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## CHBC EPIC 4 Draft Initiative Comments

*Additional submitted attachment is included below.*

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August 18, 2021

**RE: Electric Program Investment Charge (EPIC 4 Draft Initiatives)**

## I. INTRODUCTION

The California Hydrogen Business Council (CHBC)[1] appreciates the invitation to respond to the EPIC 4 Draft Initiatives Workshop. The CHBC applauds CEC's work in administering the EPIC program and workshops to improve the program for the coming cycle. The EPIC program has been instrumental in funding the research and development of innovative technologies that have helped California significantly reduce greenhouse gas (GHG) emissions. It is imperative the EPIC program continue these efforts by committing to research and development of new and emerging zero and low carbon technologies as determined by a carbon intensity score ("CI score"). The CHBC respectfully requests consideration of the following comments that address areas the CHBC believes are deserving of research and development within the EPIC 4 Initiatives.

## II. DISCUSSION

### a. The EPIC 4 Initiatives should include research and development of hydrogen as a firm seasonal and long-duration energy storage resource.

Hydrogen is a clean burning, diverse energy carrier that can be stored for an insurmountable duration and acts as a firm renewable resource for the electric grid when derived from resources like wind and solar.[2] California's renewable energy produced from wind and solar has grown exponentially and

[1] The CHBC is comprised of over 120 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] https://www.fchea.org/in-transition/2019/7/22/unlocking-the-potential-of-hydrogen-energy-storage.

must continue to grow to support the state's decarbonization goals. However, as wind and solar have grown, California's over-supply of renewable power—which occurs when California's weather is most suitable for wind and solar generation[3]--has also grown. Over-supply results in resource curtailment, which is the intentional reduction of energy that could be produced from these resources.[4] In 2018, the California Independent System Operator (CAISO) reported that approximately 461 GWh of solar and wind energy was curtailed that year.[5] That means 461 GWh of solar and wind energy was lost and Californians relied on fossil fuels to make up for renewable energy that could otherwise have been stored and redeployed when needed. In 2019, CAISO data show a significant increase of over 700 GWh of curtailed solar and wind power and up to as much as 12,000 GWh are expected to be curtailed by 2030. This year, in 2021, the CAISO hit a record of over 300MWh of curtailed renewables in March.[6]

California is facing an increasing need to deploy more renewable power and gas resources to meet the state's GHG abatement and RPS goals. There are a host of seasonal and long-duration energy storage (LDES) options that present the potential to store large volumes of renewable hydrogen including depleted oil fields, rock formations, and pipelines. (Seasonal energy storage represents resources that can be stored for days to an entire season where renewable energy generation from solar and wind resources is not as abundant as during other seasons.[7] LDES accounts for the indefinite storage of energy.[8]) These options are not subject to drought conditions and could potentially store hydrogen in large volumes for long durations. Depleted oil fields, rock formations, and pipelines show tremendous potential for the seasonal and LDES of hydrogen based on previous studies[9] and projects currently in operation. For example, depleted oil fields are being utilized in Texas as viable options for seasonal and LDES.[10] And, in

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[3] Denholm, P., O'Connell, M., Brinkman, G., Jorgenson, J. "Overgeneration from Solar Energy in California: A Field Guide to the Duck Chart." (2015). https://www.nrel.gov/docs/fy16osti/65023.pdf.
[4] *Id.*
[5] http://www.caiso.com/informed/Pages/ManagingOversupply.aspx.
[6] California ISO - Managing Oversupply (caiso.com)
[7] https://www.utilitydive.com/news/to-batteries-and-beyond-with-seasonal-storage-potential-hydrogen-offers/584959/.
[8] *Id.*
[9] 5030aece27ab4701808c08c0b8873e97.pdf (dnvgl.com); Renewables can make hydrogen green | Insight | HSBC Holdings plc.
[10] https://www.power-technology.com/features/featurecould-depleted-oil-wells-be-the-next-step-in-energy-storage-5680002/.

England, a pipeline storage project of 400 MW is under construction.[11] California will have an increasing need for reliable seasonal and LDES of firm dispatchable resources, such as renewable hydrogen, to achieve the state's decarbonization goals and retain a high level of electric grid resiliency.

**i. Depleted Oil Fields**

Depleted oil fields have been used successfully for the storage of natural gas,[12] but as California transitions to the use and storage of clean energy resources like renewable hydrogen, the potential of seasonal and LDES of renewable hydrogen within depleted oil fields must be studied, and if viable, implemented. Repurposing depleted oil fields that have already been surveyed and evaluated for storage of natural gas will reduce costs and time in determining the viability of hydrogen storage.[13] California has a many oil producing basins with an estimated 70,000 active and 35,000 idle oil wells within the state.[14] Tapping into this existing infrastructure for storage of renewable hydrogen makes sense for California and, if viable, will help the state achieve its goals.

