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CHBC Comments on IEPR Update II

Additional submitted attachment is included below.

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November 2, 2018

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 18-IEPR-01
1516 Ninth Street
Sacramento, CA 95814-5512

CHBC Comments on Draft 2018 Integrated Energy Policy Report Update Volume II

Introduction

The California Hydrogen Business Council (CHBC)[i] appreciates the opportunity to submit comments to the California Energy Commission regarding Draft 2018 Integrated Energy Policy Report Update Volume II. The CHBC previously submitted comments on the Scoping Memo[ii], provided extensive comments for the 2017 IEPR[iii,iv,v] and submitted a letter to Chair Weisenmiller who oversaw the 2017 IEPR development[vi]. This current set of comments addresses remaining concerns with the IEPR and its treatment of hydrogen and fuel cell technology.

The CHBC previously identified five issues the 2018 IEPR Update should take into account:

1. Assessment of the opportunity of sector coupling to help decarbonize energy sectors and increase the ability of integrating higher amounts of renewable energy and reduce curtailment
2. Discussion of the long-term perspective of natural gas accompanied by assessing the ability to displace natural gas and decarbonize the natural gas sector with electrolytic hydrogen and other zero and low carbon gas alternatives as replacement fuels.
3. Assessment of the needs of seasonal storage needs that includes consideration of hydrogen as a zero-carbon storage resource.
4. Consideration of hydrogen fuel cell technology options in the discussion of transportation energy/electrification, in terms of fuel and vehicles.
5. Inclusion of current cost data and of realistic use assumptions for electrolytic hydrogen in assessing the economic use case for this technology as a pathway to helping California reach its greenhouse gas emissions reduction targets.

The CHBC commends the Draft 2018 IEPR Update Volume II for including green electrolytic hydrogen as a storage solution for California, per SB 1369, and for mentioning hydrogen fuel cell electric technology as an integral part of the state's policy on zero emissions transportation.

There are several instances, however, in which the report could also be significantly strengthened by including hydrogen solutions, as detailed below, and where not doing so risks the Energy Commission not taking a technology neutral approach to its clean energy recommendations.

CHAPTER 1: Decarbonizing Buildings (Docket Number 18-IEPR-09)

In the discussion of building electrification, fuel cell systems can significantly reduce emissions at homes and other building types, and as the gas system that supplies fuel cells is decarbonized with renewable gas, emissions can be reduced throughout the lifecycle. When renewable hydrogen is used to decarbonize the gas system, zero greenhouse gas emissions are produced at any stage of the process. A parallel can be made with technologies that use direct electricity, such as heat pumps mentioned several times in this chapter, which reduce onsite emissions no matter what the electricity source and which reduce emissions on a lifecycle basis as the electricity source becomes increasingly renewable. The CHBC agrees with National Fuel Cell Research Center, Southern California Gas Company and Sacramento Municipal Utility District [vii] that renewable gas for electrification should be considered in CEC's gas and electricity planning, as a way to transition to zero emission buildings using existing infrastructure.

In addition to generating electricity onsite, and thereby in a decentralized way, the combined cooling, heat and power (CCHP) capability of stationary fuel cells to capture and utilize heat produced by the fuel cell for the provision of cooling, heating, hot water, or steam results in overall fuel cell system efficiencies ranging from 55% to up to 90%.[viii] Those fuel cell systems are already heavily commercialized in German and Japan, with over 100,000 units being utilized.[ix, x]

By renewable gas, to be clear, we mean a broad definition that includes hydrogen made from renewable sources, including green electrolytic hydrogen, an not only methane made from organic waste. The Energy Commission confuses the term "renewable gas" with bio-based gas in the section "Role of Renewable Gas in Decarbonizing Buildings", which is a persistent error in the 2017 and 2018 IEPR and which the CHBC has pointed out previously in our comments.[xi] SB 1383, strongly supported by the CHBC, explicitly does not limit the provision to only renewable **natural** gas, or **biogas,** but uses instead the broad term **renewable gas**. This terminology was chosen by Senator Lara to expressly open renewable gas to include hydrogen, e.g. from renewable methane or electrolytic hydrogen from renewable electricity. However, in this chapter and throughout the IEPR, the CEC uses renewable gas and renewable natural gas interchangeably. This leads to misguided policy recommendations, as evidenced on page 18, where it reads:

> *"Renewable gas can be a part of the solution to reducing GHG emissions from buildings, but the role is likely to be constrained by limitations on renewable gas availability, cost, and ongoing methane leakage concerns."*

