BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Adopt Biomethane Standards and Requirements, Pipeline Open Access Rules, and Related Enforcement Provisions.	Rulemaking 13-02-008 (Filed February 13, 2013)

OPENING COMMENTS BY CALIFORNIA HYDROGEN BUSINESS COUNCIL ON ASSIGNED COMMISSIONER'S SCOPING MEMO AND RULING OPENING PHASE 4 OF RULEMAKING 13-02-008

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January 10, 2020

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I. Introduction

The California Hydrogen Business Council (CHBC) [1] appreciates the opportunity to provide comments on the Assigned Commissioner's Scoping Memo and Ruling Opening Phase 4 of Rulemaking 13-02-008 ("Scoping Memo"). We applaud the Commission for recognizing the recommendation by multiple parties, including CHBC, and opening the scope of Phase 4 to considering issues related to hydrogen. We also support the Commission's effort to examine issues related to implementing SB 1440, including the December 6 workshop dedicated to this topic, which created a forum to begin raising many important topics of discussion. Per Commission staff direction at the workshop, our comments below include responses to questions directed to participants at the workshop, in addition to key issues in the Scoping Memo. A summary of main our points is as follows:

a. **We strongly agree with the opening of a track to the proceeding to establish hydrogen injection standards and protocols, to undertake a technical study to determine appropriate blending levels, and to establish Preliminary Injection Standards within the next 12 months.**
b. **Once injection standards are established, renewable hydrogen and its derivatives can help meet renewable gas targets and help ensure the stable volume levels of renewable gas**

[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 are listed here: www.californiahydrogen.org/aboutus/chbc-members/.

needed to meet short-lived climate pollutants (SLCP) reduction mandates and other state climate goals, including decarbonizing all sectors of the economy, over the long term.

c. **SB 1440 is not limited to only biomethane or organic feedstocks that are currently sources of short-lived climate pollutant emissions. Strong and flexible renewable gas targets should be set that allow any renewable gas that complies with pipeline injection standards, including renewable hydrogen, to help meet both the state's short-lived climate pollutant reduction targets as well as other climate goals – including, but not limited to, achieving 40 percent reductions in buildings (AB 3232) and economy-wide (SB 32) by 2030, achieving 100 percent clean energy in the power sector by 2045 (SB 100), and achieving carbon neutrality by no later than 2045 (Executive Order B-55-18).**

d. **Cost effectiveness should be considered to get to mandated SLCP reductions and other state climate goals, although co-benefits, such as risk reduction through technology diversity, increased resilience, air quality improvements, and other greenhouse gas emissions reductions, should also be considered in renewable gas procurement program design and cost effectiveness assessment.**

e. **It is important to consider now, rather than later, the value of supporting technologies, such as electrolyzers, that will be critical to achieving 100 percent clean energy and climate neutrality in California, which offer cross-sectoral benefits and show promise to significantly reduce cost with learning curves and scale.**

f. **When designing a renewable gas procurement program, it is important to think of cost effectiveness as application-specific, because marginal abatement costs will vary significantly from one application to the next and will be highest for difficult to decarbonize sectors, such as heating, industry, and transportation.**

g. **It is important to continue to rigorously and quantitatively examine supply curves for the range of renewable gases, with refined cost forecasting and protection against procurement**

demand outpacing supply.

h. **The procurement target should be large enough to stimulate the market to meet state SLCP and climate goals, flexible to accommodate changing market and technology conditions, and designed to minimize ratepayer impacts. We support a broad procurement target in which at least 20 percent of core gas demand by 2030 would be supplied by renewable gases including renewable hydrogen, methanated renewable hydrogen, and biomethane.**

i. **The procurement program should incentivize long-term investment and minimize financial risks and unnecessary associated costs by incorporating long-term contracts that are adaptable to fluctuating pricing.**

j. **Establishing a renewable gas procurement standard that is inclusive of a range of renewable gases, e.g. renewable hydrogen, methanated renewable hydrogen, and biomethane, is compliant with all state and federal laws, including those listed below.**

II. Comments

A. We strongly agree with the Commission's proposed direction in the Section "Consideration of Hydrogen Injection in Phase 4"[2]

We applaud the Commission's decision to open a track to the proceeding to establish hydrogen injection standards and protocols. We strongly support, as part of this process, pursuing a technical study to determine appropriate blending levels to establish a scientific basis for such standards.