**ii. Rock Formations**

Similar to depleted oil fields, rock formations as a storage medium for renewable hydrogen is an emerging technology that has potential but is in need of further evaluation. Salt caverns are a promising resource for renewable hydrogen storage due to the large storage capacity, low investment cost, high sealing potential, and low cushion gas requirement.[15] Unfortunately, there are no salt caverns within California, and therefore, these geologic resources are not an option for renewable hydrogen storage within the state.[16] Rock formations, however, may be suitable for renewable hydrogen storage and must be studied to determine viability. Previously, rock formations were developed for the storage of liquid hydrocarbons and have the potential for storage of renewable hydrogen.[17] Like depleted oil fields, rock

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[11] https://ieefa.org/highview-power-says-its-long-duration-energy-storage-pipeline-totals-400mw-4gwh/.
[12] Donadei & Schneider, Compressed Air Energy Storage in Underground Formations: Depleted Oil and Gas Fields, 2016.
[13] ACS Energy Lett. 2021, 6, 2181-2186, "Offshore Geological Storage of Hydrogen: Is This Our Best Option to Achieve Net-Zero?"
[14] https://www.latimes.com/projects/california-oil-well-drilling-idle-cleanup/#:~:text=Do%20you%20live%20within%20600,active%20or%2035%2C000%20idle%20wells%3F.
[15] Caglayan, et al., February 2020, "Technical Potential of Salt Caverns for Hydrogen Storage in Europe."
[16] https://www.eia.gov/dnav/ng/hist/na1393_sca_2a.htm.
[17] Kruck, August 2013, "Overview on all Known Underground Storage Technologies for Hydrogen."

formations already exist and scaling them for renewable hydrogen storage could be cost effective and accelerate the transition to clean energy storage.

### iii. Pipelines

Another abundant California resource is the state's pipeline gas grid distribution system. Currently, hydrogen is injected and blended into existing natural gas pipelines for the purpose of decarbonizing the gas grid.[18] However, pipelines could also serve as seasonal and LDES of renewable hydrogen. The amount of renewable hydrogen that can be blended into the existing pipeline system is being studied at the CEC and in various academic venues.[19] For the pipeline system to be a viable seasonal and LDES option for California, more studies need to be done to determine a higher hydrogen blend beyond 20%. Because hydrogen has the potential to embrittle steel and welds used to fabricate natural gas pipelines,[20] the CHBC recommends studying how California can modify the existing natural gas pipeline system to carry a higher blend of renewable hydrogen for storage purposes.

Finally, the CHBC recommends in the evaluation of the viability of the pipeline gas grid distribution system as seasonal and LDES, the research include all necessary safety measures to keep local communities protected and build trust in the use and storage of renewable hydrogen. CHBC supports research and development of safety and integrity measures through an equity lens that considers low-income and marginalized communities that live near existing pipeline gas grid distribution systems.

### b. The EPIC 4 Initiatives should implement a carbon intensity score to evaluate renewable hydrogen, and other existing and emerging decarbonization technologies so California can have access to the cleanest technologies in the race to decarbonize the state.

The value of hydrogen in a decarbonizing economy can be measured is a variety of ways. Traditionally, hydrogen has been grouped by colors based on the method by which the fuel was produced

[18] https://www.greentechmedia.com/articles/read/green-hydrogen-in-natural-gas-pipelines-decarbonization-solution-or-pipe-dream.
[19] https://www.fchea.org/in-transition/2021/3/8/hydrogen-blending.
[20] https://www.energy.gov/eere/fuelcells/hydrogen-pipelines.

– grey, blue, green, pink, yellow, white, etc. Integrating the many colors of hydrogen into complex regulatory decarbonization programs is a difficult task and relies solely on broad definitions which are not based on objective science, provide little insight, or (relative decarbonization) value in terms of comparing one source of hydrogen or emerging decarbonization technologies against another.

The CHBC supports a move away from color base definitions of hydrogen for regulatory programs and instead, supports an objective science-based approach that provides an easy-to-use method for comparing production pathways across the hydrogen spectrum. The CHBC supports a Carbon Intensity (CI) index, or CI score be used to classify various forms of hydrogen. By way of example, CARB currently uses a CI based model to compare the relative carbon values of transportation fuels in the Low Carbon Fuel Standard (LCFS).[21] Expanding upon that knowledge of developing fuel pathways and CI scores for hydrogen provides regulators, the regulated, and project developers an objective way to plan, set standards, and invest with certainty.

Like the LCFS, CI based regulatory glidepaths can be developed for any carbon abatement program across every sector of the economy. Under this regimen, regulators can assess the interim and end goals of any program, develop a compliance pathway that provides insurance the goals will be met, and bring certainty for investors who can evaluate project risks and rewards against clear, well-defined regulatory requirements. Longer glidepaths create greater compliance flexibility, investment planning horizons and market certainty for investors.

The CHBC supports the use of a Carbon Intensity (CI) index for measuring the relative value/carbon content of various hydrogen pathways against regulatory program requirements.

## I. CONCLUSION

The CHBC appreciates the opportunity to submit comments on the EPIC 4 Draft Initiatives Workshop. Although the workshop and the EPIC 4 Draft Initiatives document provided many promising research and development avenues for EPIC 4, the CHBC is supportive of a more inclusive final

[21] University of California, Berkeley Law. "California Climate Policy Fact Sheet: Low Carbon Fuel Standard." 2019.

document that incorporates new and emerging technologies that will assist California in meeting it's stated decarbonization goals.

Respectfully Submitted,

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