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

Additional submitted attachment is included below.

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

September 15, 2020

I. INTRODUCTION

The California Hydrogen Business Council (CHBC) [1] greatly appreciates the opportunity to comment on the September 2, 2020 workshop focused on draft modeling results for the Senate Bill 100 (SB 100) Joint Agency Report. We deeply thank the agencies for their hard work on this critical effort and for hosting the workshop's constructive stakeholder discussion.

This process has never been more urgent. This week, in the wake of a historically massive round of devastating catastrophic wildfires, Governor Newsom declared his intention to accelerate state climate goals, including the schedule for achieving California's 100% zero carbon electricity target**. In view of this climate emergency and the Governor's direction to pick up the pace on corrective action, we strongly urge agencies to commit now to accelerating the transition to carbon neutrality, including in the power sector, and to include in this effort plans to replace all fossil electricity storage and generation needed for a zero carbon electricity future with zero and low carbon options, including decarbonized hydrogen and its derivatives.**

Our specific comments are summarized below and elaborated on in the Comments section that follows.

A. CHBC wishes to correct the record on E3's cost projections for electrolytic hydrogen, which are pessimistic compared to many analysts' latest projections – a worrisome

[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/.

pattern in E3 reports for California agencies – as well as their questionable assumption that there is inadequate cost and supply data for including hydrogen in 2020 modeling.

B. We ask that the final Joint Agency report consider UCI findings submitted to the SB 100 docket that hydrogen is cost effective at pricing that electrolytic hydrogen is likely to achieve by 2030, if not before.

C. We request that the joint agency report on SB 100 clearly support hydrogen as an important zero carbon firm power resource and as a long duration storage resource, per SB 1369, as part of committing to a more granular, multi-dimensional modeling approach that adequately addresses issues beyond the scope of RESOLVE, such as those related to reliability, resiliency, emissions, and local requirements.

D. To support California in accelerating its climate protection program and to harmonize state agency efforts, the SB 100 Report ought to clearly support the goal of achieving zero or near zero greenhouse gas emissions in the electricity sector as a whole as soon as possible.

E. We agree with several commenters that implementation modeling ought to be reviewed more often than ever 4 years.

II. Comments

The following is a detailed discussion of the comments summarized above.

A. CHBC wishes to correct the record on E3's cost projections for electrolytic hydrogen, which are pessimistic compared to many analysts' latest projections – a worrisome pattern in E3 reports for California agencies – as well as their questionable assumption

that there is inadequate cost and supply data for including hydrogen in 2020 modeling.

In E3's cost data supplement for the SB 100 modeling report, they estimate the optimistic 2045 hydrogen price for electricity generation to be $19/MMBtu. This is more than double the optimistic *2030* hydrogen price ($8/MMbtu) reported by UCI in their survey of multiple global analyses, and also higher than the 2050 conservative pricing ($16MMbtu) reported by UCI.[2] Such pessimistic pricing projections for hydrogen, accompanied by skeptical opinions about hydrogen's prospects for any other applications than transportation, has become a pattern in E3 reports for California agencies, despite CHBC and other stakeholders pointing this out repeatedly in public comments and urging correction over the past few years. The continued failure to accurately represent the economic case for hydrogen based on up to date industry data is worrisome and stifling industry confidence that California is willing to seriously and consistently consider hydrogen as a solution to decarbonize the power sector, among other applications.

Compounding the concern is the draft report's dismissal of hydrogen as a drop-in replacement fuel for gas turbines, based on the questionable assumption that there is lack of data on costs and supply and commercial experience in California. There are, in fact, numerous reports available that rigorously look at projected cost and feasibility of hydrogen to decarbonize the power sector and beyond, as well as billions of dollars being invested based in part on such findings. E3 actually produced a report for Mitsubishi Power recently that concluded that hydrogen power plants will be profitable in Southern California, if installed in the 2025-2030 timeframe.[3] LADWP, as shared at the workshop, has looked at hydrogen as part of an intensive,

[2] *The Potential Impact of Renewable Gaseous Fuel on Optimizing the California Renewable Portfolio,* UCI, September 2020 http://www.apep.uci.edu/PDF_White_Papers/Impact_of_Renewable_Gasesous_Fuels_on_Grid_Resource_Optimization_Using_RESOLVE.pdf

[3] *Hydrogen Opportunities in a Low Carbon Future,* E3 for MHPS; June 2020. See pp. 36-37. https://www.ethree.com/wp-content/uploads/2020/07/E3_MHPS_Hydrogen-in-the-West-Report_Final_June2020.pdf

multi-year multi-stakeholder process on how to achieve 100% renewable and zero carbon resources for their power supply. Using NREL modeling and analysis, the utility has examined several scenarios in depth, which as discussed in the recent workshop and others hosted in recent months by the agencies, informed the conclusion that green electrolytic hydrogen will be required. The utility is investing nearly two billion dollars based on these findings to develop the first large scale hydrogen power plant conversion project to serve California customers. Several other major power companies, have similarly found data on hydrogen costs and supply sufficient to give them confidence to invest in hydrogen as a low or zero carbon resource replacement for fossil fuel electricity generation.[4] These real-world industry decisions contrast sharply with the draft joint agency report's conclusion that including hydrogen as a thermal generation gas replacement in modeling is premature for consideration in California electricity modeling.