We additionally support establishing Preliminary Injection Standards within the next 12 months, given the lengthy timeline of such a study and the need to not hold up stakeholders from being permitted a reasonable safe blending limit that can be established without an in-depth study.

[2] See Section 4 on p. 7 of Scoping Memo

Several existing studies and case studies point to what reasonable near-term blending limits could be.[3] Hawaii Gas, for example, currently blends 12% hydrogen into its pipeline in Oahu.[4] Germany is allowing up to 20% hydrogen into select existing pipelines.[5] In the United Kingdom (U.K.), the HyDeploy Project also plans to blend up to 20% hydrogen as part of their decarbonization efforts.[6]

These levels are in-line with assumption in E3 studies on behalf of state agencies, which suggest that hydrogen could safely comprise 20% by volume of the gas pipeline network without upgrades.[7] Notably, additional studies, policies and demonstrations focused on 100% hydrogen injection into gas pipelines are underway around the world.[8]

B. Comments on Implementation of SB 1440

1. Response to Issue Raised in Scoping Memo: Could the procurement targets be met by any renewable gas that complies with applicable pipeline injection standards?[9]

We strongly believe renewable hydrogen (and methanated renewable hydrogen) has high potential to help meet renewable gas targets once injection standards are established. Renewable hydrogen carries the benefits of scalability and geographical flexibility, as it is not limited to production pathways that rely solely on organic waste feedstocks, which are abundant but limited in total volume and location. Instead renewable hydrogen can also be produced by electrolysis powered by renewable electricity, which is highly flexible and scalable. Emerging pathways to produce renewable hydrogen also include using direct sunlight, which could open up more avenues to produce renewable hydrogen and support high volume in the renewable gas market.

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[3] https://www.californiahydrogen.org/wp-content/uploads/2019/01/Research-Reference-List-for-Hydrogen-Injection-Blending-Limits_Jan25.2019.pdf
[4] https://www.hawaiigas.com/clean-energy/hydrogen/
[5] https://www.eon.com/en/about-us/media/press-release/2019/hydrogen-levels-in-german-gas-distribution-system-to-be-raised-to-20-percent-for-the-first-time.html
[6] https://hydeploy.co.uk/
[7] For example, see slide 10 of Aas, D. et al (2019) "Draft Results: Future of Natural Gas Distribution in California," CEC Staff Workshop for CEC PIER-16-011, June 6. https://ww2.energy.ca.gov/research/notices/2019-06-06_workshop/2019-06-06_Future_of_Gas_Distribution.pdf
[8] See, e.g. *Hydrogen Europe Vision on the Role of Hydrogen and Gas Infrastructure on the Road Toward a Climate Neutral Economy*, Hydrogen Europe, April 2019; H100 and H21 projects in UK: https://sgn.co.uk/about-us/future-of-gas/hydrogen/hydrogen-100; ACT/CIT/Evoenergy 100% hydrogen test facility in Canberra, Australia https://www.evoenergy.com.au/emerging-technology/hydrogen-test-facility;
[9] See p. 11 of Scoping Memo

