

VIII.9 Hawaii Hydrogen Center for Development and Deployment of Distributed Energy Systems

Richard (Rick) E. Rocheleau (Primary Contact),
Mitch Ewan

Hawaii Natural Energy Institute
University of Hawaii at Manoa
1680 East-West Road, POST 109
Honolulu, HI 96822
Phone: (808) 956-8346; Fax: (808) 856-2336
E-mail: rochelea@hawaii.edu

DOE Technology Development Manager:
John Garbak
Phone: (202) 586-1723; Fax: (202) 586-9811
E-mail: John.Garbak@ee.doe.gov

DOE Project Officer: Roxanne Dempsey
Phone: (303) 275-4822; Fax: (303) 275-4753
E-mail: Roxanne.Dempsey@go.doe.gov

Contract Number: DE-FC51-02R021399 A008

Partners:

- State of Hawaii Department of Business, Economic Development & Tourism, Honolulu, HI
- Volcanoes National Park
- Kilauea Military Camp
- Hawaii Center for Advanced Transportation Technologies
- Hawaiian Electric Company, Honolulu, HI
- Hawaii Electric Light Company, Hilo, HI
- Sandia National Laboratories, Albuquerque, NM
- National Renewable Energy Laboratory (NREL)
- Puna Geothermal Ventures
- Office of Naval Research

Project Start Date: June 29, 2009
Project End Date: September 30, 2012

Objectives

- Install hydrogen fueling station infrastructure at Hawaii Volcanoes National Park (HAVO) on the Big Island of Hawaii;
- Support the operations of the National Park Service (NPS) hydrogen plug-in hybrid electric vehicle (PHEV) shuttle buses for 24 months through January 2012;
- Conduct engineering and economic analysis of HAVO bus operations on different routes, grades, elevations and climatic conditions;
- Validate fuel cell system performance in harsh environments including high SO₂ concentrations;
- Position HAVO as an alternative-fueled vehicle test bed for the NPS;

- Attract new partners and applications for the Big Island hydrogen infrastructure; and
- Conduct outreach to local authorities and the general public regarding hydrogen infrastructure.

Technical Barriers

This project addresses the following technical barriers from the indicated sections of the April 2009 edition of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

Technology Validation, Section 3.6.4

- (A) Lack of Fuel Cell Vehicle Performance and Durability Data
- (C) Lack of Hydrogen Refueling Infrastructure Performance and Availability Data
- (H) Hydrogen from Renewable Resources

Hydrogen Safety, Section 3.8.4

- (H) Lack of Hydrogen Knowledge by Authorities Having Jurisdiction

Contribution to Achievement of DOE Technology Validation Milestones

This project will contribute to the following DOE milestones from sections of the Multi-Year Research, Development and Demonstration Plan:

Technology Validation section 3.6.6 Milestones

- **Milestone 34: Complete power park demonstrations and make recommendations for business case economics. (2Q, 2008)** Our HAVO system will generate hydrogen utilizing an electrolyzer powered by renewable energy resources delivered over the grid. Data will be collected to evaluate cost and technical performance.



Approach

- Procure a turn-key H₂ fueling station designed for easy expansion;
- Use fuel cell PHEVs to maximize the efficiency of a new park shuttle bus service at HAVO;

- Collaborate with existing data analysis groups (Sandia and NREL) to compare system data under different operating conditions (fueling station and vehicles);
- Evaluate the effect of different grades, climatic zones, and air quality conditions including SO₂ on vehicle performance;
- Identify areas that require further technical development such as air filtration systems; and
- Transfer results to industry and government agencies.

Accomplishments

- Signed an implementation agreement with the State of Hawaii contracting Hawaii Natural Energy Institute as the project “Implementing Partner” on behalf of the State of Hawaii;
- Secured State of Hawaii \$1.2 million cost share funds via Kolohala Holdings LLP;
- Completed a hydrogen station specification;
- Issued an request for proposal for the supply of “turn-key” fueling station. Responses are due on August 14th, 2009;
- Applied for a special research and development energy supply agreements from the Hawaiian Electric Light Company through the State of Hawaii Public Utilities Commission;
- Obtained Kilauea Military Camp (KMC) approval and support as the site of the fueling station;
- Progressed permitting and National Environmental Policy Act documentation;
- Completed background noise survey at the KMC site;
- Assisted HAVO to develop a noise specification for the fueling station; and
- Assisted HAVO to secure bus funding (\$1 million).

Future Directions

- Select the supplier for fueling station – September 2009.
- Complete site prep for station – Fall 2009.
- Install the fueling station – target: April 2010 or sooner.
- Complete vehicle conversions – target: April 2010. (Note: This is a related HAVO project and not part of the Power Park funding.)
- Operate buses – April 2010 to March 2012.
- Collect and analyze fueling station and vehicle data.
- Seek opportunities for expansion of fleet and/or additional hydrogen infrastructure.

FY 2009 Publications/Presentations

1. M. Ewan and R. Rocheleau, “The Hawaii Renewable Hydrogen Program,” *National Hydrogen Association Conference & Expo*, Columbia, South Carolina. March 2009.
2. R. Rocheleau and M. Ewan, “The Hawaii Hydrogen Power Park,” *US DOE Annual Merit Review*, Washington, D.C., May 2009.