



# Hawaii Natural Energy Institute Research Highlights

*Alternative Fuels; Electrochemical Power Systems*

## **MCBH “Fast Fill” Hydrogen Station**

**OBJECTIVE AND SIGNIFICANCE:** The objective of this project was to install and operate a “Fast Fill” (less than 5 minutes) hydrogen production and dispensing station on the Island of Oahu at the Marine Corps Base Hawaii (MCBH) to evaluate the performance and durability of the equipment, and support a fleet of 16 hydrogen General Motors Equinox Fuel Cell Electric Vehicles (FCEV) operated by military personnel (Figure 1). The knowledge gained in this project will inform both the US Department of Defense on transitioning from fossil fuel fleet to a zero emission FCEV fleet, and the State of Hawaii on meeting its clean transportation goals.



Figure 1. First fill, November 2014.

**BACKGROUND:** The MCBH fast-fill hydrogen station was a component of the Hawai‘i Hydrogen Power Park project established by HNEI to support the US Department of Energy’s Technology Validation Program. The system was comprised of parallel 350-bar and 700-bar dispensing stations integrated to take advantage of common production, storage, and compression. The 12 kg per day PEM electrolyzer produced hydrogen at 15-bar. A hydrogen compressor increased the hydrogen pressure to 438-bar for storage in a bank of carbon fiber composite tanks supplying hydrogen to the 350-bar dispenser. Hydrogen from the lower pressure system was further compressed to 875-bar to supply the high pressure dispenser. For high-pressure fast fill, the hydrogen was precooled to -20°C allowing 3 consecutive 700-bar fills. A data logging system monitored and stored daily operating data. A computer model was used to evaluate the hydrogen production and dispensing performance. The station was highly automated and remotely monitored to eliminate a station attendant.

**PROJECT STATUS/RESULTS:** This project has now been completed and the station is being decommissioned.

**Major challenges experienced included:**

- Legal agreements required 2.5 years to resolve highlighting a major barrier to implementation of hydrogen fueling stations shared by similar projects.
- Installing an upgraded power supply to replace the existing 300 KVA transformer with a 500 KVA transformer extended the schedule and added a significant cost escalation.
- Commissioning time was longer than expected due to technical issues with equipment and need to eliminate trace contamination of the hydrogen supply to meet SAE fueling standards.

**Major accomplishments included:**

- Developed and executed legal agreements between University of Hawai‘i and MCBH.
- Procured a dual, 350/700 bar hydrogen production/dispensing system.
- Installed and commissioned the fueling station at MCBH meeting all base facility, security, and safety requirements.
- Conducted US DOE Hydrogen Safety Panel and independent third-party safety reviews of the equipment and site.
- Commissioned and operated the first licensed hydrogen transport trailer in Hawai‘i to transport hydrogen between military bases.
- Developed and installed a high-speed data acquisition system to measure dynamic performance of the system.
- Demonstrated well-controlled, repeatable, 4-minute high-pressure fast fills.

**Project Video Link:**

<https://www.youtube.com/watch?v=JJKduL6qIOI>

**Funding Source:** U.S. Department of Energy; Office of Naval Research; State of Hawaii

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**Last Updated:** March 2020