DOCKETED

Docket Number:	17-IEPR-01
Project Title:	General/Scope
TN #:	222479
Document Title:	Revision - CHBC Comments on IEPR Proposed Final Draft
Description:	N/A
Filer:	System
Organization:	Emanuel Wagner
Submitter Role:	Public
Submission Date:	2/8/2018 11:15:44 AM
Docketed Date:	2/8/2018

Comment Received From: Emanuel Wagner
Submitted On: 2/8/2018
Docket Number: 17-IEPR-01

Revision - CHBC Comments on IEPR Proposed Final Draft

Please note that we received updated data from UC Irvine after the 5 PM submission deadline that impacts the second bullet at the bottom of page 5. The new version (in the attached revised version of our comments) reads: "Results from UC Irvine modeling, using a capacity factor of 50%, or 12 hours of charging time per day, have calculated a levelized cost of storage (LCOS) for batteries of 10-22 Â¢/kWh compared to P2G with alkaline electrolysis of 11 Â¢/kWh. Under future systems cost and efficiency forecasts, the model calculates LCOS of batteries of 5-15 Â¢/kWh compared to alkaline P2G of 8 Â¢/kWh. P2G can be cost competitive with batteries and promises to serve an important role of enabling higher renewable electricity generation by accomplishing massive and seasonal energy storage in California."

The original submitted yesterday (2/7) @ 5 PM read:
"Initial results from UC Irvine modeling, using a capacity factor of 50%, or 12 hours of charging time per day, suggest a levelized cost of storage (LCOS) for batteries of 10-22 Â¢/kWh compared to P2G of 11-40 Â¢/kWh, depending upon the technologies and pathways considered. Under future systems cost and efficiency forecasts, the model suggests an LCOS of batteries of 5-15 Â¢/kWh compared to P2G of 8-21 Â¢/kWh. In other words, P2G can be cost competitive with batteries and promises to serve an important role fulfilling the need for energy storage in California. Low numbers for P2G represent costs for power-to-hydrogen, whereas the higher numbers represent costs for methanated hydrogen."

We hope you will consider this revised information. Many thanks.

Additional submitted attachment is included below.

California Hydrogen Business Council Comments on 2017 Final IEPR Report

February 7, 2018

The California Hydrogen Business Council (CHBC) appreciates the opportunity to comment on the California Energy Commission's *2017 Proposed IEPR Report.* The CHBC is a California industry trade association with a mission to advance the commercialization of hydrogen in transportation and stationary sources to reduce greenhouse gas, criteria pollutant emissions and dependence on oil. Our more than 100 members include fuel cell and electrolyzer companies, auto manufacturers, industrial gas companies, and natural gas companies with an interest in hydrogen and hydrogen infrastructure in California[1].

The CHBC would first like to thank the Commission for their efforts to incorporate many of our membership's comments on *2017 Draft IEPR Report*. We especially appreciate clarification in many sections and greater inclusion of renewable hydrogen in the report. There are also, however, several places in the report that still need to be corrected or improved. These are detailed below. Specific wording change requests are indicated in red line.

Our comments focus on the following sections of the report:

I. Chapter 2: Implementing the Clean Energy and Pollution Reduction Act, Senate Bill 350

---

[1] 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 Advanced Emission Control Solutions, Air Liquide Advanced Technologies U.S. LLC., Airthium, 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, Beijing SinoHytec, Black & Veatch, BMW of North America LLC, Boutin Jones, Cambridge LCF Group, Center for Transportation and the Environment (CTE), CNG Cylinders International, Community Environmental Services, CP Industries, DasH2energy, Eco Energy International, LLC, ElDorado National – California, Energy Independence Now (EIN), EPC - Engineering, Procurement & Construction, Ergostech Renewal Energy Solution, EWII Fuel Cells LLC, First Element Fuel Inc, FuelCell Energy, Inc., GenCell, General Motors, Geoffrey Budd G&SB Consulting Ltd, Giner ELX, Gladstein, Neandross & Associates, Greenlight Innovation, GTA, H2B2, H2Safe, LLC, H2SG Energy Pte Ltd, H2Tech Systems, Hitachi Zosen Inova ETOGAS GmbH, HODPros, Horizon Fuel Cells Americas, Inc., Hydrogenics, Hydrogenious Technologies, Hydrogen Law, HydrogenXT, HyET - Hydrogen Efficiency Technologies, Hyundai Motor Company, ITM Power Inc, Ivys Inc., Johnson Matthey Fuel Cells, Kontak, LLC, KORE Infrastructure, LLC, Life Cycle Associates, Linde North America Inc, Longitude 122 West, Inc., Loop Energy, Luxfer/GTM Technologies, LLC, McPhy Energy, Montreux Energy, MPL Consulting, Inc., National Renewable Energy Laboratory (NREL), Natural Gas Fueling Solutions – NGFS, Natural Hydrogen Energy Ltd., Nel Hydrogen, 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, Port of Long Beach, PowerHouse Energy, 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, Sumitomo Corporation of Americas, Sunline Transit Agency, T2M Global, Tatsuno North America Inc., The Leighty Foundation, TLM Petro Labor Force, Toyota Motor Sales, United Hydrogen Group Inc, US Hybrid, Verde LLC, Volute, Inc., WireTough Cylinders, LLC, Zero Carbon Energy Solutions.

