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Additional submitted attachment is included below.

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Comments by California Hydrogen Business Council on SB 100 Draft Report Workshop

December 18, 2020

I. INTRODUCTION

The California Hydrogen Business Council (CHBC) [1] welcomes the opportunity to comment on the December 4, 2020 workshop focused on the draft Senate Bill 100 (SB 100) Joint Agency Report ("Report"). We continue to appreciate the immense effort the agencies have put into this critical process and commend you on the progress made since the start of this complex endeavor. Our feedback is summarized below and explained further in the Comments section that follows.

A. The CHBC appreciates the addition of the zero-carbon firm power resource scenario and the inclusion of hydrogen as a potential resource in this analysis.

B. We strongly support the modeling takeaway that resource diversity decreases overall cost and that zero carbon resources, and particularly hydrogen, hold promise to significantly contribute to cost reduction.

C. Hydrogen for use in fuel cells for the purposes of implementing SB100 should not be limited to hydrogen produced with RPS eligible feedstock sources but rather RPS eligible and zero carbon feedstock sources.

[1] The CHBC is comprised of over 100 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 dependence on oil. 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. Members of the CHBC can be found here: https://www.californiahydrogen.org/aboutus/chbc-members/.

D. We fully agree that further analysis is needed on SB 100 implementation that includes a more comprehensive examination of reliability and other key variables, and generally support the next steps, considerations, and recommendations made in the report.

II. COMMENTS

A. The CHBC appreciates the addition of the zero-carbon firm power resource scenario and the inclusion of hydrogen as a potential resource in this analysis.

Although the CHBC continues to desire to correct the record on the erroneous assertion that electrolytic hydrogen production technology is not commercially mature or available, we appreciate forward movement on inclusion of renewable hydrogen as a resource in IRP processes.

Rather than citing the hundreds of gigawatts of renewable electrolytic hydrogen production projects announced over the past 12 months around the globe, the CHBC points to the California Energy Commission solicitation GFO-17-602 for commercial renewable hydrogen production facilities that yielded multiple qualified bids and two awards for megawatt-scale renewable, electrolytic hydrogen production facilities. Simply put, although, like all technologies needed to contribute to SB100 goals, continued progress on cost is of great benefit to all Californians, but technology maturity is an entirely separate issue. Renewable electrolytic hydrogen is 100% commercial with systems available from many companies. Cost and performance forecasting is uncertain for all technologies, but the renewable hydrogen sector is fully equipped to provide data for inclusion of renewable hydrogen in resource planning with cost and performance forecasting of equal quality to other resources, such as batteries, that are on steep cost trajectories.

We support the addition of a study scenario focused on zero-carbon firm power resources and that 100% hydrogen combustion is one of the fuels mentioned as potentially represented by

the "generic dispatchable" and "generic baseload" resources modeled in the scenario. As the CHBC has shared in previous comments in this and other agency proceedings, hydrogen made from renewable and zero carbon resources holds great promise to provide dispatchable, decarbonized firm power that can be stored in vast quantities until needed, such as during seasonal and peak demand periods – and can be deployed today if regulatory barriers can be removed. Greater deployment of hydrogen also presents many economic opportunities for California, due to its high potential for a rapid downward cost trajectory and for creating and retaining good, green jobs in the state. Additionally, renewable and zero carbon hydrogen is key to enabling California to reach its goal of carbon neutrality economy wide, including in hard to abate applications like industrial heat and chemical processes, legacy building heat, back up generation, heavy duty transportation, and passenger vehicles where plugging in is difficult, long ranges and bigger vehicles are demanded or fast refueling is needed.

B. We strongly support the modeling takeaway that resource diversity decreases overall cost and that zero carbon resources, and particularly hydrogen, hold promise to significantly contribute to cost reduction.

The Report states that if zero-carbon firm technologies are able to reach a cost of approximately $60/MWh, they could reduce system costs by an estimated $2B annually in 2045.[2] UC Irvine, citing multiple analysts, reports in a recent White Paper that $60/MWh is a mid-range 2030 cost estimate for electrolytic hydrogen[3] and is also within the forecast range for methanated electrolytic hydrogen by 2035.[4] UC Irvine analysis also shows that the RESOLVE model starts selecting zero-carbon gas at significant levels at this pricing and already to some extent at pricing as high as $135/MWh. We hope future analysis and planning for SB 100 implementation will continue to investigate the potential cost savings of including zero carbon

[2] Report, pp 25,

[3] Jeffrey Reed, PhD, UC Irvine, *The Potential Impact of Renewable Gaseous Fuel on Optimizing the California Renewable Portfolio.* Note this White Paper presents future pricing estimates for electrolytic fuels in kilograms (kg) and Million Metric British thermal units (MMBtu). At 60% efficiency for conversion, there are 5.69 MMBtu per MWh. This leads to their mid-range 2030 cost projection of $16/MMBtu being equal to $60/MWh. This would be the cost using existing resources (so no generation capex recovery).

[4] Ibid, p. 6

hydrogen based fuels in California's electricity resource portfolio.

C. Hydrogen for use in fuel cells for the purposes of implementing SB100 should not be limited to hydrogen produced with RPS eligible feedstock sources but rather RPS eligible and zero carbon feedstock sources.

Limiting the hydrogen in fuel cells to that produced with RPS eligible sources excludes important feedstocks, such as legacy large hydropower to power electrolysis, that would help to fully realize the grid integration potential of electrolysis, as well as accelerate the economical production of zero carbon hydrogen, which is widely recognized as being needed to decarbonize hard to abate applications. We therefore recommend that the chart on p. 18 of the report be amended to include RPS and zero carbon feedstocks.

D. We fully agree that further analysis is needed on SB 100 implementation that includes greater incorporation of hydrogen, along with a more comprehensive examination of reliability and other key variables. We generally support the next steps, considerations, and recommendations made in Chapters 4 and 5 of the Report.

The CHBC is heartened that the agencies recognize the need for further analysis. We strongly agree with the Report that "Future work should better capture the impact and value of resources that are either not represented or not well valued in the current modeling framework" [5] and that specifically these ought to include hydrogen and long duration storage, which is not adequately captured in current modeling efforts. We encourage discussions and modeling of long duration storage to also include seasonal storage – that is, technologies that can store energy without discharging over months to ensure energy supply remains adequate over seasonal shifts in demand. We furthermore agree that reliability should be a top priority incorporated into the next phase of analysis, along with other critical points like equity and workforce development. We additionally strongly support the direction to revisit issues related to SB 100 implementation on an annual basis, as the task is too great and complex to review less often.

[5] Report, p. 108

III. CONCLUSION

The CHBC appreciates the agencies' consideration of these comments and looks forward to continuing to work in each of your respective venues and jointly to build understanding of how hydrogen can help California meet its renewable and zero carbon electricity goals with optimal reliability and benefit to the economy, environment, and social welfare of all Californians.

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