Hydrogen as a renewable gas does not have methane leakage concerns, and electrolytic hydrogen in particular has no conceivable availability issues, as its sole limitation is the availability of renewable electricity. Therefore, the issues identified are squarely issues for renewable natural gas (methane derived from organic matter). Moreover, the IEPR misinterprets comments and submissions provided by other parties in this context, which refers specifically to renewable natural gas, but when referenced in the IEPR, reads like comments related to renewable gas. **CEC needs to review this language and strive to be as precise as possible in using the right terminology, so as not confuse different definitions and technology options, which lead to policy recommendations.**

Furthermore, we agree with the Energy Commission's assessment that electrification of buildings carries many challenges and urge a recommendation that state policy support a wide set of technology options to

decarbonize the building sector, which ought to include renewable gases. We recommend that the CEC adopt a consideration of gas utilities offering a renewable gas option for their customers over recommending a full technology conversion to onsite electrification. Providing customer choice for utility customers is one simple way to jumpstart a renewable gas market while helping consumers and the state in their desire to reduce GHG emissions.

In addition, the CEC should consider analyzing the conversion of the current natural gas grid to hydrogen. During a CHBC workshop in conjunction with the Hydrogen Council, Equinor presented a concept of converting the natural gas pipelines system in northern England to hydrogen for full decarbonization for the building sector, while allowing for a connected hydrogen fueling station system in support of transportation electrification.[xii] This utilizes existing assets with modifications, while also enabling a reliable, diverse energy supply that is necessary for an energy reliant economy.

This is complementary to the E3 study cited, for example, on page 19 of the draft report, which notably acknowledges that hydrogen made from renewable electricity is one of the key strategies for integrating high penetrations of renewable generation in California and avoiding expensive overbuild.[xiii]

Chapter 3: Increasing Flexibility in the Electricity System to Integrate More Renewable Energy (Docket Number 18-IEPR-06)

Similar to our comments submitted on the 2017 IEPR, this 2018 draft again does not do enough to lay out a comprehensive strategy to promote the development of renewable hydrogen in California, as was contemplated by the passage of SB 1383 (Lara, statutes of 2016).

While the guidance of SB 1369 (Skinner) on green electrolytic hydrogen is mentioned on page 97, which we appreciate, no actual analysis has been offered related to hydrogen. The storage discussion on the following pages does not mention electrolytic hydrogen nor its derivatives, despite talking about bulk or long-term energy storage needs, which is a key niche of the technology. The CHBC would be happy to provide an update to CEC staff on the state of the technology, deployments from around the world, and invites staff to the hydrogen energy storage workshop on November 6 in Pasadena at ESNA to participate in an in-depth learning opportunity.[xiv]

SB 100 will require a massive buildout of energy storage in California, especially long-duration, seasonal storage. Without a diverse set of options that includes electrolytic hydrogen, a 100% renewable grid will remain a theory. Electrolytic hydrogen is essential to a decarbonized pathway for renewable electricity integration because:

1) It can be produced from surplus renewable generation that would otherwise be wasted or dedicated renewable generation;
2) It can be blended with renewable hydrogen made from other renewable sources including biogas and bio-based renewables, which can further eliminate short lived climate pollutants (SLCP).
3) Its storage options are massive, including tanks, geological formations, or the vast existing natural gas grid, which can help repurpose a major asset for a decarbonized use.
4) It offers one of the only economic and the most flexible means for zero emission long-duration (e.g., seasonal) storage of renewable power. Unlike pumped hydro and compressed air, electrolytic hydrogen is geographically flexible. Unlike battery storage, which becomes more costly the longer the storage duration, electrolytic hydrogen becomes less costly, so that at 4-6 hours of duration, electrolytic hydrogen is more cost effective than batteries.

5) Electrolytic hydrogen can be produced in much larger quantities than all other renewable gases to meet a much larger fraction of the otherwise difficult to electrify end-uses (such as long-haul freight, aviation, marine transport, and district heating).
6) Renewable hydrogen offers zero GHG and zero criteria pollutant conversion options in both its production and end-use.
7) Stationary and other fuel cell systems are available today that can use these renewable fuels to produce zero emissions power, heating, and cooling. These are only constrained by the availability of renewable hydrogen, which limits both the market and the significant GHG, criteria air pollutant and toxic air contaminant emission reductions that can be uniquely achieved by the use of continuous power fuel cell systems.