I. Comments on Chapter 2: Implementing the Clean Energy and Pollution Reduction Act, Senate Bill 350

A. Page 94 (Tracked Changes version) - Recommended addition of hydrogen and fuel cell outreach and education groups

We reiterate our concern that current ZEV outreach and education efforts are battery-centric, at the expense of hydrogen and fuel cell technology, which is a hindrance to FCEV adoption and contrary to state policy. Therefore, we recommend that this bullet point below either substitute "electric vehicles" with "zero emission vehicles" or use the following language:

> **Support development of specialized consumer education and engagement tools.** The Energy Commission, in coordination with the CPUC, CARB, and nonprofit outreach organizations like Veloz, should enhance public understanding of the adequacy of *battery, plug-in hybrid and fuel cell* electric vehicles for their transportation needs, the costs and benefits of using utility.

II. Chapter 3: Increasing the Resiliency of the Electricity Sector - Recommended Corrections for Accuracy

A. Section: Opportunities to Use Excess Energy, Subsection on Hydrogen Production from Electrolysis of Water – Three corrections/recommendations

1. Page 135 (Tracked Changes version)- The top sentence incorrectly suggests that power-to-gas must be injected into a natural gas pipeline, and should be revised as follows for accuracy:

"This renewable hydrogen or methane can be stored in designated tanks, used in hydrogen fueling stations for transportation, or directly injected into hydrogen pipelines or the natural gas ~~pipelines~~ system. This strategy of transferring electrical energy into gaseous chemical energy for energy storage or other useful purposes is termed power-to-gas."

2. Page 135 (Tracked Changes version)- The IEPR continues to use outdated and incorrect E3 information instead of current and corrected data supplied to E3 by our Members.

We appreciate that the latest version of the IEPR acknowledges in this section that the E3 results cited are preliminary; however, these results are nonetheless based on incorrect assumptions that negatively skew the economics of electrolytic hydrogen and are misleading to include in this report. Our members have supplied E3 with current, correct data, which E3 and Commission staff graciously received, and which should be incorporated into the report instead. We specifically request to have the opportunity to present current data to Commission staff for their further consideration.

3. Page 136 (Tracked Changes version) - The increased ARFVTP funding proposed in the proposed final draft for renewable hydrogen production is an improvement over the original draft, but still needs to be increased to make meaningful progress, and still forces non-bioenergy based renewable hydrogen to compete on an uneven playing field.

The CHBC is wholly supportive of the Commission having nearly doubled the funding amount originally proposed in the draft IEPR. However, as previously mentioned in our comments, meaningful progress toward reaching state goals of fueling ZEVs, promoting instate renewable hydrogen production, and supporting a broad renewable gas market requires increasing funding support to at least $20M. Like any emerging clean energy technology market, electrolytic hydrogen needs significant support to reach economies of scale, and $3.9 million, while more promising than the originally proposed $2 million, will only support a couple projects.

Also, by not creating a tranche specifically for electrolytic hydrogen or somehow evening the playing field, the solicitation gives an unfair advantage to bio-based gas technologies, which unlike electrolytic hydrogen, have benefitted from years and millions of dollars of state support. While CHBC fully agrees with continued state support of bio-based fuel development, it is not fair or in line with a technology agnostic approach to structure a funding solicitation that ignores this disparity in public funding history. It also stands to deprive California of the only currently viable pathway to instate renewable hydrogen production at scale.