We also agree with the comment by Michael Colvin from EDF at the workshop that lack of commercial experience in California does not mean that there is not experience elsewhere that ought to be taken into consideration. At least 35 GW of electrolysis has been installed globally, with hundreds of megawatts expected to operational soon.[5] Several gigawatts are in the planning stages, with Germany alone committed to building 5 GW by 2030.[6] Oahu, Hawaii operates gas power plants with 12% hydrogen blends, a 30% hydrogen turbine has been ordered for the IPP project, 100% hydrogen power plant pilot projects have been successfully tested in Japan and Europe,[7] and several large scale commercial 100% hydrogen power plants

[4] Other electricity generation companies investing in hydrogen as a drop in replacement fuel for power plants include NextEra, Uniper, and Engie, along with various technology and financing partners. See, for example: https://www.greentechmedia.com/articles/read/utilities-on-both-sides-of-atlantic-follow-oil-majors-hydrogen-lead and https://press.siemens.com/global/en/pressrelease/hyflexpower-worlds-first-integrated-power-x-power-hydrogen-gas-turbine-demonstrator

[5] https://www.iea.org/reports/hydrogen

[6] https://www.cleanenergywire.org/factsheets/germanys-national-hydrogen-strategy

[7] 100% low NOx hydrogen generation is being demonstrated in a gas unit in Kobe, Japan, with others planned to be in operation this year: https://www.nedo.go.jp/english/news/AA5en_100382.html; https://global.kawasaki.com/news_200721-1e.pdf; 100% low NOx generation has also been successfully tested in Siemens aeroderivative gas turbines in Europe: https://new.siemens.com/mea/en/company/stories/energy/hydrogen-capable-gas-turbine.html; Siemens is working on expanding this capability to other types of turbine technology by 2023 and to get to 100% hydrogen

are in development, such as the IPP project, the NUON Vattenfall project in Sweden,[8] and the HYFLEXPOWER project in France.[9] California should not wait to begin modeling innovative, promising technologies such as these.

B. We ask that the final Joint Agency report consider UCI findings that hydrogen is a cost effective firm power resources at pricing that electrolytic hydrogen is conservatively estimated to achieve by 2030, if not before.

UCI took the initiative to insert hydrogen into the RESOLVE model, and the findings were shared in a report recently published.[10] Their analysis shows that if renewable hydrogen/renewable methane injected onto the natural gas grid reach price points below $24/MMBtu (the conservative 2030 price estimate for electrolytic hydrogen, according to their extensive research) "the optimal resource portfolio selected by RESOLVE (30 MMT base scenario) begins to select the use of renewable fuel in existing natural gas plants while reducing the deployment of battery storage."[11] Greater amounts are selected at likely hydrogen pricing, and even more at optimistic pricing. We respectfully request that you carefully consider this important finding in the final joint agency report.

C. We also request that the joint agency report on SB 100 commit to a more granular, multi-dimensional modeling approach that adequately addresses issues beyond the scope of RESOLVE, such as those related to reliability, resiliency, emissions, and local requirements, and that the report clearly support hydrogen being included in modeling as an eligible zero carbon firm power resource and as a long duration storage resource, per SB 1369.

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capability for its whole fleet by 2030. https://www.powermag.com/siemens-roadmap-to-100-hydrogen-gas-turbines/

[8] https://www.nsenergybusiness.com/projects/nuon-magnum-power-plant/

[9] https://press.siemens.com/global/en/pressrelease/hyflexpower-worlds-first-integrated-power-x-power-hydrogen-gas-turbine-demonstrator;

[10] http://www.apep.uci.edu/PDF_White_Papers/Impact_of_Renewable_Gasesous_Fuels_on_Grid_Resource_Optimization_Using_RESOLVE.pdf

[11] Ibid, p. 3

Alex Morris of CESA, rightly commented that modeling for SB 100 implementation must do a better job than Resolve at capturing long duration storage requirements. Among the eligible storage resources ought to be hydrogen because not only is consideration of green electrolytic hydrogen for storage mandated in California by SB 1369, but it is also now becoming increasingly recognized that decarbonized hydrogen storage will be needed to help overcome the gaps in the ability of solar, batteries, wind, and hydro and maintain reliable power in California in all conditions and seasons, as the state transitions to decarbonized power and greater reliance on electrification. This was underscored by James Barner of LADWP, who shared that after the utility's comprehensive analysis of how to implement the utility's 100% renewable power goal, green electrolytic hydrogen is being included in planning, along with other zero carbon technologies, as an important storage resource.

