

2011 Asia Pacific Clean Energy Summit and Expo

September 13-15 2011



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- **Energy Efficient Acquisition:** Evaluation of energy factors will be mandatory when awarding contracts for systems and buildings.
- **Sail the "Great Green Fleet":** DON will demonstrate a Green Strike Group in local operations by 2012 and sail it by 2016.
- **Reduce Non-Tactical Petroleum Use:** By 2015, DON will reduce petroleum use in the commercial fleet by 50%.
- **Increase Alternative Energy Ashore:** By 2020, DON will produce at least 50% of shore-based energy requirements from alternative sources; 50% of DON installations will be net-zero
- **Increase Alternative Energy Use DON-Wide:** By 2020, 50% of total DON energy consumption will come from alternative sources

Interagency Cooperation

Encourage Maximum Use of Renewable Energy

Strategic Partnership to Enhance Energy Security

Development and Support of a Sustainable Biofuels Industry




MEMORANDUM OF UNDERSTANDING
between the
DEPARTMENT OF AGRICULTURE
and the
DEPARTMENT OF THE NAVY

I. Purpose and Basis for this Memorandum of Understanding
This Memorandum of Understanding (Agreement) formalizes a relationship between the United States Department of the Navy (DON) and the United States Department of Agriculture (USDA) (hereinafter collectively referred to as "the Parties").

This Agreement establishes that the Parties agree to encourage maximum use of renewable energy, including outreach to other Federal, State, Local, and Tribal entities, as well as private entities, with the goal of providing technical assistance and financial products to these entities for the development of advanced biofuels and other renewable energy systems. The Federal Government, States, local governments, counties, utilities, private sector, non-governmental organizations, and other entities must all take steps to decrease nationwide energy use through the investment in and effective utilization of new, more efficient technologies, while also emphasizing the development of renewable energy projects.

Through this Agreement, the Parties will work together to support President Obama's initiative to reduce energy consumption derived from fossil fuels, and to increase energy production from renewable energy sources. Today, the United States depends on imported fossil fuels to meet over 60 percent of its energy needs. This dependence leaves the United States vulnerable to supply disruptions and highly volatile energy prices. Fortunately, the United States has abundant natural resources, including wind, solar, hydrokinetic, ocean thermal, and geothermal sources for electricity generation, and land for energy crops that can be refined into biofuels to meet both commercial and military transportation needs. The Parties are in agreement that developing the United States' renewable energy economy promises to make the United States a global leader in the production of sustainable, clean, and economically beneficial energy.

21 January 2010

Navy & Agriculture




Memorandum of Understanding
Between
U. S. Department of Energy
And
U. S. Department of Defense
Concerning Cooperation in a Strategic Partnership to Enhance Energy Security

I. Purpose
The purpose of this Memorandum of Understanding (MOU) is to identify a framework for cooperation and partnership between the Department of Energy (DOE) and the Department of Defense (DOD), hereafter referred to as the Parties, to strengthen coordination of efforts to enhance national energy security, and demonstrate Federal Government leadership in transitioning America to a low carbon economy. This MOU covers, but is not limited to, efforts in the areas of energy efficiency, renewable energy, water efficiency, fossil fuels, alternative fuels, efficient transportation technologies and fueling infrastructure, grid security, smart grid, storage, waste-to-energy, basic science research, mobile/deployable power, small modular reactor nuclear energy, and related areas.

II. Legal Authority
DOE enters into this MOU under the authority of section 646 of the Department of Energy Organization Act (Pub. L. 95-91, as amended, 42 U.S.C. § 7256). DOD enters into this MOU under the authority of DOD Instruction 4000.19 "Inter-Service and Intra-Governmental Support" August 9, 1995.

III. Background
In the 2010 Quadrennial Defense Review, the DOD expressed an intent to partner with other U.S. agencies to research, develop, test, and evaluate new sustainable energy technologies. The DOD aims to speed innovative energy and conservation technologies from laboratories to military end users, and it uses military installations as a test bed to demonstrate and create a market for innovative energy efficiency and renewable energy technologies coming out of DOE laboratories, among other sources. The DOE is currently supporting a range of projects aimed at improving energy efficiency and renewable energy efforts across the military services.

July 22, 2010

Defense & Energy





MEMORANDUM OF UNDERSTANDING
BETWEEN
THE DEPARTMENT OF THE NAVY
AND
THE DEPARTMENT OF ENERGY
AND
THE DEPARTMENT OF AGRICULTURE

On 30 March 2011, President Barack Obama directed the Parties to work with private industry to create advanced drop-in biofuels that will power both the Department of Defense and private sector transportation throughout America.

This Memorandum of Understanding (MOU) by and between the Department of the Navy (DON), Department of Energy (DOE), and the Department of Agriculture (USDA), hereafter referred to as the Parties, is entered into to initiate a cooperative effort by the Parties to assist the development and support of a sustainable commercial biofuels industry and to foster mutual cooperation of the parties to achieve the goals and objectives further described herein.