SB 1440 is not singularly limited to the goal of reducing short-lived climate pollutant emissions. While facilitating short-lived climate pollutant reductions is a required consideration, so too is supporting the state's broad greenhouse gas emissions reductions targets. Accordingly, strong renewable gas targets should be set that facilitate both the state's short-lived climate pollutant targets as well as other climate goals – including, but not limited to, achieving 40 percent reductions in buildings (AB 3232) and economy-wide (SB 32) by 2030, achieving 100 percent clean energy in the power sector by 2045 (SB 100), and achieving carbon neutrality by no later than 2045 (Executive Order B-55-18). Additionally, whether to facilitate SCLPs or carbon dioxide emissions reductions, limiting SB 1440 targets to biomethane would unnecessarily limit technological and market options to achieve the state's short-lived climate pollutant and other climate goals – likely increasing the time and cost of doing so. We therefore encourage the Commission to adopt strong but flexible targets, which account for the state's broad array of climate goals, facilitates both near-term emissions reductions and technological development to achieve longer-term goals, and allows any renewable gas that complies with pipeline injection standards – including renewable hydrogen – to contribute to the state's short-lived climate pollutant reduction targets and other climate goals.

While SB 1440 is not limited in scope to just reducing SCLP, including renewable hydrogen in renewable gas procurement programs nonetheless aligns with the state's short-lived climate pollutant law, SB 1383, upon which SB 1440 is partially based. SB 1383 directs state agencies to "consider and, as appropriate, adopt policies and incentives to significantly increase the sustainable production and use of renewable gas, including biomethane and biogas." While the bill specifically references biomethane and biogas, it is not limited to those renewable gases.[10] The Energy Commission's *2017 Integrated Energy Policy Report* reinforces this in its discussion on implementing SB 1383, explicitly including renewable hydrogen in the suite of solutions California deploys to mitigate SLCPs.[11]

[10] The first paragraph of SB 1440 refers to the SB 1383 mandate: "*Existing law requires state agencies to consider and, as appropriate, adopt policies and incentives to significantly increase the sustainable production and use of renewable gas. Existing law requires the Public Utilities Commission (PUC), in consultation with the State Energy Resources Conservation and Development Commission and the State Air Resources Board, to consider additional policies to support the development and use in the state of renewable gas that reduce short-lived climate pollutants in the state."*

[11] See, e.g., 2017 IEPR pp. 260, 280, 285-286.

Including renewable hydrogen in renewable gas procurement programs also aligns with the recently released joint utility renewable gas interconnection rule, which explicitly expanded its scope from biomethane to renewable gas. The draft rule states: "*In an effort to be inclusive of all viable renewable gas sources that may be injected into utility pipelines, the Joint Utilities opted to define 'Renewable Gas' instead of 'Renewable Methane*.' *Renewable Methane could limit some forms of renewable gas, such as renewable hydrogen, that might be safely injected into the pipeline in the future."*[12] The CPUC ought to implement its renewable gas procurement program consistent with this principle of allowing a broad range of renewable gases, including renewable hydrogen, to participate, in order to diversify the state's renewable gas portfolio, maximize environmental benefits, enable technological innovation, and ensure adequate supply.

2. Response to questions regarding how to consider and define cost effectiveness in SLCP/GHG reduction

a. Cost effectiveness can most simply be considered to get to mandated SLCP reductions and other climate goals, although co-benefits, such as risk reduction through technology diversity, increased resilience, air quality improvements, and other greenhouse gas emissions reductions should be also considered in renewable gas procurement program design and cost effectiveness assessment.

California has a mandate to reduce methane by 40%, hydrofluorocarbon gases by 40%, and anthropogenic black carbon by 50% below 2013 levels by 2030, per SB 1383. The simplest way to think of the most cost-effective way to achieve these reductions is whatever pathway costs the least. Hydrogen promises to be the most scalable, and likely lowest cost, form of renewable gas. BNEF suggests costs for renewable hydrogen could drop 80% by 2030, and further thereafter, if the sector gets the political support it needs to achieve scale.[13] SB 1440 targets should specifically include hydrogen, including near-

[12] See p. 3 JOINT UTILITIES RENEWABLE GAS INTERCONNECTION RULE OF PACIFIC GAS AND ELECTRIC COMPANY (U 39 G), SOUTHWEST GAS CORPORATION (U 905 G), SOUTHERN CALIFORNIA GAS COMPANY (U 904 G), AND SAN DIEGO GAS & ELECTRIC COMPANY (U 902 G); Filed November 1, 2019
http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M319/K526/319526436.PDF
[13] https://www.bloomberg.com/news/articles/2019-08-21/cost-of-hydrogen-from-renewables-to-plummet-next-decade-bnef

term targets to help achieve scale, and significant longer-term volumes as costs come down.