We also agree with Michael Colvin from EDF that California's electricity modeling must specifically strengthen its focus on zero carbon resources for firm power. Simply counting on fossil natural gas into the foreseeable future is a suboptimal approach from a climate and resource diversification perspective. The final report ought to clearly heed the findings shared at the workshop by Mr. Barner of LADWP that "to replace the gas resources in the future clean dispatch resources field with green hydrogen or some other renewable fuel will be needed to provide grid resiliency and to help with that last 10% of renewables needed to achieve 100% renewable" electricity.

Current modeling furthermore does not take a granular and deep enough look at reliability. This must be corrected so that modeling, as Delphine Hou from CAISO articulated, produces actionable resource portfolios that can be used in actual grid planning. James Shetler of the Northern California Balancing Authority rightly pointed that the state agencies' current approach, while acknowledged as directional only, does not adequately reflect reliability requirements and realistic resiliency challenges, such as the impacts of smoke cover on renewable generation. Lorraine Paskett correctly shared that investing in hydrogen is part of an international trend to improve reliability and diversification in regions like Europe where

carbon neutrality is being pursued. Commissioner McAllister echoed this in his closing remarks, which we very much appreciated.

We also agree with comments by John White from CEERT that modeling for air emissions is needed and beyond the scope of the RESOLVE model. Notably, hydrogen used in gas turbines can eliminate particulate matter and SOx from gas power plants, further underscoring the relevance and importance of including hydrogen in zero carbon electricity planning for some regions where such benefits would be particularly meaningful.[12]

D. To support California in accelerating its climate protection program and to harmonize state agency efforts, the SB 100 Report ought to clearly support the goal of achieving zero or near zero greenhouse gas emissions in the electricity sector as a whole as soon as possible by replacing fossil natural gas with zero carbon resources, including decarbonized hydrogen.

Achieving California's carbon neutrality goal requires ending reliance on natural gas by replacing those finite fossil resources that will be needed in a renewable power future to secrure reliability with decarbonized resources - primarily gaseous fuels, including hydrogen.

While we welcome the inclusion of hydrogen as a zero carbon resource for use in fuel cells in the draft report, the pricing modeled is excessively high and the vision too limited. We were very heartened that Commissioner McAllister and others at the agencies expressed interest in taking an expanded look at the role of hydrogen state zero carbon electricity planning. We also appreciate mention by agency staff at the workshop that they have this in mind for future analysis. But the need to act now is laid bare by the current climate emergency and the Governor's direction to accelerate SB 100 targets.

[12] https://www.power-eng.com/2020/03/12/just-what-goes-into-converting-a-gas-fired-turbine-to-hydrogen-the-mhps-perspective-on-carbon-free-thermal-power/#gref

The groundwork for expanding planning for hydrogen in California's electricity system has already started and can and ought to be a foundation for further work. E3 has already begun presenting scenarios that replace fossil natural gas with zero carbon resources as part of the CARB carbon neutrality effort,[13] which could be built on for the SB 100 process. More significantly for actionable, pragmatic planning, NREL and LADWP have also developed a process that ought to be learned from and could potentially be replicated for state purposes. There could be tailored for different territories and balancing authorities to reflect varying regional needs - as Commissioner McAllister articulated, one size plan will not fit all.

It makes little sense to limit the SB 100 analysis to the narrow parameters of retail electricity, knowing that broader state policy and the deteriorating state of the climate will demand us to plan for carbon neutrality economy wide, including the for the power sector. As the CHBC and others have advocated before,[14] striving for a zero carbon electricity system that is part of the state's carbon neutrality goal was also clearly the intent of SB 100, even if not the precise letter of the law.

Failing to do so also sends a chilling market signal that will send innovative new zero carbon fuel industries and the jobs zero they create elsewhere - Europe's investment in hydrogen as a pillar of their stimulus effort is projected to create 5.4 million jobs[15] - rather than realizing their potential to be a boon to California's economic recovery.

E. We agree with several commenters that implementation modeling ought to be reviewed more often than ever 4 years.

[13] See CARB August 29, 2020 Public Workshop to discuss Achieving Carbon Neutrality in California: A Report by E3 https://ww2.arb.ca.gov/our-work/programs/carbon-neutrality/carbon-neutrality-meetings-workshops

[14] See Comments submitted to SB 100 docket by CHBC on August 20, 2020 and by Lorraine Paskett on behalf of MHPS, Orsted, and TNRE on August 14, 2020.

[15] http://img03.en25.com/Web/GNA/%7B92f7804a-3c5f-4fde-83c2-6f48c5198625%7D_FCH-JU_presentation_in_Webinar_Exploring_Renewable_H2_production_Pathways.pdf

We support comments made by V. John White of CEERT, Lorraine Paskett of True North Renewable Energy, and James Barner of LADWP that reviewing the analysis for a joint agency report every four years will not be sufficient. Technology and market developments are moving too swiftly, and state planning needs more built in flexibility than such long windows between reports will allow. The CHBC, therefore, supports repeating the process at least every two years, if not annually.

F. CONCLUSION

The CHBC appreciates the joint agencies' consideration of these comments and looks forward to working with you to accelerate the transition to 100% zero carbon electricity and the key ways hydrogen can enable this critical achievement.

/s/

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