B. Section: Recommendations - Correction to bullet that starts with "Use excess renewable electricity productively"

Page 141 (Tracked Changes version) - The last sentence of this bullet, while an improvement over the initial draft, still needs to be corrected to accurately reflect the uses of hydrogen made from surplus renewable electricity. It should read as follows: "Potential uses for excess include desalination or conversion to hydrogen either to fuel stationary or mobile fuel cells, to store power, or to displace natural gas.

III. Chapter 4 – Accelerating the Use of Distributed Energy Resources on the California Grid: Recommend Addition of Hydrogen Energy Storage and Power-to-Gas to Figure 25: Energy Storage Technologies by Discharge Time, Size and Use

The chart on p. 150 (Tracked Changes version) leaves out hydrogen energy storage and power to gas. The report states that the reason our recommendation to add it was left out is because:

> *"CPUC Decisions 14.10.045 and 17.04.039 clarified that hydrogen and power-to-gas systems do not qualify as energy storage under the implementation of AB 2514 and AB 2868."*

However, the chart includes pumped hydro of approximately 500 MW-1 GW, even though CPUC Decision 13.10.040 excluded pumped hydro projects larger than 50 MW from the storage framework, and Decision 17.04.039 excluded pumped hydro altogether in that particular proceeding. To be clear, CHBC is not arguing for exclusion of pumped hydro from California's storage procurement strategy, as we believe the technology has value. What we are pointing out is inconsistent, flawed logic in the Commission's reasoning for not using a chart, such as the one we recommended previously in our comments, that includes hydrogen/power to gas. This amounts to unfair treatment of hydrogen-based technologies as potential storage sources. It's also out of step with global trends, given that the US federal government[2], Europe[3], Canada[4], Australia,[5] global corporate leaders[6] –and even this IEPR – consider hydrogen and power to gas systems as potential, if not essential, storage sources in a low carbon energy future.

IV. Comments on Chapter 7 – Transportation Energy

The CHBC provided a set of comments on the Draft IEPR version of this Chapter encouraging more inclusion of hydrogen and fuel cell electric transportation. We are disappointed that none of these comments seem to have been incorporated or addressed in the proposed final version of the report. We look forward to working with the CEC on addressing the identified issues and hope the final version of this Chapter will include greater discussion of hydrogen transportation, including information on hydrogen cost, FCEV purchase price projections, and hydrogen fuel cell electric medium and heavy duty truck sales.

V. Comments on Chapter 9 – Renewable Gas

A. Section: In-State Renewable Gas Economic Potential - Focuses exclusively on biomethane and ought to include more data on other gases, including electrolytic renewable hydrogen.

As CHBC shared in its comments on the draft version of the IEPR, by solely covering biomethane production, this section is not true to its title and is inconsistent with the correctly broader definition of renewable gas found at the top of this chapter. It also ignores important information about renewable hydrogen that merits being part of California's policy discourse. To help correct this, **we repeat our recommendation to add to this section the data below**.

---

[2] See DOE's H2@scale - e.g. https://energy.gov/sites/prod/files/2016/12/f34/fcto_h2atscale_workshop_sarkar_satyapal_2.pdf; and NREL research and pilot project on power-to-gas: https://www.nrel.gov/esif/partnerships-southern-california-gas.html.

[3] For example: http://www.fch.europa.eu/sites/default/files/P2H_Full_Study_FCHJU.pdf

[4] See IESO, e.g. http://www.ieso.ca/sector-participants/energy-procurement-programs-and-contracts/energy-storage

[5] https://arena.gov.au/news/power-gas-trialto-inject-hydrogen-australias-gas-grid/

[6] https://www.bloomberg.com/news/articles/2017-09-05/better-than-a-battery-big-energy-backs-hydrogen-power-storage

1. Economic potential of electrolytic hydrogen for vehicle fuel:

- CHBC analysis projects that based on expected progress on technology cost, along with electricity prices ranging from zero (excess generation) to $.06 per kWh, electrolytic hydrogen and methane can be can be produced at costs comparable to conventional vehicle fuel, and this is without consideration of any renewable fuel premium.[7]
- Reaffirming this finding, the cost of electrolytic hydrogen for vehicle fuel on the worldwide market is currently projected by other energy analysts to reach cost parity to 2017 gasoline prices by 2025, after which it is projected to become the cheaper option.[8] Given that California is a global frontrunner in intermittent renewable power development, given that utility scale solar power is already falling to less than $.03 per kilowatt-hour,[9] and given that Europe's bullish policies on power to gas, as well as developments in other regions, are spurring technology development,[10] these projections indicate that electrolytic hydrogen and gasoline could reach cost parity in California by 2025.

