Port Demand Assessment
MARAD Co-Fund
Hydrogen for Maritime and Rail Fuel Cell Technologies

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May 7/8, 2024

Project ID #SDI013

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Project Goals

- Assess power demand at Ports that would be good candidates for application of H_2 fuel cell power.
- Formulate a plan for a potential future stationary fuel cell design/build/deploy MarFC 2.0 Project.

Project Overview

Timeline:

- Start: July 2024
- End: July 2025
- 0% complete

Budget:

- Total: Pending

MT Barriers Addressed:

- A: Inadequate standards
- E: Financing mechanisms (Lack of cost and performance data)
- F: Inadequate user experience

Partners:

- Sandia *(project manager)*
- Cummins (formerly Hydrogenics)
- DOT/MARAD

*DOT/MARAD: US Department of Transportation, Maritime Administration

Collaboration and Coordination

The U.S. Department of Transportation's Maritime Administration (MARAD): Bryan Vogel and Dan Yuska

U.S. Department of Energy Hydrogen Fuel Cells Technologies Office (HFTO): Pete Devlin

Sandia National Laboratories: Lennie Klebanoff

Cummins/Accelera: Dammika Weeratunga, Ryan Sookhoo

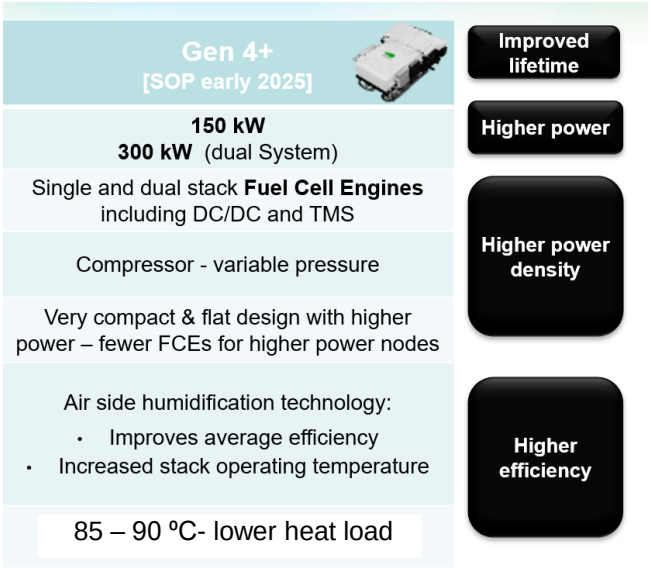
Approach:

The Maritime Fuel Cell (MarFC) Project designed, built and deployed a 100 kW containerized hydrogen fuel cell generator (MarFC) for portable power on land and sea. That project has been completed. This follow-on project will conduct a Port Power Demand Assessment to examine Port power needs that current fuel cell technology can fill.

Higher power in a smaller footprint: The available fuel cell power (in the same footprint) has increased almost 4X since 2014. This opens up many more possibilities for Port powering applications.

11 years later

2014 (MarFC): Four HD 30 Power Rack, operating temp. = 65 ºC. (30 kW modules, Rack output = 120 kW)



2025 (MarFC 2.0): In the same footprint, will be able to have three 150 kW modules in a rack, rack output = 450 kW). The higher operating temperature allows a reduced cooling BOP, saving space.

Sandia (with assistance from Accelera) will assess power demand at a representative Port suitable for fuel cell use.

Remaining Project Challenges and Barriers

- Once project is funded, we need to pick a representative port to conduct Port Power Assessment Survey. The representative port selection will be important to capture relevant powering options.

- The likely near-term fuel cell capabilities need to be defined, and mapped onto the demand options for Port powering to determine best fit of fuel cell technology to end use, and to formulate a plan for a potential future MarFC 2.0 Project.

Proposed Future Work

- Sandia and Accelera to collaborate on a Port Power Demand Assessment for potential Port end users. The original MarFC was conceived and designed for its use powering reefer units at 208 VAC, and later retrofitted to provide the more prevalent 480 VAC power. However, the potential applications for portside stationary power go beyond reefer units, and are greatly expanded by the increased FC power now available. All potential Port power demands, that could be handled by stationary fuel cell power, need to be surveyed to better understand the design and performance requirements for a possible future MarFC 2.0 unit.

- Design the next-generation MarFC (version 2.0) to optimize alignment with chosen Port powering targets, and also align with other commercial fuel-cell applications (e.g., heavy duty trucks) to improve the economic viability of a next-generation MarFC.

- Perform in-depth evaluation of the electrical architectures of desirable end-use applications, especially for powering a ship. A next generation MarFC would need to provide power that we are confident is compatible with the end-use application.

- Focus on cybersecurity. A next generation MarFC would have to have robust and high-bandwidth wireless communications capability, while at the same time guaranteeing secure communications and data storage.

Once the project is funded, Sandia (with assistance from Accelera) will be conducting a Port survey of prospective end use applications, to specify the technical requirements of a potential future MarFC 2.0.

("Any proposed future work is subject to change based on funding levels")

Summary

The Maritime Fuel Cell (MarFC) Project designed, built and deployed a 100 kW containerized hydrogen fuel cell generator (MarFC) for portable power on land and sea. That project has been completed. A follow-on project will conduct a Port Power Demand Assessment to examine Port power needs that current fuel cell technology can fill. The available fuel cell power (in the same footprint) has increased almost 4X since 2014. This opens up many more possibilities for Port powering applications.

Sandia (with assist from Accelera) will perform an assessment of the power demand at Ports that would be good candidates for application of H_2 fuel cell power. Given those power needs, the team will formulate a plan for potential future stationary fuel cell design/build/deploy MarFC 2.0 Project.

Responses to Reviewers' Comments

This is the first year the project is being reviewed

Thank You!

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