I. Background
A robust advanced drop-in biofuels market is an essential element of our national energy security. Energy security for the Nation requires unrestricted, uninterrupted access to affordable energy sources to power our economy and our military. Traditional fossil-fuel based petroleum is derived from crude oil that has increasingly challenging market and supply constraints. Chief among these is limited, unevenly distributed, and concentrated global sources of supply. America's growing dependence on foreign sources of crude oil undermines foreign policy objectives and comes at an ever increasing impact to the Nation's trade imbalance. In recent

June 2011

Navy, Energy & Agriculture

Enhance Energy Security MOU

The purpose of this MOU is to identify a framework for cooperation and partnership between DOE and DOD to strengthen coordination of efforts to enhance national energy security, and demonstrate Government leadership in transitioning America to a low carbon economy.



Aviation APUs Workshop: 9/30/2010

Purpose:

- To begin discussing collaboration across DOD and DOE in keeping with the MOU
- To motivate RD&D for APU applications

Next Steps

- Identify specific POCs for DOD activities (RED DOTS)
- Develop GSE Strategic Demo Plan

Waste-to-Energy Workshop: 1/13/2011

Purpose:

- To identify DOD-DOE waste-to-energy and fuel cells opportunities
- To identify challenge and determine actions to address them

Next Steps

- Set up an on-going WG to begin coordination, collaboration, assistance
- Develop a guidance document for Feds using third party financing

Shipboard APUs Workshop: 3/29/2011

- March 2011
- Organized by ONR

Biofuels-Fuel Cells

	Fuel	Power Generation	Energy Storage	Distribution & Control	Power Loads
Ships					
Unmanned Vehicles					
Aircraft Systems					
Expeditionary Systems					

**Long endurance, Unmanned
Air Vehicle (UAV) power
(26hr flight Nov 2009)**



**Long endurance , air independent
power systems for Unmanned
Undersea Vehicles (UUV)**



S&T Objectives

- Conduct research to understand performance and durability limitations of PEM fuel cells
- Evaluate suitability of PEM and SOFC power systems for applications-specific conditions
- Develop critical technologies supporting reforming of logistic fuels
- Explore potential of utilizing seabed methane hydrates for seafloor power generation

Approach

- Experimental studies of fuel cell performance response to stresses including trace impurities, and drive and temperature cycling.
- Experimental studies using Hardware-in-Loop (HiL) for dynamic applications
- Bench-scale testing of advanced reforming technologies including plasma diesel arc
- Integrated Raman probe and high pressure calorimetry for hydrates characterization

Hawaii Fuel Cell Test Facility



Results

- Fully equipped fuel cell test facility for performance, durability, and HiL testing
- Validated test protocols for SS, cyclic and dynamic testing
- Preliminary experiments demonstrating reforming of logistic fuel at reduced temperature
- Characterization of methane hydrates via simultaneous spectroscopy and high pressure calorimetry underway

Non-tactical Hydrogen Powered General Motors Fuel Cell Vehicles and Hydrogen Infrastructure

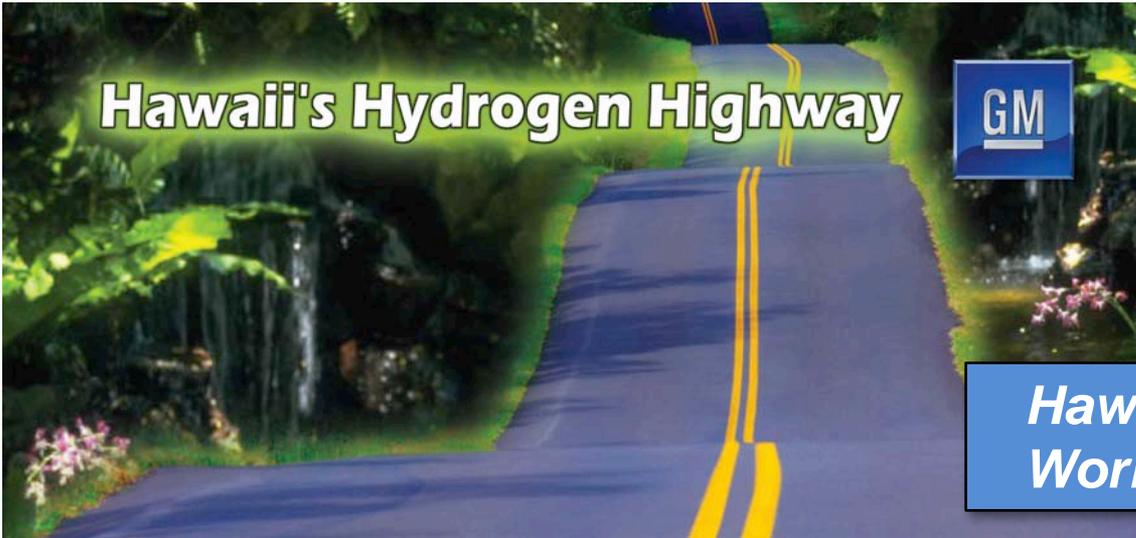
- Evaluation ongoing at Camp Pendleton
- Planned evaluation by MARFORPAC in Hawaii
- Coordinating with other Services and DoE