2. Economic potential of power-to-hydrogen and power-to-gas for energy storage:

Electrolytic hydrogen and methane produced using renewable electricity compare favorably to lithium ion batteries, pumped hydro, and compressed air energy storage (CAES), particularly at continuous capacity – which is foreseen as the state seeks to integrate larger shares of renewable generation. CHBC's submission to the IEPR docket on the *Economics of Power-to-Gas* contains a detailed comparative cost analysis of power-to-gas and lithium ion batteries, as well as comparisons of power-to-gas to pumped hydro and CAES. Key points of this economic analysis include:

- At a storage duration of 4 hours and above, Power-to-Gas-to-Power (P2G2P), that is, power-to-gas-systems used to return energy in the form of electricity generation via a power plant, could reach cost parity with a battery system. It can also provide valuable services, such as zero carbon supply for resource adequacy and grid services.

- (Revised 2/8/18) Results from UC Irvine modeling, using a capacity factor of 50%, or 12 hours of charging time per day, have calculated a levelized cost of storage (LCOS) for batteries of 10-22 ¢/kWh compared to P2G with alkaline electrolysis of 11 ¢/kWh. Under future systems cost and efficiency forecasts, the model calculates LCOS of batteries of 5-15 ¢/kWh compared to alkaline P2G of 8 ¢/kWh. P2G can be cost competitive with batteries and promises to serve an important role of enabling higher renewable electricity generation by accomplishing massive and seasonal energy storage in California.

---

[7] Source: CHBC White Paper on Power-to-Gas: The Case for Hydrogen

[8] Source: Navigant Research, International Energy Agency, International Monetary Fund, US Department of Energy

[9] https://www.pv-magazine.com/2017/05/25/tep-to-buy-solar-power-at-under-3-cents-per-kwh/

[10] See CHBC's *Economics of Power-to-Gas* and June 27 Workshop submissions to the IEPR docket for examples of strong support in European countries for power to gas development. http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-10/TN219923_20170626T180524_Emanuel_Wagner_Comments_Economics_of_Power_to_Gas.pdf

- Recently a study conducted by McKinsey & Company found that converting renewable power into hydrogen via electrolysis followed by salt cavern hydrogen storage and use of combined cycle power plant conversion back to electricity (i.e. P2G2P) was cheaper than pumped hydro storage. The findings showed that with a round trip efficiency of 40% and capital costs of $1000/kW, this approach has a lower levelized cost of electricity than pumped hydro storage, the current lowest cost energy storage solution.[11]

- NREL states: "Initial cost analysis indicates that hydrogen systems could be competitive with battery systems for energy storage and could be a viable alternative to pumped storage hydro and CAES at locations where these latter two technologies are not favorable."[12]

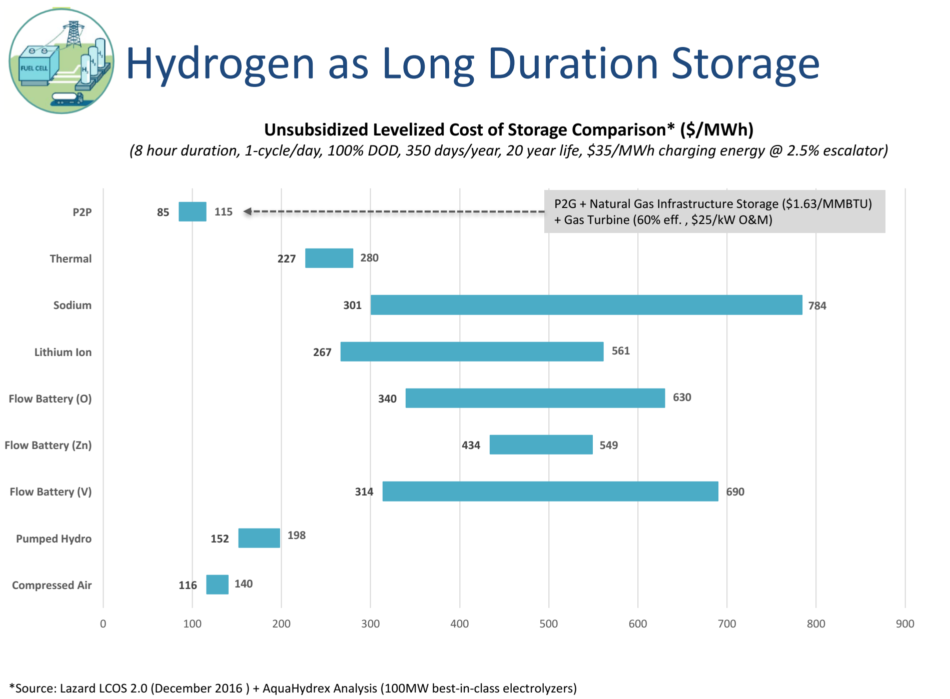
- Additional 2016 analysis by PwC suggests that worldwide, the LCOS for electrolytic hydrogen used as energy storage will be competitive with lithium ion batteries, pumped hydro, and CAES by 2030.[13]

