

Sustainable Cities and Military Installations
3-6 June 2012
Hotel Ranga, Hella, ICELAND

ONR Installation & Community
Energy S&T Research

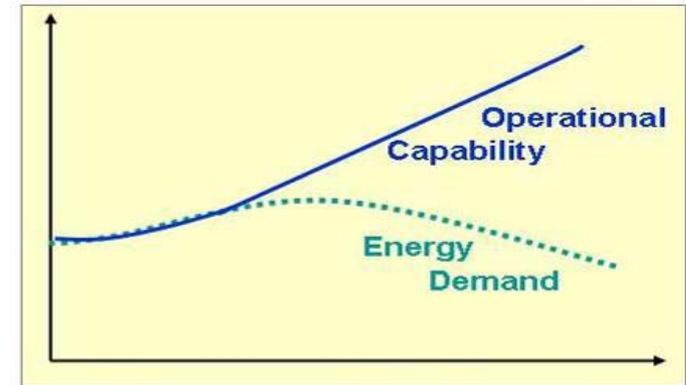


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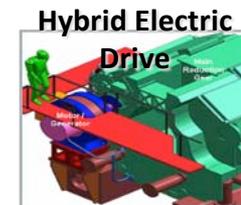
- **Energy Efficient Acquisition:** Evaluation of energy factors will be mandatory when awarding contracts for systems and buildings.
- **Sail the "Great Green Fleet":** DON will demonstrate a Green Strike Group in local operations by 2012 and sail it by 2016.
- **Reduce Non-Tactical Petroleum Use:** 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

Winning & Preventing Wars With an Energy Strategy

- **Win Wars by Increasing Operational Capabilities through Reduced Demand**
 - ✦ Implement the use of non-petroleum alternative fuels
 - ✦ Install secured alternative/renewable energy at CONUS and OCONUS military facilities
 - ✦ Implement alternative/renewable energy for expeditionary and special operations forces
 - ✦ Increase platform and facilities energy efficiencies
- **Soft Power to Prevent Wars with Strategic Partnerships and Humanitarian Actions**
 - ✦ Implement alternative/renewable energy with global partners
 - ✦ Install alternative/renewable energy during humanitarian operations for enduring use
 - ✦ Implement secured energy partnerships with community at OCONUS military installations



Navy Base Coronado



Program Description

- ***Reduce energy costs and increase energy security at Department of the Navy (DoN) facilities by accelerating the introduction and adoption of advanced energy systems and equipment.***
- ***Conduct advanced technology demonstrations to evaluate emerging energy technologies using Navy and Marine Corps facilities as test beds.***
- ***Collect and analyze data to evaluate the performance and reliability of energy technologies under various environmental and operating conditions.***
- ***Derisk new energy technologies to help enable their acquisition and adoption.***