There are also other factors that ought to be considered beyond direct costs when designing procurement programs to ensure maximum benefits, including, but not necessarily limited to:

- *Technology diversity* – Developing resilient and reliable energy markets depends on diversification, and that is especially true for a market as nascent as renewable gas. Including a broad range of options that includes renewable hydrogen will help ensure supply stability, among other types of risk mitigation.

- *Air quality* – Reducing SLCPs and other greenhouse gas emissions can present opportunities that ought to be seized where possible to also advance compliance with federal clean air standards that have long eluded certain regions of the state and cause serious public health problems, especially among disadvantaged communities. Hydrogen carries the unique air quality benefit of being the only gas used to fuel zero emissions fuel cell electric vehicle (FCEV) technology. This is not only the most promising option to fully replace both diesel-fueled, heavy-duty trucks that are the main cause of elevated pollution in most areas of California which are failing to attain federal air quality standards, but also light-duty passenger hydrogen fuel cell electric vehicles, which can ensure that zero emissions options are available to the large number of the state's population that cannot easily charge a car at home or that need faster fueling times than battery electric vehicles allow. Currently hydrogen – and particularly renewable hydrogen – struggle to be cost competitive with incumbent fossil fuels, but these economics could significantly improve for renewable hydrogen by optimizing transport and delivery via access to the common carrier gas system. Including renewable hydrogen in a gas procurement program, in conjunction with establishing pipeline injection protocols and standards, is a critical next step.

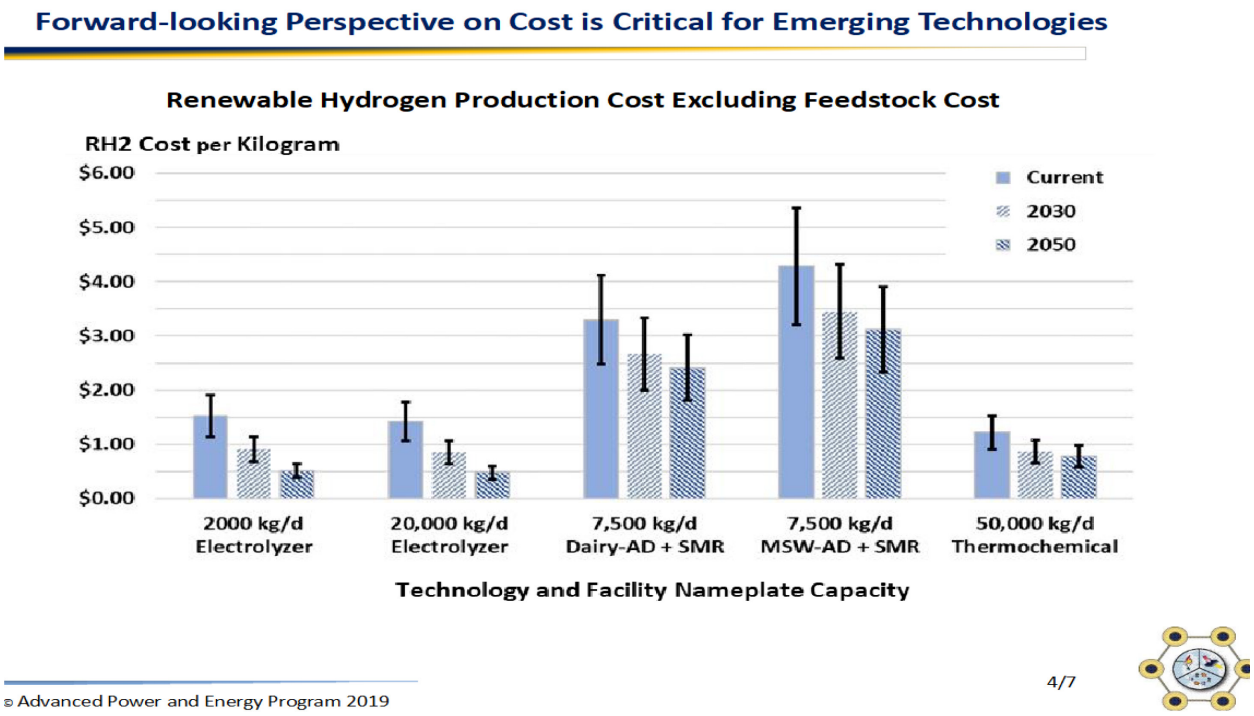
- *Resiliency* – Renewable, zero, and low-carbon hydrogen can also be used to fuel stationary fuel cells to supply zero emissions 24/7 long duration power and heat, displacing the need for diesel and fossil gas backup and microgrid generation that is becoming increasingly necessary, due to planned and unplanned shutoffs related to wildfires. Notably, community-based microgrids that include fuel cell systems can target the key resources needed to support providing both emergency services and disaster recovery services, such as fire stations, hospitals, police stations, shelters and telecommunications. Small, hydrogen-fueled backup power fuel cell systems (up to 100 kW) can provide emergency power for railroad crossings, traffic signals and cell phone towers. When renewable hydrogen is used as a feedstock, stationary fuel cells emit no criteria pollutants, toxic emissions or greenhouse gas emissions over their lifecycle. Blending renewable hydrogen with pipeline gas presents a unique opportunity to begin to immediately and significantly lower the greenhouse gas and air pollution content of that gas when used in fuel cells or other end uses. This would be greatly enabled by including renewable and low carbon hydrogen in a renewable gas procurement program.

