Navy Ocean Energy Program

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Ocean Thermal Energy Conversion (OTEC) Technology Workshop
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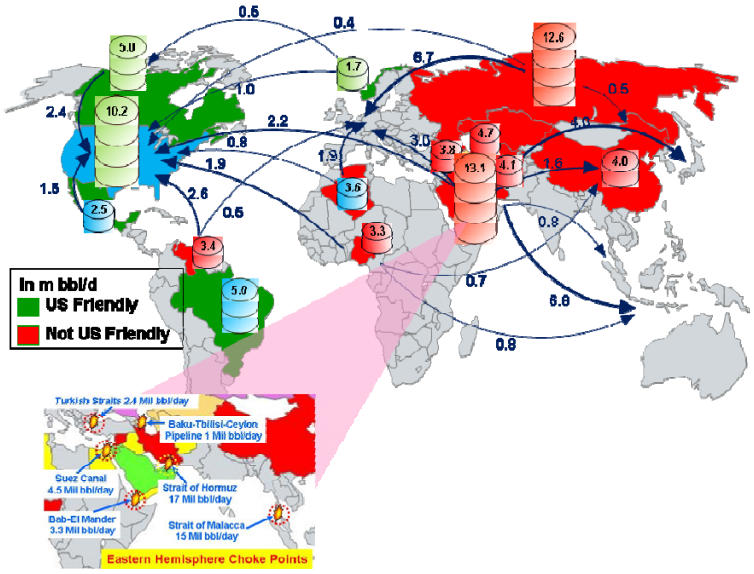
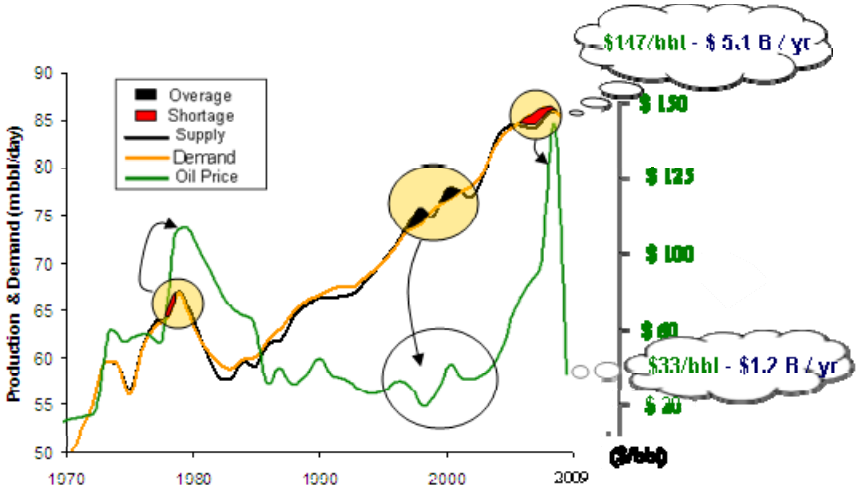
Things that Keep Us Up at Night

- 80% of world's fuel travels by ocean
- 90% of world's trade travels through choke points
- Navy's fuel cost in 2007 was $1.2B, in 2008 it was $5.1B
- U.S. imports 57% of energy needs
- Piracy adds $1M to shipping costs/trip
- Cost to refill a DDG-51: $1.8M in 2008, $643K in 2009
- FBCF $400/gal