ESTEP Program Structure

SPAWAR

Program Management
Info/Network Security Expertise
Technical & Business Training

**Incorporate Veteran
& Wounded Warrior**

**ONR Oversight &
Funding**



NPS

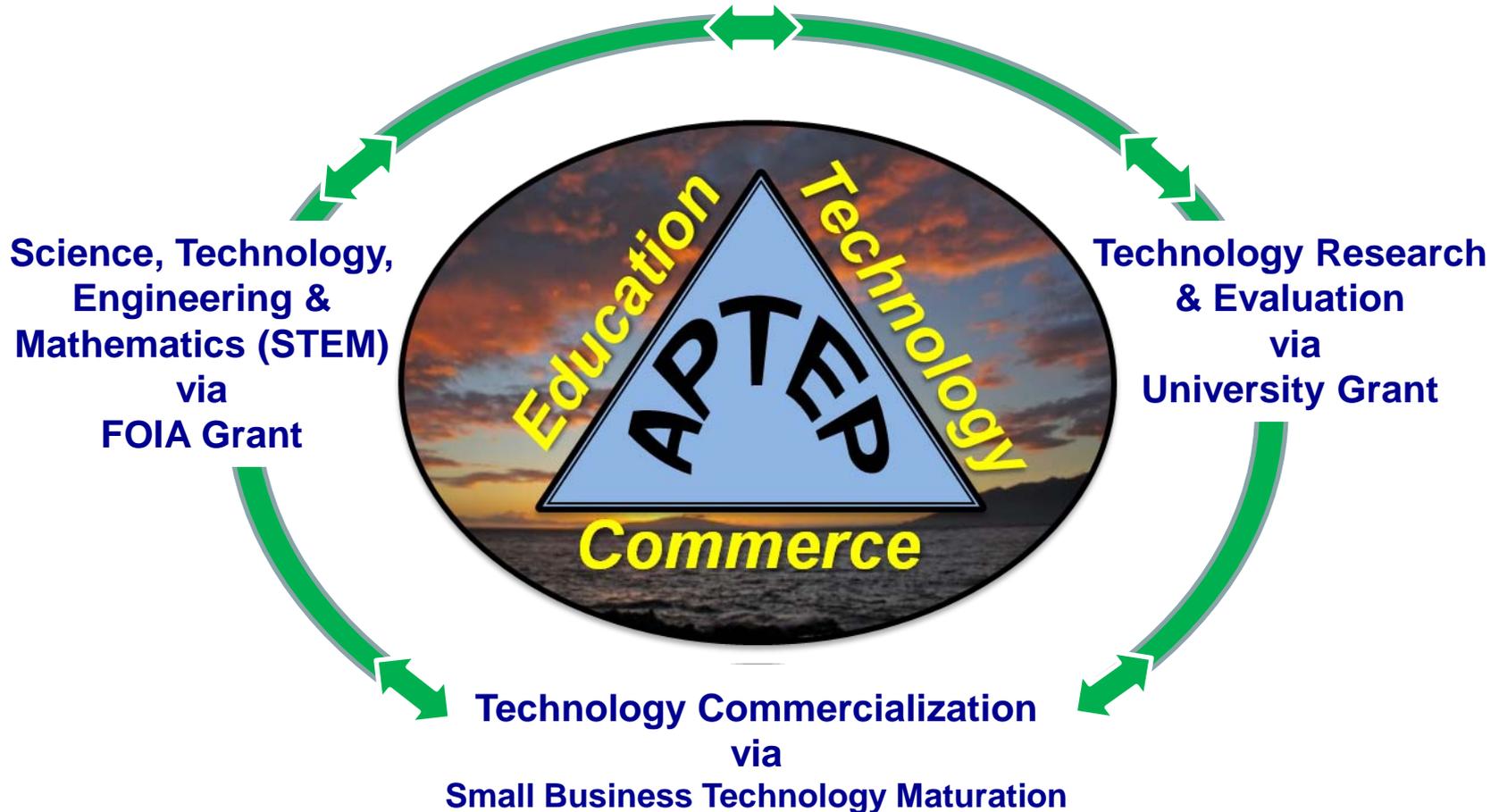
Energy ROI Research
Student Project Participation
Technical & Business Education

NAVFAC/NFESC

Project Management
Facility Expertise
Technical & Business Training

"And I'm proud to announce that the Department of Defense, working with us, the world's largest consumer of energy, will make one of the largest commitments to clean energy in history -- with the Navy purchasing enough capacity to power a quarter of a million homes a year." - President Barack Obama (State of the Union Address, 24 Jan 2012)

"As we recover from this recession, the transition to clean energy has the potential to grow our economy and create millions of jobs - but only if we accelerate that transition. Only if we seize the moment." - President Barack Obama (White House Website, 29 Jan 2012)



- Promote sustainability through alternative energy research, technology development & education
- Provide a cleantech workforce by linking energy education & research institutes with cleantech companies

- **Alternative Fuels**

- Fuel chemistry, combustion process analysis [collaborative with other services]
- Material compatibility and storage/degradation analysis
- Methane hydrates characterization and international surveys
- Biomass sustainability studies [Navy and joint with DoAg]
- Waste-to-energy [joint with DoE & other Services]



H₂ Powered FC Vehicles

- **Hydrogen (H₂), Fuel Cell Research and Evaluation**

- H₂ production and storage for grid stabilization [planning with DoE, Puna Geothermal and Hawaii Electric Light Co]
- Non-tactical vehicle evaluation and grid interface [joint with other services & DoE]
- Fuel Cell back-up power systems [Navy and joint with DoE]
- Unmanned systems evaluation
- Fuel cell materials research [joint with DoE]



Hawaii Fuel Cell Test Facility



OTEC HXGR

- **Renewable Power Generation**

- Ocean Thermal Energy Conversion heat exchanger corrosion and biofouling evaluation [joint with NAVFAC and DoE]
- Solar photovoltaic and small wind systems evaluations