- *Other greenhouse gas reductions* – Similarly, reducing SLCPs with renewable gas can carry the additional benefit of reducing other greenhouse gas emissions as well, which can and ought to be considered when designing procurement programs. Renewable electrolytic hydrogen emits zero greenhouse gases over its lifecycle in any use case. Renewable hydrogen reformed from biogas can be carbon negative depending upon the feedstock.

b. It is important to consider now, rather than later, the value of supporting technologies, such as electrolyzers, that will be critical to achieving 100 percent clean energy and climate neutrality in California, and which offer cross-sectoral benefits and hold promise to significantly come down in cost with learning curves and scale.

California has a history of visionary support for clean energy technologies – such as solar and LED lighting – that with the state's support were able to evolve from the highest to

among the lowest cost options. The state has the chance to do the same now with renewable hydrogen. The chart below from UC Irvine[14] shows that electrolyzers, which make hydrogen by splitting water into hydrogen and oxygen, have especially great potential to come down in cost compared to other renewable gas technologies. Such future potential ought to be factored into cost effectiveness assessments.



c. When designing a renewable gas procurement program, it is important to think of cost effectiveness as application-specific because marginal abatement costs will vary significantly from one application to the next and will be highest for difficult to decarbonize sectors, such as heating, industry, and transportation.

Cost calculation can be significantly different when considering specific climate pollutants and applications. For example, the value of LCFS credits is far higher than carbon credits on the cap and trade market because transportation decarbonization has a higher abatement cost**.** Abatement costs will be highest in the difficult to decarbonize applications that renewable gas can address, such as space heating, cooking and water

[14] See Slide 4/7 in Dr. Jeffrey Reed (CHBC, UC Irvine) presentation at December 6 CPUC Technical Workshop to Consider SB 1440 by Dr. Jeffrey Reed, Chair of Hydrogen Busin

heating in existing buildings, firm renewable generation capacity, and industrial process heat applications. It therefore makes sense for cost effectiveness comparisons to be application-specific when designing renewable gas procurement programs.

d. It is also important to continue to rigorously and quantitatively examine supply curves for the range of renewable gases, with refined cost forecasting and protection against procurement demand outpacing supply.