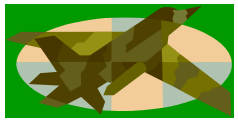
Impact to military readiness



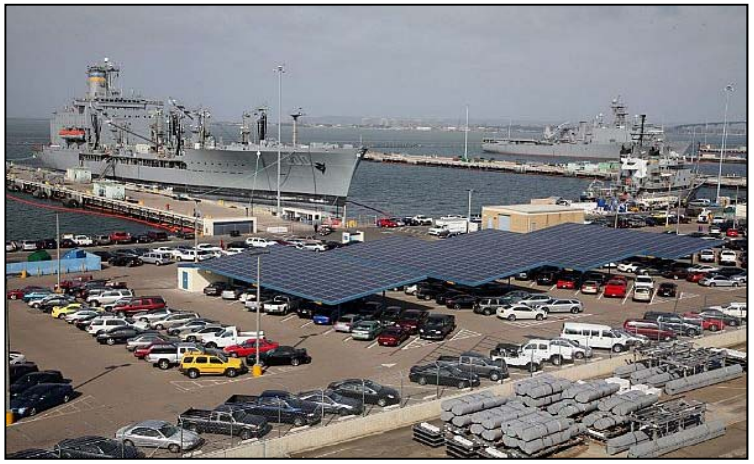


Recent Guidance from Administration

- On October 14, 2009, the Secretary of the Navy established five Department of the Navy (DoN) Energy Targets:
  - The lifecycle energy cost of platforms, weapons systems, and buildings, the fully-burdened cost of fuel in powering these, and contractor energy footprint will be mandatory evaluation factors used when awarding contracts.
  - The Navy will demonstrate a Green strike group of nuclear vessels and ships using biofuel in local operations by 2012. By 2016, the Navy will sail a "Great Green Fleet" composed of nuclear ships, surface combatants with hybrid electric power systems using biofuel, and aircraft flying only on biofuels.
  - By 2015, the Department of the Navy (DoN) will reduce petroleum use in the commercial fleet of 50,000 vehicles by 50 percent by phasing in a composite fleet of flex fuel, hybrid electric, and neighborhood electric vehicles.
  - By 2020, at least half of the DoN's shore-based energy requirements will come from alternative sources.
  - By 2020, half of total DoN energy consumption will come from alternative sources.



F-18 Green Hornet

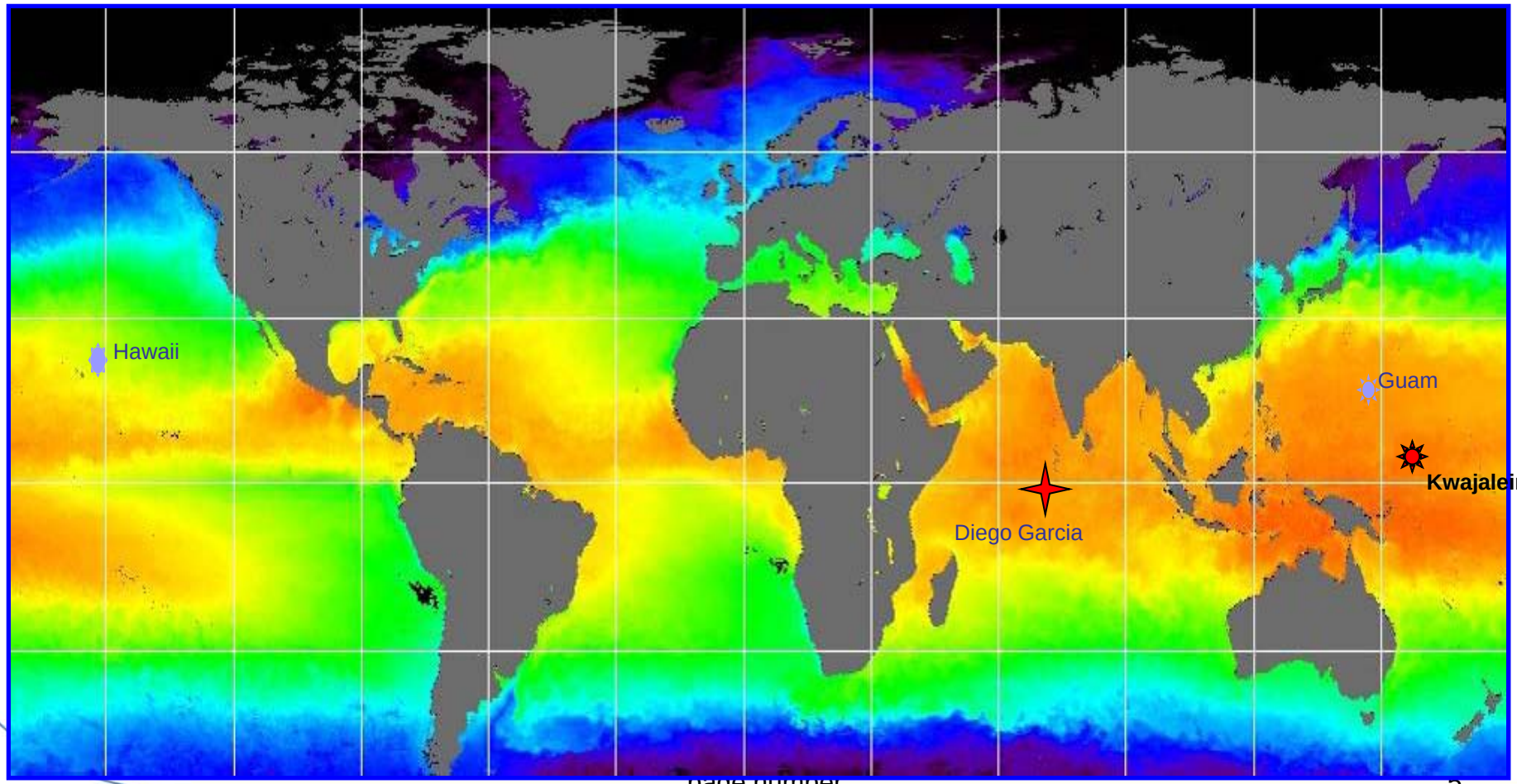


What do we want?/ What do we bring to the table?