MARFORPAC & Marine Corps Base Hawaii



Marine Corps Base Camp Pendleton



Hawaii Advanced Vehicle Working Group (HAVWG)



Joint Base Pearl Harbor-Hickam Renewable H₂ Production & Fueling Station



Deployable Modules

- Hydrogen Fuel Processor (H₂FP) uses two electrolyzers; produces up to 50kg/day.
- Hydrogen Pressure Management (H₂PM) pressurizes H₂ up to 5000psi.
- Hydrogen Pressure Storage (H₂PS) stores H₂ at 5000psi.
- Water filtration
- Power Control
- MEP 9 Generator for deployment
- Operating since Nov 2006

146 kW Photovoltaic Array

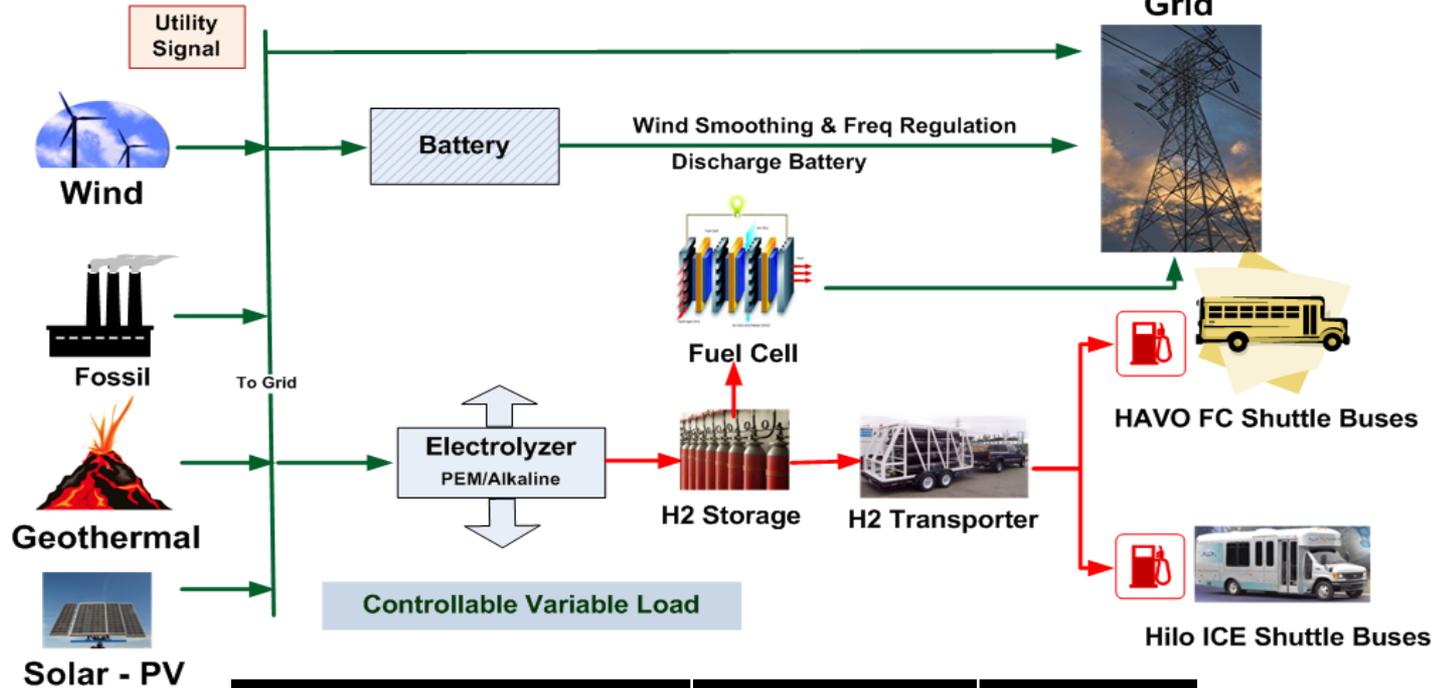
- Provides power to base grid when station is not operating.
- Operating since May 2009

Five 10 kW Vertical Axis Wind Turbines

- Additional renewable energy for hydrogen station; power to base grid when station is not operating.



Batteries & Electrolyzers as Grid Management Tools



Service	Electrolyzer	Battery
Up Reserve	Yes	Yes
Down Reserve	Yes	Yes
Up Regulation	Yes	Yes
Down Regulation	Yes	Yes
Fuel Production	Yes	No
Voltage/VAR Support	No	Yes

Hydrogen-Electric Sustainable Energy Infrastructure

Hawaii as the Defense Energy Model for Asia-Pacific Region

- Increase penetration of renewable energy into DoD installations and partner communities
- Distributed power for Humanitarian Assistance & Disaster Relief (HADR), Expeditionary Ops, and FOBs

