Cory Shumaker 19-2-6

CALIFORNIA HYDROGEN BUSINESS COUNCIL

Hydrogen Means Business in California!

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Mary Nichols
Chair
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CHBC Comments on ARB's Proposed Zero-Emission Airport Shuttle Regulation

The California Hydrogen Business Council[i] applauds the Air Resources Board (ARB) for taking action to recognize the importance of powering airport shuttles with zero-emissions technology, either battery or fuel cell.

The CHBC is encouraged by the support given to both electric charging infrastructure and to hydrogen refueling infrastructure needed to implement both ZEV technologies. These are all the more essential to California's climate and clean air efforts given that utility electricity and hydrogen fuel supplies are moving towards becoming 100% renewable and carbon free, both through SB 100 mandates and industry commitments like the CHBC's and Hydrogen Council's.[ii]

We urge you to consider the inherent bias for one technology over another that funding preferences can create when fleet operators evaluate the business cases. Those biases can skew adoption towards a particular technology that may not be optimized for long-term sustainability. Depending on fleet deployment and operations requirements, fleet operators must be free to adopt the ZEV technologies best suited to their application. BEVs and FCEVs offer different value propositions due to the difference primarily in battery recharge time (hours) versus hydrogen refueling time (minutes), but also in weight, range and performance. Increased adoption of FCEVs will enable ARB to address more total emissions than if it only encourages BEVs. A funding parity policy will therefore be crucial to success of air quality improvement initiatives and will allow airport shuttle fleet operators to make the best ZEV technology choice based on their particular business and operational considerations over a broad time horizon.

CHBC offers the following summary highlighting infrastructure economic considerations for FCEVs vs. BEVs.

- Electric charging is easy and cheap to trial for the first few vehicles.
- The total cost of incrementally adding several electric charger to an existing site is small, as long as the utility electrical supply infrastructure capacity is not exceeded.
- By contrast, hydrogen fueling is more expensive to trial for the first few vehicles.
- Since widespread hydrogen infrastructure does not exist at the same scale as electricity infrastructure, most initial hydrogen infrastructure is not incremental, and developers must bear the total cost of first deployment, although mobile refueling technologies can be applied.
- As the fleet size increases, hydrogen has a distinct advantage over electricity.
- Inevitably, the local electric grid infrastructure becomes constrained, requiring very costly investments to overcome those constraints.
- By contrast, the initial investment in hydrogen fueling is typically adequate to accommodate the entire fleet of FCEVs, with little to no incremental investment required.
- Estimated all-in electrical costs for battery electric GSE vs. all-in hydrogen costs for fuel cell electric GSE are shown below. [iii]

Deployment	All in Electrical Costs	All in Hydrogen Costs
500 GSE passenger airport	>$30M	<$8M
20 GSE cargo depot	>$2M	<$800K
190 GSE cargo airport	>$20M	<$6M

In sum, the choice of ZEV technology is multi-faceted, time phased, and dependent on actual usage. Only a thorough business case evaluation can determine the best technology choices for each fleet operator. Those evaluations should be made with parity of incentive funding.

We appreciate your consideration of our comments and offer further discussions with your team to answer potential questions.

Best regards,

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Deputy Director
California Hydrogen Business Council

[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..; 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; California Air Resources Board (CARB); California Fuel Cell Partnership (CaFCP); CALSTART; Cambridge LCF Group; Center for Transportation and the Environment (CTE); Chiyoda Corporation; Coalition for Clean Air; Community Environmental Services; CP Industries; DasH2energy; Eco Energy International; EcoNavitas; ElDorado National – California; Energy Independence Now (EIN); EPC - Engineering, Procurement & Construction; Ergostech Renewal Energy Solution; EWII Fuel Cells LLC; FIBA Technologies; First Element Fuel; FuelCell Energy; GenCell; General Motors, Infrastructure Planning; Geoffrey Budd G&SB Consulting; Giner ELX; Gladstein, Neandross & Associates; Greenlight Innovation; GTA; GTM Technologies; H2B2 USA; H2Safe; H2SG Energy Pte; Hexagon Lincoln; Hitachi Zosen Inova ETOGAS; HODPros; Hydrogen Law; Hydrogenics; Hydrogenious Technologies; HydrogenXT; HyET - Hydrogen Efficiency Technologies; Hyundai Motor Company; ITM Power; Ivys; Johnson Matthey Fuel Cells; KORE Infrastructure; Kraft Powercon; Life Cycle Associates; Linde North America; Longitude 122 West; Loop Energy; Millennium Reign Energy; Mitsubishi Hitachi Power Systems Americas; Montreux Energy; Motive Energy; Natural Gas Fueling Solutions (NGFS); Natural Hydrogen Energy; Nel Hydrogen; Neo-H2; Neuman & Esser USA; New Flyer of America; Next Hydrogen; Noyes Law Corporation; Nuvera Fuel Cells; Pacific Gas and Electric Company (PG&E); Pacific Northwest National Laboratory (PNNL); PDC Machines; Planet Hydrogen; Plug Power; Politecnico di Torino; Port of Long Beach; Powertech Labs; Primidea Building Solutions; Proton OnSite; RG Associates; Rio Hondo College; Rix Industries; Sacramento Municipal Utility District (SMUD); SAFCell; Schatz Energy Research Center (SERC); Sheldon Research and Consulting; Solar Wind Storage; South Coast Air Quality Management District; Southern California Gas Company; Strategic Analysis; Sumitomo Corporation of Americas; Sumitomo Electric; Sunline Transit Agency; T2M Global; Tatsuno North America Inc.; Terrella Energy Systems; 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; Verde; Vinjamuri Innovations; Winkelmann Flowform Technology; WireTough Cylinders; Yanli Design; Zero Carbon Energy Solutions.

[ii] https://www.californiahydrogen.org/2018/12/20/chbc-endorses-full-decarbonization-goal-of-hydrogen-in-transportation-by-2030/

[iii] Estimates provided by Plug Power; see https://www.californiahydrogen.org/wp-content/uploads/2017/10/1515_02_Cioffi_Plug-Power.pdf