- What do we want? "Operational Independence"
  - Long term goal: For island locations obtain reliable & affordable power, water and cooling from ocean resources – power purchase agreement
  - Short term goal: Partner with industry to expedite commercialization of ocean power with emphasis on OTEC

- What do we bring?
  - funding
  - sponsor for SBIR and Congressional Adds
  - long term contracts (stability)
  - land, infrastructure support, security
  - we pay our bills ⟶ favorable financing terms
  - assistance expediting permitting
  - with DOE & NOAA, help to bring industry together

Navy first looking at Diego Garcia, Hawaii & Guam



Courtesy: NASA Jet Propulsion Laboratory

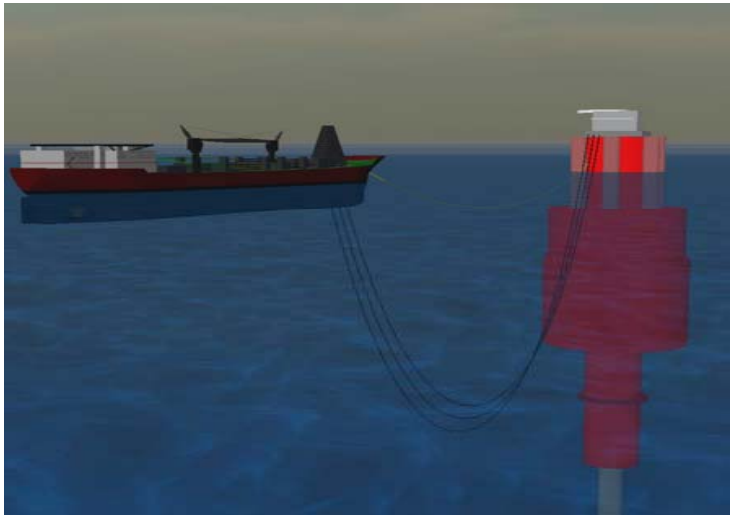
Island Requirements

- Reliable electric power supply to meet mission (no grid for reliability)
- Eliminate vulnerable fuel oil supply
- Adequate, potable water supply
- Refrigeration/cooling
- Reduce/eliminate environmental impacts

Role of US Navy in supporting OTEC

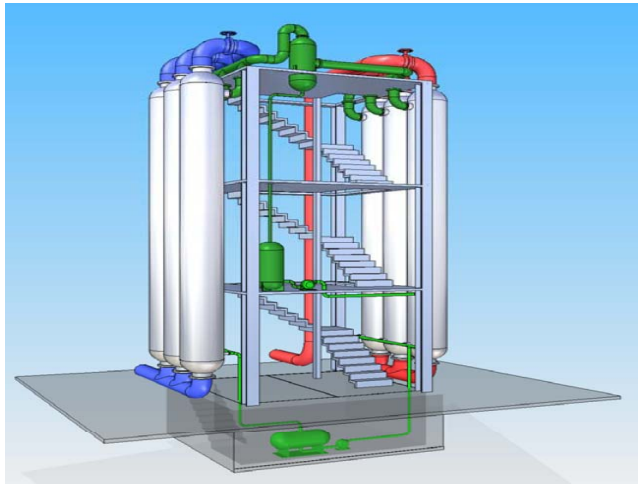
- OTEC offers hope as potential long term baseload technology for island locations, with further benefits from renewable fuel and potable water generation
  - Problem- expanding OTEC to required scale and competitive pricing requires technological and commercial advances
  - **For OTEC to assist in meeting Navy goals, OTEC commercialization needs to speed up**

- Navy plans to partner with DOE, NOAA and industry to advance the technology
  - Navy has multiple OTEC and other ocean energy R&D investments designed to commercialize promising technologies and encourage eventual private investment for large scale projects



Navy OTEC projects

- Navy OTEC Projects
  - Evaluate and test high efficiency, low cost heat exchanger configurations for commercial OTEC system
  - OTEC Key Component and System Design: Provide system and CWP/platform interface component design for floating OTEC
  - Conduct survey in private sector to identify maturity levels for ocean energy devices/systems
  - Determine technical feasibility of synthetic fuel production from floating OTEC
  - Determine technical & economic feasibility of on shore & offshore OTEC systems at GUAM Naval facility
  - Conduct OTEC surveys to identify most suitable NAVY/USMC site in Hawaii
  - Identify wave, tidal, ocean current, and thermal ocean energy resources at Naval/USMC facilities world-wide



Questions????