The chart below shows the potential cost competitiveness of hydrogen as energy storage compared to other carriers.

[11] McKinsey & Company, "Commercialisation of Energy Storage in Europe," Fuel Cell and Hydrogen Joint Undertaking, European Commission, March, 2015.

[12] http://www.nrel.gov/docs/fy16osti/64764.pdf

[13] https://www.worldenergy.org/wp-content/uploads/2017/03/WEResources_E-storage_2016.pdf



3. Economic potential of electrolytic hydrogen for other use cases:

Worldwide costs of electrolytic hydrogen will reach cost parity with conventional hydrogen production (steam methane reforming) by about 2025 and become competitive with natural gas end uses for power and building heating within the next decade. Driving these dynamics will be technology cost declines as the P2G industry expands internationally, increasing amounts of and cheaper renewable electricity that will available for P2G lower rates, pressure to reduce greenhouse gas emissions, and opening wholesale markets to P2G, and allowing P2G to access low and negative rates for excess power generation. [14]

[14] Sources: Navigant Research, International Energy Agency, International Monetary Fund, US Department of Energy

B. Section on Priority End Uses for Renewable Gas - Corrections

1. On p. 334 (Track Changes version), the list of commercial-ready end uses for renewable gas in the section's first paragraph is inaccurate and incomplete. It ought to be amended for accuracy as follows:

"Renewable gas has been used, or proposed for use, as a substitute for conventional natural gas in several energy sectors. The most commercial-ready end uses are electricity generation, natural gas vehicle fuel displacement, pipeline natural gas displacement, energy storage, industrial use, and ancillary grid services.

2. The Transportation Fuel subsection should be updated to reflect the Governor's recent Executive Order.

The Governor recently called for expanding the hydrogen fueling station target in California to 200 by 2025, so this should be reflected at the top of page 340 (Tracked Changes version).[15]

3. The subsection on On-Site or Grid Connected Electricity Generation focuses solely on bioenergy and leaves out electroytic hydrogen.

By limiting its discourse to bio-based gases, this subsection is too narrow and inconsistent with the broader and more appropriate definition of renewable gas found elsewhere in the report. Electrolytic renewable hydrogen can also power fuel cells, as well as displace fossil-based natural gas in power plants. It is the only renewable gas option that can achieve these tasks high volume. We again request that these facts be included in this subsection.

4. The Pipeline Injection Challenges section contains several major errors.

- Page 344 (Track Changes version): The PATHWAYS model that led to the reported conclusion that "Power-to-gas was by far the least cost-effective strategy out of the ones considered" (p. 344, Track Changes version) are, as previously explained in the discussion of Chapter 3, incorrect. Conclusions **should be based on the more realistic and current data provided to E3 by our members, which paint a very different and more positive economic picture of power-to-gas.** As previously mentioned, we request an opportunity to present this current data to Commission staff.

- Pages 344-345 (Tracked Changes version) - The following statement is also incorrect: *"5 percent hydrogen concentration will accelerate fatigue crack growth in steel pipes, conservatively requiring pipelines to be repaired or replaced every 80 years, as opposed to 100 or more years."* The actual research report, however, states:

  "Parametric studies on the initial crack depth were conducted to find the maximum crack depth after 100 years under the given pressure fluctuations in hydrogen and in natural gas (assumed

[15] https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/

to be the same as that in air). The results showed that axial cracks in X42 line pipes with an initial depth smaller than 40% of the wall thickness ***do not reach depths equal to 75% of the thickness over a period of 100 years.*** *For X52, X56, X60, and X65, the corresponding initial crack depth of 50% of the wall thickness* ***never leads to depths equal to 75% of the thickness over a period of 100 years***.*"*[16]

Comment [mb1]: Include a footnote with link to the report and page #

It also seems that the "80 year" limit in the Proposed Final IEPR may come from Figure 26 in the research report that refer to results for 100% hydrogen, not 5%.

