Marine Fuel Cells and the Water-Go-Round

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Presented by:
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Hydrogenics
Florø, Norway, September 18-19, 2019
The growth of shipping means drastic cuts in emissions are required to meet the targets = Zero Emission

**Worldwide shipping trend**

**Maritime GHG emissions**

Today

IMO Target

60% efficiency improvement and use of non-fossil fuels

Business as usual

From: *Third IMO GHG Study 2014*
Commercial Benefits of Zero

- Higher revenue and Lower total cost of ownership
- Fuel price certainty
- Less complicated on-board systems with less frequent and simpler maintenance
- Low noise, no exhaust = happier customers
- Green marketing = more customers
- Win public contracts

Choose Red and White Fleet as Your Environmentally Friendly Cruise Partner in San Francisco

The Red and White Fleet has been awarded the State of California’s WRAP award for progressive environmental efforts for over 13 years in a row.

“Your environmentally friendly cruise partner”
**Maritime Fuel Cell (MarFC) Project**

- **Port of Honolulu, Hawaii**
- U.S. DOE's FC Office and the U.S. DOT's Maritime Administration funded
- FC Unit replaces diesel generators providing auxiliary power on board to ships at berth
- Four 30-kW fuel cells (Total 100 kWnet), power-conversion equipment and 75 kg of on-board hydrogen storage
- Enough energy to power 10 refrigerated containers for 20 continuous hours of operation

[Link to the company news updates](http://www.hydrogenics.com/about-the-company/news-updates/2015/09/01/nothing-but-water-hydrogen-fuel-cell-ready-to-provide-renewable-power-to-honolulu-port)
“Conditional Approval In Principle” for Zero/V

Nov. 1, 2017

The Scripps Institute of Oceanography (SIO) to use the MarFC unit to provide shore power for the Research Vessel (R/V) Robert Gordon Sproul

While in Port, the vessel requires 480 VAC 3-phase shore power 24 hours per day.

The MarFC unit is currently being refitted for 480 VAC

Deployment scheduled for 6 months Starting ~ 10/1/2019
Marine hydrogen fuel cell systems can use off-the-shelf technology

Diesel Hybrid

Fuel Cell Hybrid

Water-Go-Round
The Water-Go-Round

- Aluminum catamaran
- 70’ / 21 m LOA
- 84 passenger (reconfigurable)
- 22 knot top speed
- 2x 300 kW electric motors
- 360 kW PEM fuel cell
- 100 kWh Li-ion battery
- H₂: 242 kg @ 250 bar
The WGR project is a partnership

Project Lead

Funding & Administration

Cost-Sharing Partners

This project is supported by the “California Climate Investments” (CCI) program.
The WGR will be on the water in Fall 2019 and will operate for at least 3 months in trials for CARB

Planned uses during the trial:
- Commuter ferry
- Excursion/tour boat
- Research/survey vessel
- Package/freight delivery
- Crew boat

After the project concludes, the vessel will enter commercial service (TBD)
The fueling will look like today’s operation with diesel

California’s Office of Spill Prevention and Response (OSPR) has exempted hydrogen fueling from the insurance requirements imposed on diesel fueling
Water-Go-Round Features

- **Fuel cell room**
  - 3 x 120 kW racks

- **H₂ tank array**
  - 250 kg, 250 bar compressed gas, 1-2 days operation

- **300 kW (400 hp) shaft motors** (1 in each demi-hull)

- **100 kWh batteries** in hulls provide boost power to achieve 22 knots

- **84 passengers with high visibility window arrangement**

- **Boarding from sides and bow for maximum flexibility**

- **Roof windows and bow observation deck** to create a fantastic viewing experience
HyPM™-R120 Fuel Cell Power Rack

- 30 kW
- 30 kW
- 30 kW
- 30 kW

120 kW

240 kW
+ 1 more rack = 360 kW for the WGR
Keel laying ceremony (Nov. 8, 2018)
End of April
End of May
Cleaner
Lower Cost
Better

Learn More

Visit
watergoround.com
ggzzeromarine.com

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The Water-Go-Round
Launching Fall 2019
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