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California Energy Commission
Dockets Office, MS-4
1516 Ninth Street
Sacramento, CA 95814-5512

March 24, 2017

Re: Comments on EPIC Investment Plan by CHBC

Dear Chairman Weisenmiller and fellow CEC Commissioners,

The California Hydrogen Business Council (CHBC) appreciates the opportunity to submit comments on the California Energy Commission's 2018 - 2020 EPIC Investment Plan Draft Funding Initiatives. For your consideration, we offer the following recommendations for inclusion into the EPIC Triennial Investment Plan.

Theme 2, S2.2: Push Low-Carbon Microgrids Closer to Commercial Viability

The CHBC would encourage the CEC to include Power-to-Gas demonstration projects for funding consideration under Theme 2 - S2.2 "Push Low-Carbon Microgrids Closer to Commercial Viability" of the Investment Plan. The CEC's goal to establish commercial opportunities for microgrids would very much be in line with investment in demonstration projects for renewable gas from electrolysis, known as Power-to-Gas (P2G).

The CHBC's White Paper "Power-To-Gas: The Case For Hydrogen" explains how P2G technology has the potential to provide a large-scale, cost-effective solution for storing excess energy produced from renewable sources. In summary, Power-to-Gas (P2G) uses excess renewable energy via electrolysis of water to produce hydrogen gas, serving as a "gas battery." Like regular batteries, P2G technologies have excellent **load-following** capabilities, which are necessary to manage the intermittency of solar and wind resources. Unlike battery storage, however, **P2G can store utility-scale quantities of energy indefinitely**, without self-discharge, either in tanks, the natural gas grid, or directly in hydrogen caverns. This seasonal storage capability can play a role when wind power generated in March can be delivered into the high-value energy markets of August and September. These unique attributes have the potential to enable very high levels of renewable energy production while maximizing economic value.

This ability of P2G to allow energy from renewable sources, such as solar photovoltaic and wind, to be generated during periods of low demand for use later in high demand periods reduces the need for renewable curtailment. This can be effective in alleviating the "ramping" problem experienced by electric utilities in the afternoon and evening periods and smoothing the "duck curve".

Thus, P2G RD&D, including pre-commercial pilots and system modeling, would represent an important, high-value addition to the EPIC portfolio.

There are several P2G facilities in Europe in various phases of development, with over 28 P2G facilities operational in Germany aloneⁱⁱⁱ, and three more are operational in North America. Two P2G projects are active in the US, one at the National Renewable Energy Laboratory in Golden, Colorado, and the other at the University of California, Irvine. These demonstrations will assess the feasibility and potential benefits of using the natural gas pipeline system to store photovoltaic and wind-produced energy. These are referred to collectively as a "system solution" because of the added benefits of helping balance the grid and providing substantial energy storage capacity.

Conclusion

California is faced with an increasingly urgent need to deploy utility-scale energy storage solutions to support intermittent renewable power generation. CAISO reports that over 300 GWh of solar and wind electricity were curtailed in 2016, and that number is likely to increase. Battery storage technology cannot provide all the energy storage California needs to meet its climate goals. Bulk storage options like pumped hydro and compressed air carry geographic restrictions that also limit the contribution they will be able to make to California's energy system. P2G enables long-term storage of large amounts of emission-free energy, and is geographically flexible, especially when connected to the vast gas network. P2G is thus critical to California to meet its ambitious climate goals cost-effectively and needs to be part of the state energy portfolio. Investing in advancing the commercialization of P2G now will help accelerate its adoption and move this technology to market. Therefore, the CHBC believes P2G should receive an in-depth evaluation by the CEC for its potential as a large-scale storage option, as well as its potential applications to microgrids.

Thank you for your consideration!

Sincerely,



Emanuel Wagner
Assistant Director | California Hydrogen Business Council

ⁱ 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. 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 AC Transit, Air Liquide Advanced Technologies U.S. LLC., American Honda Motor Co., Inc., Ballard Power Systems, Bay Area Air Quality Management District, Beijing SinoHytec, Bethlehem Hydrogen Inc, BMW of North America LLC, California Air Resources Board, California Fuel Cell Partnership, California Performance Engineering Inc., CALSTART, Cambridge LCF Group, Center for Transportation and the Environment, China Hydrogen Fuel Cell Corporation, Coalition for Clean Air, Community Environmental Services, E4 Strategic Solutions, Eldorado National – California, Energy Independence Now, Engineering, Procurement and Construction, LLC, Ergostech Renewal Energy Solution, First Element Fuel Inc, FuelCell Energy, Inc., General Motors Corporation, Giner, Inc., Gladstein, Neandross & Associates, Greenlight Innovation, GTA, Inc., GTM Technologies Inc., H2B2, H2Safe, LLC, H2SG Energy Pte Ltd, H2Tech Systems, Horizon Fuel Cells Americas, Inc., Hydrogen in Motion, Hydrogenics Corporation, Hydrogenious Technologies, HydrogenXT, Hyundai Motor Company & Kia Motors Corp, i-2-m, Idaho National Laboratory, Intelligent Energy, IRD Fuel Cells LLC, ITM Power Inc, Ivys Inc., Johnson Matthey Fuel Cells, Linde North America Inc, Loop Energy Inc, McPhy Energy, MPL Consulting, Inc., National Renewable Energy Laboratory, Nel Hydrogen, New Flyer of America Inc, Next Hydrogen Corporation, Noyes Law Corporation, Nuvera Fuel Cells LLC, Pacific Gas and Electric Company, Paramount Energy West LLC, PDC Machines, Inc., Plug Power, Inc., Port of Long Beach, PowerHouse Energy Americas, Powertech Labs, Inc., Proton OnSite, Ramco Consulting Company Inc, Rio Hondo College, RIX Industries, Sacramento Municipal Utility District, SAFCell Inc, Schatz Energy Research Center, Solar Hydrogen System, South Coast Air Quality Management District, Southern California Gas Company, Sumitomo Corporation of Americas, SunLine Transit Agency, Tatsuno North America Inc, Terrella Energy Systems Ltd, Toyota Motor North America Inc., Advanced Power and Energy Program - UC Irvine, United Hydrogen Group Inc, US Hybrid Corporation, WireTough Cylinders, LLC, Zero Carbon Energy Solutions, Ztek Corporation

ii CHBC White Paper “Power-To-Gas: The Case For Hydrogen”

<https://californiahydrogen.org/sites/default/files/CHBC%20Hydrogen%20Energy%20Storage%20White%20Paper%20FINAL.pdf>

iii Pilot Projects in Germany: <http://www.powertogas.info/power-to-gas/pilotprojekte-im-ueberblick/>