- **Energy Security and Renewable Penetration Impact Mitigation**

- Megawatt energy storage for grid stabilization [collaborative with DoE and Hawaii Electric Light Co]
- Micro-grid: Maui & planning for other islands [joint with DoE & NEDO]
- Grid modeling and analysis [joint with DoE]

FROG Energy Efficient Structures

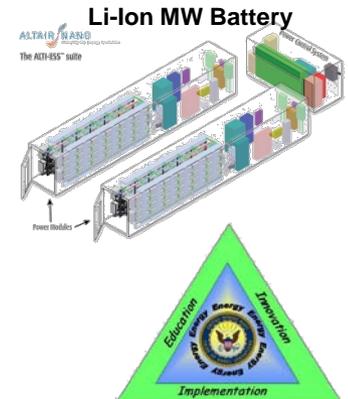


- **Energy Efficiency**

- Energy neutral-to-energy positive structures
- Ice production/water purification system evaluation

- **Alternative Energy Analysis and Outreach**

- STEM programs K-12 & Community Colleges (Hawaii CCs), U Hawaii, Chaminade U & U Guam [collaborating with SPAWAR]
- *Power Systems workforce development [University of Hawaii, and Florida State University consortium]*



Passenger Ground Vehicles

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

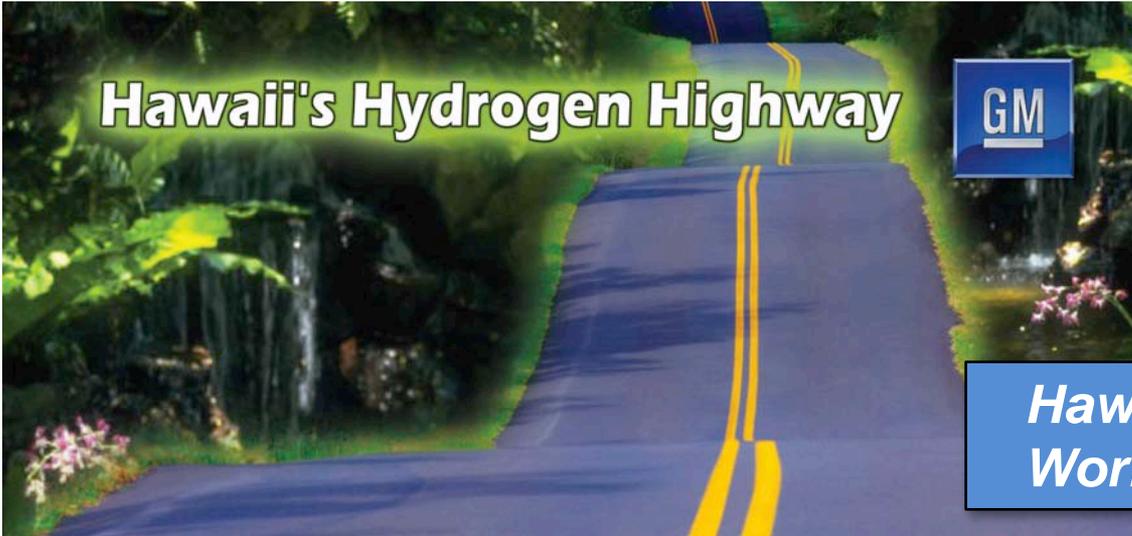
- Evaluation ongoing at Camp Pendelton and by MARFORPAC in Hawaii
- Coordinating with other Services and DoE



MARFORPAC & Marine Corps Base Hawaii



Marine Corps Base Camp Pendleton



Hawaii Advanced Vehicle Working Group (HAVWG)



MCBH Fueling Station

Background:

- Hydrogen refueling station to support H₂ powered vehicles
- All-service Hawaii Advanced Vehicle Working Group
- University of Hawaii – Hawaii Natural Energy Institute research grant

Current Situation:

- Temp fueling in place
- Funded, design complete, equipment ready.
- Awaiting legal agreement between HNEI and MCBH.