The CHBC agrees with the draft report's focus in this chapter on California's commitment to a zero-emission transportation future in which only two options are available, battery technology and fuel cell technology. We appreciate the mention of hydrogen FCEV technology on pages 105 and 106. However, the discussion of battery electric vehicle (BEV) technology still far outweighs that for FCEV technology, and we urge the Energy Commission to remedy this.

It is true that BEVs sales are increasing, because they benefit from massive infrastructure deployment funding from the IOUs under SB 350, Electrify America, state and local agencies and the CEC's Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). Approximately $1,000,000,000 are being spent in California in the near-term on charging infrastructure build out, not including grid upgrade costs, at a time when basic charging is already available for owners of homes with garages where they can plug in. This investment volume compares to 1/50th for hydrogen fueling infrastructure per year for a technology that is accessible for all people regardless of property ownership and access to home charging.

ARFVTP's $20M for hydrogen fueling is important, but it also sets the limit for available hydrogen stations and therefore vehicle deployment. While Governor Brown was aware of the need for additional infrastructure and thus requested an additional $72M for station funding, the Assembly failed to approve an increase of the $20M allocated annually. A lack of education on this technology continues to hamper the buildout of stations, and continues to slow down the transition to ZEV technologies. It is in the interest of the State of California, and in light of the Governor's Executive Order, that the CEC include a thorough description of hydrogen and fuel cells in the IEPR. Delay or sole focus on one technology will be costly for the state and the health of residents who cannot access other ZEV technology options.

As recent studies have found, hydrogen infrastructure investment at scale is actually more cost effective than battery electric vehicle infrastructure buildout. A study from Germany finds:

> *If vehicle penetration increases up to 20 million vehicles in the base case scenario, a battery charging infrastructure would cost around € 51 billion, making it more expensive than hydrogen infrastructure, which comes in at around € 40 billion. Additionally, securing supply based on renewable electricity requires a consideration of seasonal storage options.* [xv]

Recommendations

The recommendations starting on p. 110 completely leave out any hydrogen or fuel cell related recommendations for storage and ZEVs.

Two useful recommendations to accelerate the hydrogen transportation sector and energy storage sector with hydrogen would be:

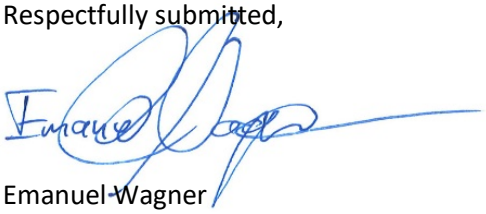
1) Review of a SB 350 like system of charging infrastructure investment for hydrogen station infrastructure
2) Assessment of the opportunity for transportation electrification for medium and heavy duty transportation sectors and transit (buses, rail, etc.)

Conclusion

The CHBC appreciates the opportunity to review and comment on the Draft 2018 Integrated Energy Policy Report (Draft IEPR) Update Volume II. As expressed, we highly recommend that the Energy Commission work with the hydrogen and fuel cell industry directly to address the issues raised, and develop an IEPR that allows for a broad variety of zero-emission technologies to help California meets its ambitious climate and energy goals. Hydrogen should be part of the strategy recommended to decarbonize buildings, the electric grid and transportation, and any discussion on decarbonization should also more generally include the replacement of combustion technologies with zero emissions alternatives.

The CHBC looks forward to working with the CEC as this process continues.