To stimulate investment, transparent analysis regarding availability of various types of renewable gas over time will be critical, along with potential offramp triggers (e.g. price cap) that could reduce or defer procurement obligations if scarcities occur.

e. The procurement target should be large enough to stimulate the market to meet state SLCP and climate goals, flexible to accommodate changing market and technology conditions, and designed to minimize ratepayer impacts. We support a broad procurement target in which at least 20 percent of core gas demand by 2030 would be supplied by renewable gases including renewable hydrogen, methanated renewable hydrogen, and biomethane.

As discussed above, procurement targets should include all renewable gases and consider the state's broad array of climate goals – not just its SLCP reduction goals. In particular, as previously mentioned, goals for 40% reduction in emissions from buildings, 100% clean electricity, and economy-wide climate neutrality argue for a significant role for hydrogen derived from renewable feedstocks (e.g. eligible renewable electricity and biogas), zero carbon feedstocks (e.g. legacy hydropower and curtailed renewables), as well as low carbon hydrogen (e.g. blends of renewable and zero carbon hydrogen with natural gas, and hydrogen produced with grid electricity) and other renewable gases. This has been elucidated in deep decarbonization scenarios conducted on behalf of state agencies by E3.[15] Each of their scenarios shows a significant role for renewable gas to

[15] Mahone, Amber, Zachary Subin, Jenya Kahn-Lang, Douglas Allen, Vivian Li, Gerrit De Moor, Nancy Ryan, Snuller Price. 2018. *Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model*. California Energy Commission. Publication Number: CEC-500-2018-012. https://www.ethree.com/projects/deep-decarbonization-california-cec/

help meet the state's deep decarbonization and climate neutrality goals. Furthermore, their power-to-gas scenario assumes no heat-pumps and about 22% renewable gas (including 7% hydrogen by energy, or 20% by volume) by 2030, with about 74% renewable gas by 2050.[16] This scenario shows deeper emissions reductions in the building sector than high electrification scenarios in 2030, yet none meet the goals of AB 3232. This suggests that achieving 40% greenhouse gas emissions reductions in the building sector by 2030 will require at least those fractions of renewable gas, if not more, in addition to other potential strategies.

f. The procurement program should incentivize long-term investment and minimize financial risks and unnecessary associated costs by incorporating long-term contracts with pricing certainty.

Investor confidence requires the ability to enter into long term contracts with certainty regarding pricing over a long period. This has been fundamental to the success of renewable electricity generation development, in which investors have secured visibility into long term pricing through instruments like power purchase agreements and standard offer contracts. Investor confidence is key to support project development and innovation, while minimizing project and financial costs, and thus costs associated with meeting the procurement targets.

g. Establishing a renewable gas procurement standard that is inclusive of a range of gases, e.g. renewable hydrogen, methanated renewable hydrogen, and biomethane, is compliant with all state and federal laws, including those listed below.

1) **AB 1900**[17] – This OIR was opened pursuant to AB 1900, which among other provisions, requires *"the PUC to promote the in-state production and distribution of biomethane,"* which a renewable gas procurement program

[16] See "PATHWAYS Model: Summary and comparison of scenario results," and specifically, the 'Annual GHG Emissions – Sector' and 'Fuel Shares' tabs, comparing 'CEC 2050' and 'CEC 2050 No Heat Pumps Plus' scenarios.. https://www.ethree.com/wp-content/uploads/2018/05/Comparison_Graphs_CEC-EPIC-GHG-Scenarios-clean-26Jan2018.xlsm
[17] https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201120120AB1900

would help accomplish. The law also requires *"the PUC to adopt pipeline access rules that ensure that each gas corporation provides nondiscriminatory open access to its gas pipeline system to any party for the purposes of physically interconnecting with the gas pipeline system and effectuating the delivery of gas."* Designing a procurement program that is limited to biomethane, rather than inclusive of other types of renewable gas, could be viewed as discriminatory because it would create an uneven economic playing field by effectuating delivery of biomethane rather than all renewable gases.