Comment [mb2]: Is this the figure in the Irvine report or the report in footnote 678 in the Final IEPR?

C. Section on Economic Assessment of Renewable Gas End Uses – incorrectly equates "renewable gas" with bio-based gas.

As mentioned in previous comments, this section (pages 346-351, Tracked Changes version) implies that renewable gas and bio-based gas are virtually synonymous. It leaves out discussion of any non-bio-based renewable gases, including hydrogen. This imbalance ought to be corrected, or the title of the subsection ought to be changed to "Economic Assessment of Biogas End Uses" to avoid confusion.

D. Section on Renewable Gas Revenue Streams – two recommendations

1. "Vehicle Revenue" Subsection of Renewable Gas Revenue Streams Section should include more discussion of electrolytic renewable gas.

Pages 353-354 (Tracked Changes version) - As previously mentioned in our comments, when referencing how the LCFS program can support renewable gas, rather than focusing on biomethane exclusively, this subsection ought to include that the LCFS program should also facilitate production and use of electrolytic renewable hydrogen and methane. As mentioned in previous comments, the LCFS program has the strong support of the hydrogen industry, and the increased production of renewable hydrogen is urgent given the projected shortfall of hydrogen for vehicle fueling in California in the near future, given the state mandate to ensure a third of hydrogen at fueling stations is renewable, and given the state requirements to lower greenhouse gas emissions and criteria pollutants. We specifically mentioned CHBC's support for the LCFS and recommendation to leverage this program for renewable hydrogen development in our submission to the docket on *Market Development Opportunities and Pathways for Renewable Hydrogen in California*. Notably, renewable hydrogen is already being used by AC Transit to generate LCFS credits with a carbon intensity of 0g CO2. If electrolysis were to be provided access to wholesale power from renewables, the revenue from vehicle fuel sales would be substantial. The LCFS program could also be leveraged to help oil refineries lower their Carbon Intensity, as CARB has been working on. We strongly urge the Commission to encourage these approaches.

2. Electricity Revenues Subsection - Ensure even playing field for bio-based renewable gas and electrolytic gas

Page 356 (Tracked Changes version) – The report states:

---

[16] https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0ahUKEwi0gZyggd3YAhWvmuAKHRHhCCAQFgg0MAI&url=http%3A%2F%2Fwww.apep.uci.edu%2Fdownload01%2FPower-to-Gas%2FFinal_Report_SoCalGas_Project_UIUC.doc&usg=AOvVaw1mrQ4W1bu7KFISGedK_qDP.

"Bioenergy developers and California utilities – Bioenergy Association of California, American Biogas Council, Organic Waste Systems, Victor Valley Wastewater Reclamation Agency, Clean Energy, PG&E, and SoCalGas – suggested opening a proceeding to allow for changes to the RPS and BioMAT to better support and promote bioenergy. Proposed changes may include allowing for procurement of larger or variable power capacities or creating a mandated ratio of renewable energy from biomass. Also suggested is increasing Self-Generation Incentive Program funding for renewable gas generation and use."

As mentioned in previous comments, we respectfully request that the Commission add that the CHBC also proposes that if any changes are made to the RPS that favor bioenergy are made, such as those mentioned above, the changes ought to include equivalent incentives for renewable hydrogen fuel cells.

E. Long-Term and Alternative Pathways for Renewable Gas – Corrections and recommendations

1. Page 359 (Tracked Changes version) - Power-to-Gas subsection

While the inclusion of Power-to-Gas is appreciated, the description is incomplete and inaccurate. We request that it be amended as follows:

An emerging ~~use~~ technology for producing ~~of~~ renewable hydrogen and renewable synthetic methane is ~~as electricity grid storage and balancing mechanism~~ called power-to-gas (P2G). As discussed in Chapter 3, renewable hydrogen produced via electrolysis can provide a load when wind or solar generation may otherwise be curtailed, and be used to provide fuel for hydrogen transportation, to displace fossil fuel in natural gas end uses, to supply energy to fuel cells, or to store energy for later use. ~~later by highly dynamic electrolyzers and fuel cells.~~

2. Page 362-366 (Tracked Changes version)- Recommendations subsection - The CHBC supports the recommendations in this section, but with this adjustment:

We request adding a recommendation that the electricity grid be recognized as the carrier of renewable electricity, so that an electrolytic hydrogen facility can purchase renewable power that is not co-located with the facility, much like the natural gas pipeline acts as the carrier in biogas based LCFS schemes.