Respectfully submitted,



Emanuel Wagner
CHBC Deputy Director

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[i] The California Hydrogen Business Council (CHBC) is a California industry trade association with a mission 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 include Air Liquide; Advanced Technologies U.S. LLC.; Alameda-Contra Costa Transit District (AC Transit); American Honda Motor Company; Anaerobe Systems; Arriba Energy; Ballard Power Systems, Inc.; Bay Area Air Quality Management District (BAAQMD); Beijing SinoHytec; Black & Veatch; BMW of North America LLC; California Air Resources Board (CARB); California Fuel Cell Partnership; CALSTART; Cambridge LCF Group; Center for Transportation and the Environment (CTE); Coalition for Clean Air; Community Environmental Services; CP Industries; DasH2energy; Eco Energy International, LLC; EcoNavitas; ElDorado National – California; Energy Independence Now (EIN); EPC - Engineering, Procurement & Construction; Ergostech Renewal Energy Solution; EWII Fuel Cells LLC; FIBA Technologies, Inc.; First Element Fuel Inc; FuelCell Energy, Inc.; GenCell; General Motors, Infrastructure Planning; Geoffrey Budd G&SB Consulting Ltd; Giner ELX; Gladstein, Neandross & Associates; Greenlight Innovation; GTA; GTM Technologies, LLC; H2B2 USA; H2Safe, LLC; H2SG Energy Pte Ltd; Hexagon Lincoln; Hitachi Zosen Inova ETOGAS GmbH; HODPros; Hydrogen Law; Hydrogenics; Hydrogenious Technologies; HydrogenXT; HyET - Hydrogen Efficiency Technologies; Hyundai Motor Company; ITM Power Inc; Ivys Inc.; Johnson Matthey Fuel Cells; KORE Infrastructure, LLC; Life Cycle Associates; Linde North America Inc; Longitude 122 West, Inc.; Loop Energy; Millennium Reign Energy; Mitsubishi Hitachi Power Systems Americas; Montreux Energy; Motive Energy; Natural Gas Fueling Solutions (NGFS); Natural Hydrogen Energy Ltd.; Nel Hydrogen; Neo-H2; Neuman & Esser USA, Inc; New Flyer of America Inc; Next Hydrogen; Noyes Law Corporation; Nuvera Fuel Cells; Pacific Gas and Electric Company - PG&E; PDC Machines; Planet Hydrogen Inc; Plug Power; Politecnico di Torino; Port of Long Beach; Powertech Labs, Inc.; Primidea Building Solutions; Proton OnSite; RG Associates; Rio Hondo College; Rix Industries; Sacramento Municipal Utility District (SMUD); SAFCell Inc; Schatz Energy Research Center (SERC); Sheldon Research and Consulting; Solar Wind Storage LLC; South Coast Air Quality Management District; Southern California Gas Company; Strategic Analysis Inc; Sumitomo Corporation of Americas; Sumitomo Electric; Sunline Transit Agency; T2M Global; Tatsuno North America Inc.; Terrella Energy Systems Ltd; The Leighty Foundation; TLM Petro Labor Force; Toyota Motor Sales; Trillium - A Love's Company; University of California, Irvine; US Hybrid; Valley Environmental Associates; Vaughan Pratt [Individual]; Verde LLC; Vinjamuri Innovations LLC; Winkelmann Flowform Technology; WireTough Cylinders, LLC; Zero Carbon Energy Solutions.

[ii] California Hydrogen Business Council Comments on 2018 IEPR Scoping Memo February 26, 2018, https://efiling.energy.ca.gov/GetDocument.aspx?tn=222743

[iii] Comments of the CHBC to CEC's Draft Scoping Order for 2017 IEPR, submitted February 27, 2017, https://efiling.energy.ca.gov/GetDocument.aspx?tn=216254
[iv] California Hydrogen Business Council Comments on 2017 Draft IEPR Report, submitted November 13, 2017, https://efiling.energy.ca.gov/GetDocument.aspx?tn=221729
[v] California Hydrogen Business Council Comments on 2017 Final IEPR Report, submitted February 7, 2018, https://efiling.energy.ca.gov/GetDocument.aspx?tn=222507
[vi] IEPR Comments Submission and Renewable Hydrogen Cost Evaluation Integrity, submitted February 8, 2018, http://www.californiahydrogen.org/wp-content/uploads/2018/02/Chair-Weisenmiller-letter_Feb-8-2018.pdf
[vii] Draft 2018 IEPR Update Volume II, p 31.
[viii] Ellis, M.W., M.R. Von Spakovsky, and D.J. Nelson, *Fuel cell systems: efficient, flexible energy conversion for the 21st century.* Proceedings of the IEEE, 2001. 89(12): at 1808-1818.
[ix] https://fuelcellsworks.com/news/germany-natural-gas-powered-fuel-cell-powered-boilers-accelerating-in-home-use
[x] https://www.h2-international.com/2015/09/21/ene-farm-installed-120000-residential-fuel-cell-units/
[xi] Comments of California Hydrogen Business Council Regarding the 2017 Integrated Energy Policy Report (IEPR) & Scope Issues at https://efiling.energy.ca.gov/GetDocument.aspx?tn=216254
[xii] https://www.californiahydrogen.org/wp-content/uploads/2017/10/Steinar-Eikaas.pdf
[xiii] https://www.energy.ca.gov/2018_energypolicy/documents/2018-06-20_workshop/2018-06-20_presentations.php (See Presentation: Deep Decarbonization in a High Renewables Future - Implications for Renewable Integration and Electric System Flexibility)
[xiv] https://www.californiahydrogen.org/events/chbc-hydrogen-energy-storage-workshop-at-energy-storage-north-america-expo/
[xv] https://www.californiahydrogen.org/wp-content/uploads/2017/10/Energie_Umwelt_408_NEU.pdf