback, including CHBC's. Although encouraged by the inclusion of hydrogen in this PATHWAYS model, the modeling should incorporate adoption scenarios and cost progress that aligns with those found in optimal strategies internationally or suggested by renewable hydrogen experts.

Optimal hydrogen strategy scenarios should be analyzed consistently with the optimal deployments determined in leading national and regional strategies such as those in Canada, the United Kingdom, and the European Union.[2] These strategies find that hydrogen will make up 24 to 35 percent of final energy consumption by 2050. Canada anticipates hydrogen supplying 30 percent of end use energy, the United Kingdom strategizes up to 35 percent, and the European Union predicts at least 24 percent. As shown in these strategies, primary energy using hydrogen as an energy carrier is cost and risk optimal. In recognition of the aforementioned strategies identifying a high use case for hydrogen in

[1] The CHBC is comprised of over 135 companies and agencies involved in the business of hydrogen. Our mission is to advance the commercialization of hydrogen in the energy sector, including transportation, goods movement, and stationary power systems to reduce emissions and help the state meet its decarbonization goals**. The views expressed in these comments are those of the CHBC, and do not necessarily reflect the views of all of the individual CHBC member companies.** CHBC Members are listed here: https://www.californiahydrogen.org/aboutus/chbc-members/

[2] UK Secretary of State for Business, Energy, and Industrial Strategy. "UK Hydrogen Strategy," August 2021.; European Commission. "A Hydrogen Strategy for a Climate-Neutral Europe," August 2020.; The Honorable Seamus O'Regan. "The Hydrogen Strategy for Canada," December 2020.

meeting their decarbonization goals by 2050, the PATHWAYS model should similarly incorporate hydrogen into the technical inputs at a rate that is reflective of global projections.

The PATHWAYS model should employ renewable or other zero-carbon hydrogen in all sectors as identified below:

1. In the light-duty transportation sector, the modeling should include at least a 25 percent fuel cell electric vehicle use case;
2. In the medium, heavy-duty, and off-road transportation sector, the modeling should include at least an 80 percent adoption of hydrogen for transit, freight, rail, and harbor craft;
3. To decarbonize building heating, the modeling should include the adoption of hydrogen at 70 percent using either advanced furnaces or thermo-acoustic heat pumps with coefficient of performance (COP) of at least 2;
4. To decarbonize heavy industries, the modeling should include the 100 percent adoption of hydrogen for high-temperature process heat, refining, and chemical processes requiring hydrogen; and,
5. In the power sector, no less than 10% of delivered power should be produced from hydrogen-powered generators providing firming for variable renewable resources or such higher percentage as may be determined by optimal dispatch modeling. To decarbonize California's firm power, the modeling should include at least 10 percent of delivered terawatt powered by renewable hydrogen-driven generators.
6. For those sectors or applications requiring pipeline delivery of hydrogen, the cost of pipeline delivery found in the H21 North of England study[3] should be adopted on a unit-of-delivered-

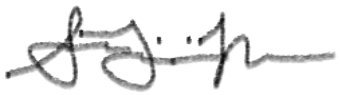
[3] https://h21.green/projects/h21-north-of-england/. Accessed 11/19/21.

energy basis and should result in a delivery cost no more than $3/MMBtu higher than delivery of natural gas on a unit energy basis.

Finally, in light of the United States Department of Energy in Hydrogen Shot[4] goal, at least one scenario should assume the goal of $1 per kilogram is achieved and the base-case cost of 30 bar renewable hydrogen at the plant gate should be no higher than $2 per kilogram by 2030.

The CHBC looks forward to the incorporation of one or more high hydrogen scenarios in the PATHWAYS model and to our continued engagement with the CARB on the 2022 Scoping Plan. We appreciate the opportunity to engage on the modeling scenarios.

Respectfully Submitted,



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[4] https://www.energy.gov/eere/fuelcells/hydrogen-shot. Accessed 11/19/2021.