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RE: CHBC Comments on ARB Technology Assessment: Ocean-Going Vessels

The California Hydrogen Business Councilⁱ recommends that the Report *“Technology Assessment: Ocean-Going Vessels”* should reassess hydrogen and fuel cells as a solution for maritime applications to meet emission requirements. As currently written, the Report mentions hydrogen and fuel cells, but positions LNG as the only serious alternative fuel for propulsion. However, technology providers, ship builders, ship owners, ship operators, and governments are already evaluating zero emission hydrogen and fuel cell solutions for ships and have made public announcements regarding their assessments and plans, which ARB should consider. For example:

Royal Caribbean Cruise:

- <http://www.rclcorporate.com/rcl-announces-two-new-ships-powered-by-lng-and-fuel-cells/> and
- <http://www.rclcorporate.com/investors/press-releases/press-release/id/1334/>

Viking Cruises:

- <https://www.maritime-executive.com/article/worlds-first-hydrogen-powered-cruise-ship-scheduled#gs.BA5v7es>

Fiskerstrand Holding AS:

- <https://www.sdir.no/en/news/news-from-the-nma/breaking-new-ground-in-hydrogen-ferry-project/>

Norway:

- <https://fuelcellsworks.com/news/work-on-hydrogen-ferry-in-norway-continues>

Scotland:

- <https://fuelcellsworks.com/news/group-led-by-point-and-sandwick-trust-awarded-funding-by-scottish-government-to-develop-hydrogen-pow>

Europe:

- <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/fch-01-2-2018.html> and
- <http://www.fch.europa.eu/project/marine-application-new-fuel-cell-powertrain-validated-demanding-arctic-conditions> and
- http://www.fch.europa.eu/sites/default/files/FCH%20Docs/171121_FC_H2JU_Application-Package_WG3_Ferries%20%28ID%202910573%29%20%28ID%202911659%29.pdf

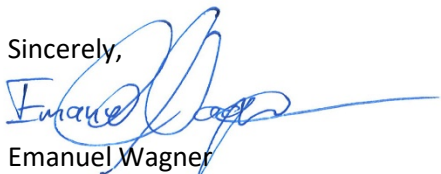
Although LNG may be a short term solution to reduce marine vessel emissions, it is not a zero emission solution. Fuel cells and hydrogen fuel are a zero emission solution and are a viable way to drastically reduce marine emissions. Hydrogen fuel cells are already successfully proven in heavy duty applications, and the cost of the technology and vehicles continues to decrease.

Today, neither the LNG or hydrogen fueling infrastructure to support ships are available. Investing today's resources solely in a transition fuel – natural gas – should be re-evaluated; especially when the ultimate solution – hydrogen – is already in-hand and the industry and other countries are moving toward this zero emission fuel cell solution. We are concerned that if a one solution approach is followed, the new assets of a natural gas infrastructure could quickly become obsolete and our investment resources stranded once the ships have converted to hydrogen. We propose that a significant share of our resources should be focused on developing the hydrogen infrastructure at the ports to support these zero emission ships.

Hydrogen fuel at the ports can be a source of zero emission energy for ships and an array of zero emission equipment including material handling, generators for cold-ironing and back-up power, drayage trucks, trains, and light duty vehicles. Hydrogen infrastructure at the scale to support fueling ships is synergistic with these parallel zero emission applications and will be transformative in scale and enable the volumes of fuel to drive down fuel costs. Such an investment will accelerate conversion of the ports to zero emissions, and early investment in the hydrogen solution could save money by accelerating earlier adoption of that ultimate solution. We suggest that investments should strongly consider hydrogen infrastructure and avoid committing all investment to an interim natural gas solution.

Coordination between the availability of hydrogen fueled ships and the port infrastructure will be critical to ensure the fuel infrastructure is optimally utilized. During the introduction and ramp-up phase, hydrogen can be utilized in bulk quantities for blending with natural gas and/or diesel fuels for combustion engines, as well as for the aforementioned parallel zero emission applications.

Sincerely,



Emanuel Wagner
Assistant Director
California Hydrogen Business Council

¹ The 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 Advanced Emission Control Solutions, Air Liquide Advanced Technologies U.S., Airthium, Alameda-Contra Costa Transit District (AC Transit), American Honda Motor Company, Anaerobe Systems, Arriba Energy, Ballard Power Systems, Bay Area Air Quality Management District, Beijing SinoHytec, Black & Veatch, BMW of North America, California Performance Engineering, Cambridge LCF Group, Center for Transportation and the Environment (CTE), CNG Cylinders International, Community Environmental Services, CP Industries, Dash2energy, Eco Energy International, ElDorado National – California, Energy Independence Now (EIN), EPC - Engineering, Procurement & Construction, Ergostech Renewal Energy Solution, EWII Fuel Cells, First Element Fuel, FuelCell Energy, GenCell, General Motors, Geoffrey Budd G&SB Consulting Ltd, Giner ELX, Gladstein, Neandross & Associates, Greenlight Innovation, GTA, H2B2, H2Safe, H2SG Energy Pte, H2Tech Systems, Hitachi Zosen Inova ETOGAS GmbH, HODPros, Hydrogenics, Hydrogenious Technologies, Hydrogen Law, HydrogenXT, HyET - Hydrogen Efficiency Technologies, Hyundai Motor Company, ITM Power, Ivys, Johnson Matthey Fuel Cells, Kontak, KORE Infrastructure, Life Cycle Associates, Linde North America, Longitude 122 West, Loop Energy, Luxfer/GTM Technologies, McPhy Energy, Millennium Reign Energy, Montreux Energy, National Renewable Energy Laboratory (NREL), Natural Gas Fueling Solutions – NGFS, Natural Hydrogen Energy, Nel Hydrogen, New Flyer of America, Next Hydrogen, Noyes Law Corporation, Nuvera Fuel Cells, Pacific Gas and Electric Company - PG&E, PDC Machines, Planet Hydrogen, Plug Power, Port of Long Beach, PowerHouse Energy, 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, Sumitomo Corporation of Americas, Sunline Transit Agency, T2M Global, Tatsuno North America, The Leighty Foundation, TLM Petro Labor Force, Toyota Motor Sales, True Zero, United Hydrogen Group, US Hybrid, Verde, Vinjamuri Innovations, Volute, WireTough Cylinders, Zero Carbon Energy Solutions.