2) ZEV Transportation Related State and Federal Laws

a) **AB 8** calls for funding of hydrogen fueling infrastructure for transportation.[18] Currently, virtually all hydrogen used as transportation fuel is delivered by truck. Although in the long-term, dedicated hydrogen pipelines may be the most cost-effective solution, in the near term, existing natural gas infrastructure can serve a critical role in the hydrogen supply chain, and hydrogen blends will likely be part of the natural gas supply over the long term as well. Implementing a procurement program that encourages hydrogen blends in the gas system is, therefore, time critical.

b) **SB 1505** further mandates that a third of hydrogen for transportation fueling in California come from renewable sources, which can be produced from biogas, syngas made from bio-waste, directly with solar energy, or by electrolysis that splits water into hydrogen and oxygen.[19] Any of these production pathways may show improved economics through transport over the natural gas common carrier gas system in various use cases. Currently, the hydrogen industry has surpassed the state's 33% renewable mandate,[20] and the CHBC supports the Hydrogen Council's goal of achieving 100% decarbonized hydrogen for

[18] Bill text: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB8
[19] https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=200520060SB1505
[20] As reported by CARB Staff to CHBC and published in *Zero Emission Transportation and Power The Opportunity of Hydrogen Energy*, CHBC, January 2018 https://www.californiahydrogen.org/wp-content/uploads/2018/03/CHBC_Opportunity-of-Hydrogen-and-Fuel-Cells-January-2018.pdf

transportation by 2030.[21] To enable more in-state renewable hydrogen, which the hydrogen industry wants and which would provide California the full emissions and jobs benefits of renewable hydrogen, it is essential to create well-formed and supportive regulatory frameworks, including standards and protocols for interconnecting and injecting renewable hydrogen into gas pipelines, as well as procurement programs to advance the market – similar to what has proven necessary and effective for renewable power. Today, the first generation of renewable hydrogen production facilities are under development in the state, including a 100% renewable hydrogen production facility in Moreno Valley, Riverside County, due to come online in 2020 that is funded by the Energy Commission and that will use dedicated renewable generation to power a 2.5 MW electrolyzer to produce hydrogen.[22] There are also several other projects also in development, some of which have not yet been publicly announced. A renewable gas procurement standard would help encourage these organizations to consider this option in their production and delivery optimization.

3) **Federal and State clean air standards** - Without adequate and economical hydrogen supplies, large regions of California risk remaining consistently out of attainment of air quality standards mandated by the federal Clean Air Act. The biggest challenge to achieving attainment is excessive NOx emissions, the vast majority of which come from mobile sources, and among mobile sources, the biggest source of NOx in California is heavy duty trucks[23] – a sector which is difficult to electrify due to long driving ranges, high demand on performance and utilization rates. Hydrogen fuel cell electric technology is a key component of the state's Mobile Source Strategy to resolve this pernicious problem.[24] To ensure abundant, cost-competitive, non-subsidized renewable hydrogen supplies

[21] https://www.californiahydrogen.org/2018/12/20/chbc-endorses-full-decarbonization-goal-of-hydrogen-in-transportation-by-2030/
[22] This project is being developed by Hydrogenics and StratosFuel with funding from the Energy Commission.
[23] Source: CARB https://www.arb.ca.gov/app/emsinv/2017/emssumcat_query.php?F_YR=2012&F_DIV=-4&F_SEASON=A&SP=SIP105ADJ&F_AREA=CA#7
[24] https://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf

for fueling trucks and other vehicles, the renewable hydrogen industry needs access to pipelines not only as an option to transport vehicle fuel, but also to enable the multiple market entry points, such as energy storage, that will be needed to achieve economies of scale.

