

Heavy Duty, Goods Movement and Clean Ports SAG Agenda

April 30, 2024

Summary:

- A lot of activity happening in the news for fuel cells in ports and maritime!
- Lee Kirshenboim, Engineering Consultant, CTE presented on the Hyster-Yale/Nuvera fuel cell top loader in Port of Los Angeles (presentation attached)
- CHBC continues to reach out to companies to provide updates on FC ports/maritime projects during SAG calls.
- CHBC working with Energy Independence Now (EIN) to host Hydrogen and Fuel Cells in Ports & Maritime workshop in 2024

Notes - Ports/Maritime:

1. Greetings and Introductions, review of the Anti-Trust Guidelines
2. Latest Interesting News to This SAG – Ports/Maritime
 - a. [Japan's First Hybrid Hydrogen-Biofuel Passenger Ship in Operation](#)
 - b. [Varanasi pilot location for deployment of green hydrogen fuel cell inland vessel](#)
 - c. [Advent Technologies, Siemens Energy to work on maritime fuel cell solution](#)
 - d. [Containerised hydrogen systems clear early hurdles for maritime use](#)
 - i. [PowerCell Group Joins in on Hydrogen Fuel Cell Infrastructure Demonstration of HyFlex](#)
 - e. [Doosan Fuel Cell's SOFC passes world's first environmental test for maritime applications](#)
 - f. [EH Group receives DNV's blessing for marine fuel cell system](#)
 - g. [PM Narendra Modi unveils India's first hydrogen fuel cell ferry at Cochin Shipyard](#)
 - h. [Nuvera Fuel Cells joins APOLO ammonia cracker technology project](#)
 - i. [PowerCell has become part of the EU project H2Marine with the goal of developing the most powerful marine fuel cells](#)
 - j. [Design Approval Sought for World's First High-Speed Fuel Cell Vessel](#)
 - k. [Port of Gothenburg carries out hydrogen-powered excavation](#)
 - l. [Future Proof Shipping and ZEM Ports NS launch groundbreaking H2 Barge 2](#)
 - m. [Chart, GasLog partner to develop liquid hydrogen shipping from Middle East](#)
 - n. Other newsworthy items in FC maritime and ports?
 - i. Webinar May 22nd: [Hydrogen Fuel Cell Technology for Ships – From Feasibility Studies to First H2 Vessels](#)
3. Project Presentations
 - a. Lee Kirshenboim, Engineering Consultant, CTE: Hyster-Yale/Nuvera fuel cell top loader
 - i. Presentation attached
 - b. Suggestions?
 - i. CALSTART Port of San Diego HFC tug boat project (Kelly Ratchinsky)
 - ii. ABB hydrogen fuel cell container ship
 - iii. PNNL – Seattle hydrogen port study
 - iv. e1Marine Methanol fuel cell technology ([Thetius study](#))
 - v. DOE Hornblower Hydrogen Refueling Barge
 1. Will be refueling Sea Change (SWITCH)
 - vi. SCAQMD/CARB Hydrogen Barge - capture and control system for vessels at berth (Stax Engineering)
 1. Fuel cell, solar and battery storage