Future:

- Co-locate of PV at fueling site



Expeditionary Waste Disposal

Micro Auto Gasification System (MAGS)

Background:

- Safely dispose of all waste generated in remote & expeditionary sites (FOBs)
- Treats organic waste, plastics, chemicals, wood products, bio-hazardous waste.
- Waste heat for water heating, environmental comfort, etc.
- Funded by Code 33 since 2006 (shipboard)
- FY10 project for expeditionary use

Current Situation:

- Site construction started - 4 Apr 2011
- Installation Complete - June 2011
- Assessment - Jun/July 2011
- Final Report - Aug 2011
- Phase II Pohakuloa Training Area - FY12



Project FROG: Energy Neutral → Positive Structures

Ilima Middle School FROG, Oahu



- Key step in reducing installation energy demand is adopting energy efficient structural design practices
- Energy neutral or low energy structures simplify the incorporation of alternative energy systems
- Advanced structural concepts
 - ❖ Provide low cost energy efficient facilities that are easy to install
 - ❖ Can be *Energy Positive* exporting power to a grid

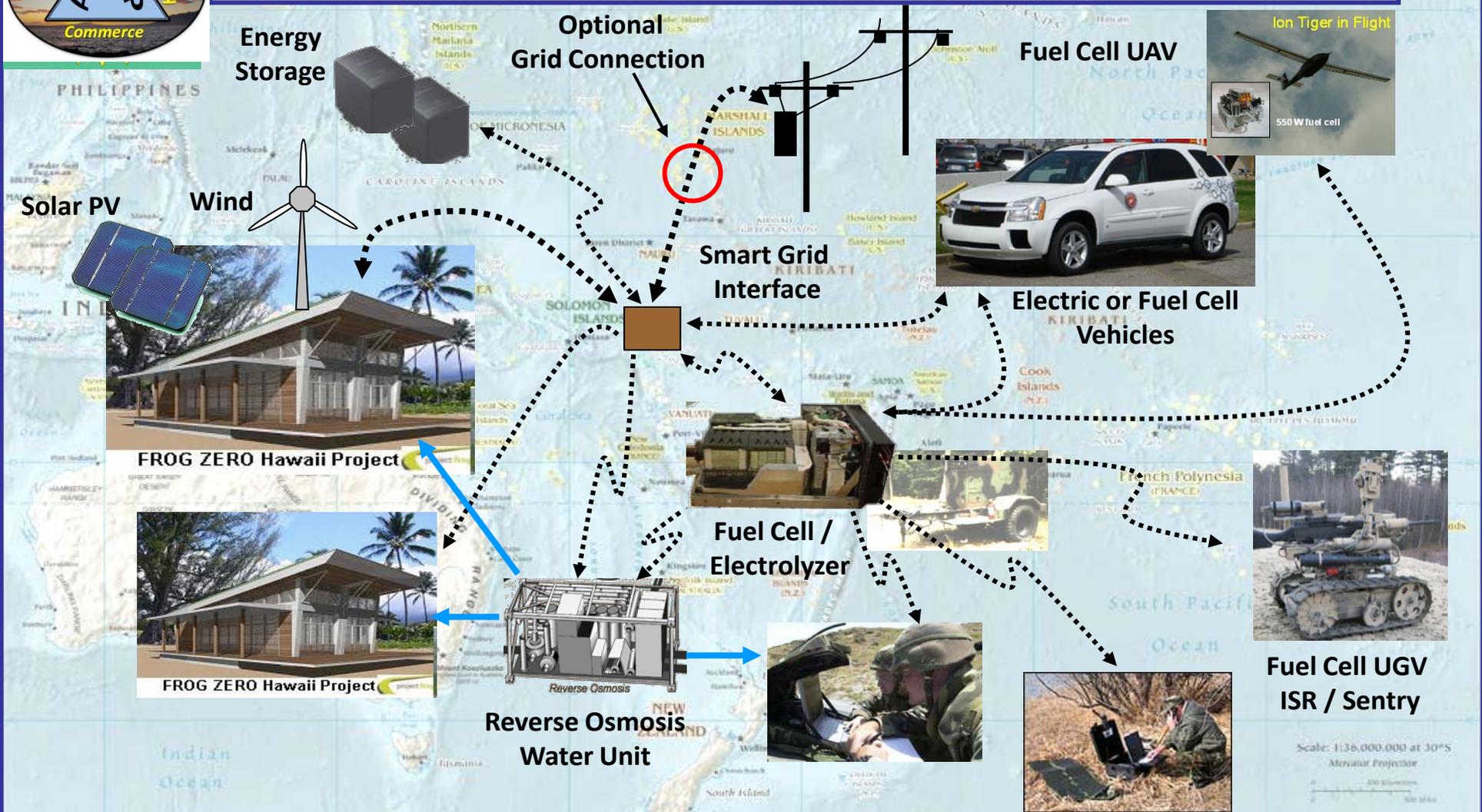
Kawaikini Charter School, Kauai

Alternative Energy Research

(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





Thank You

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