4) **SB 1383, Short Lived Climate Pollutant Reduction Mandate** - Requires the Public Utilities Commission, along with other state agencies, "to consider and, as appropriate, adopt policies and incentives to significantly increase the sustainable production and use of renewable gas."[25] Renewable gas procurement programs are clearly consistent with this mandate. Notably, the Energy Commission's *2017 Integrated Energy Policy Report,* in its discussion on implementing SB 1383, explicitly includes renewable hydrogen in the suite of solutions California deploys to mitigate SLCPs.[26]

5) **Other greenhouse gas reduction mandates –** The capabilities of renewable hydrogen to provide unusual, and possibly unique, decarbonization benefits, such as high volume, flexible seasonal storage and decarbonized gas generation, as well as zero emissions solutions to difficult-to-electrify transportation applications, hard-to-abate industrial applications, and critical long duration onsite back up generation, will also likely make it a critical resource to reach the deep greenhouse gas reductions mandated by SB 350, SB 32, AB 3232 and Executive Order B-18-55.

6) **SB 100 mandate to achieve 100% renewable and zero carbon retail electricity sales –** Achieving the goals set by SB 100 will likely require hydrogen solutions in order to integrate high penetrations of variable renewable generation, provide mass scale long duration and seasonal storage, and ensure 100% zero carbon generation goals are met. Solar, wind, hydro, and batteries, while very important, will not allow California to achieve its clean energy goals.

[25] SB 1383 text: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383
[26] See, e.g., 2017 IEPR pp. 260, 280, 285-286.

Underscoring this point, at a recent CEC IEPR workshop on near zero electricity, an expert from Energy Futures Initiative assessed that while hydrogen faces near term challenges to reach full commercialization as an electricity system asset, in the 2050 timeframe, it is an important focus of innovation and investment - and when produced with renewable electricity can get California to its net zero carbon emissions target.[27] To enable this, procurement programs that encourage blending of hydrogen can uniquely begin to decarbonize gas generation immediately, since hydrogen is not a global warming gas. Eventually, there is potential for storage and generation projects of up to 100% hydrogen, which are in development or being demonstrated around the world, including in California. As recently presented to the CPUC,[28] LADWP is seeking to convert its Intermountain Power Project to 100% hydrogen by 2045. Meanwhile another 1 GW storage project using the same salt caverns in Utah is also aiming to deploy hydrogen storage and electricity generation among its suite of solutions.[29] A power plant in the Netherlands is planning to convert a 440 MW gas turbine to 100% hydrogen by 2023,[30] while 100% low NOx hydrogen generation is already being demonstrated in a smaller unit in Japan.[31]

7) **SB 1369 –** Signed into law in 2018, this bill directs the CPUC to examine green electrolytic hydrogen as a storage source and for other potential beneficial uses. Establishing a procurement program that enables green electrolytic hydrogen's transport and storage in the common carrier gas system would optimize its potential and potentially better enable the CPUC to fulfill its responsibility as directed by SB 1369.

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[27] See *Optionality, Flexibility & Innovation - Pathways for Deep Decarbonization in California* TN-229819 Submitted 9/23/2019; https://ww2.energy.ca.gov/2019_energypolicy/documents/2019-09-24_workshop/2019-09-24_presentations.php

[28] https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Gas/Natural_Gas_Market/Nov13LADWP.pdf

[29] https://amer.mhps.com/world%E2%80%99s-largest-renewable-energy-storage-project-announced-in-utah.html

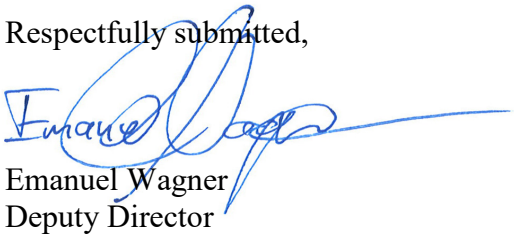
[30] https://www.nsenergybusiness.com/projects/nuon-magnum-power-plant/

[31] https://global.kawasaki.com/en/stories/articles/vol74/

III. Conclusion

The CHBC appreciates this opportunity to submit these comments, and we look forward to collaborating further with Commission to address the important issues involved in creating hydrogen injection standards and protocols, as well as renewable gas procurement programs that take a technology neutral approach and support development of a broad range of renewable and low carbon gases, in order to rapidly and economically achieve California's climate goals.

Respectfully submitted,



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Dated: January 10, 2020