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4. Current SAG Activities – This Month’s Focus: Maritime/Ports
 - a. Outreach
 - i. Events
 1. Planning Hydrogen & Fuel Cells in the Ports Workshop for August
 - ii. California ports
 1. CHBC to summarize and utilize [Electrification of California Ports by Moffatt & Nichol](#)
 2. Inquire with CA Port Authorities what hydrogen and fuel cell information and equipment they need.
 - a. POLA/POLB
 - b. Port of San Diego
 - c. Port of Oakland
 - d. Port of Hueneme
5. Regulatory/Legislative Updates
 - a. CARB LCFS Hearing was April 10 on the Amendment Package: Comments due 30 days post workshop (May 10): Mik working with CARB staff on specifics
 - b. [SB 1387](#) Newman- Zero Emission, MD HVIP incentive bill- CHBC supports: April 25th amended and passed out of Transportation committee to Appropriations
 - c. [SB 1418](#) Archuleta: Require local governments to expand their existing expedited and transparent permitting process for zero emission vehicle infrastructure to include hydrogen fueling- CHBC supports - May 6 hearing in Appropriations- opportunity around June to add support language for including on-site production.
 - d. [SB 1420](#) Caballero- Hydrogen;; Passed out of committee as amended - working with utilities on further amendments
 - e. We are also discussing SB 903 (broad PFAS ban bill) and working with our Power Gen members on input for potential amendments; in communication with FCHEA as well.
 - f. The updated CA budget to be released in May
 - g. California Hydrogen Market Development Strategy: Web feedback form is open for input (no deadline), Individual companies should submit their priorities.
 - i. Original email provided the Framing Document- refer to this as guidance for input.
 - ii. This is the opportunity to submit priority areas for your company and how your projects fit in.
6. Events
 - a. Webinar May 22nd: [Hydrogen Fuel Cell Technology for Ships – From Feasibility Studies to First H2 Vessels](#)
 - b. June 16-17th [California Hydrogen Leadership Summit](#) – Sheraton, Sacramento
 - i. Some sponsorship levels still available
 - c. Value registration ends May 10; discount for CHBC members
 - d. See [Wednesday Weekly](#)
7. Open Discussion
 - a. Next month’s topic: Rail /Aviation

Attendees:

- Magnus Ahlstrom, PowerCell Group
- Gus Block, Nuvera Fuel Cells

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- Shari Boyd, Deloitte
- Morgan Caswell, Port of Long Beach
- Cortney Copeland, GO-Biz
- John Cornish, Engineering, Procurement and Construction
- Travis Douglas, HyAxiom Inc.
- Patrick Fiedler, Fiedler Group
- Katrina Fritz, CHBC
- Rick Gasaway, Green Stewardship LLC
- Sean Gibson, Modern Hydrogen
- Brian Goldstein, Energy Independence Now
- Kevin Goss, Toyota Motor North America
- Jennifer Hamilton, CHBC
- Kelly Katchinsky, CALSTART
- Lee Kirshenboim, CTE
- Matthew Klippenstein, Canadian Hydrogen Association
- Jose Lopez-Gallego, RIC Energy
- Greg Moreland, GDIT
- Peter Odunde, TRC
- Leah Pillsbury, IVYS Inc.
- Joanna Richart, Ricardo
- Kevin Robert, Robert Bosch LLC
- Rod Sanchez, Deloitte
- Jared Sayers, Azolla Hydrogen
- Susan Schoenung, Longitude 122 West
- Brian Schorr, CHBC
- Cory Shumaker, CHBC
- Andreas Truckenbrodt, Loop Energy
- Zannatul Zannat, Port of Long Beach

Fuel Cell Hybrid Electric Top Loader Project

Lee Kirshenboim

Center for Transportation and the Environment



Project Overview

- 2018 CARB ATD Solicitation
- Improve air quality at ports
- Technologies demonstrated:
 - 1) Electrification of hydro-mechanical powertrains
 - 2) Delivery of electric power and energy with a hydrogen fuel cell engine
 - 3) Wireless charging of on-board battery



Project Partners





Vehicle

- 30.6 kg of hydrogen
- 130 kWh on-board battery
- Two 45 kW fuel cells
- 220 kW peak power electric traction motor

Wireless Charger

- 250 kW inductive charger
- 2.5 hours for full charge

Fueling System

- Mobile refueler with 120 kg of H₂
- 15 minutes to refuel at 350 bar
- 33% renewable h₂

Demonstration In-Progress

- 5 months of demonstration
- 38 operational days¹
- 986 containers moved
- Efficiency ranges from 1.2 - 3.6 kg/hr
 - Rail and yard shifts

Challenges

- Long lead times
- Change in hydrogen supplier and unit
- Wireless charger alignment and integration
- User errors
 - Vehicle startup
 - Vehicle shutdown
 - Parking position (overnight & breaks)
 - Utilization

