Department of Navy
Energy Program

WELCOME

Ocean Energy Technologies And Initiatives

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Power Generation 101

–Three things required to Generate Electricity
- Electric conductor
- Magnetic field
- Motion between the two

–A Prime Mover Produces the Motion; Typical Convention Power Plants
- Steam Turbines
- Combustion Turbines
- Diesel Engines

–Ocean Energy Technologies Use Forces of Nature as the Prime Mover

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Ocean Energy Resources

Ocean energy technologies can be classified by the ocean energy resource through which power is derived, namely - wave, thermal, tidal, or ocean current. Navy Region Marianas is investigating some of these technologies and their derivatives:

- Ocean Thermal energy conversion (OTEC)
- Wave generation
- Tidal generation
- Ocean current
- Salt water air conditioning (SWAC)

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Ocean Thermal Energy Conversion

Basic Concept

- Rankine Cycle
  - Utilize the temperature difference between warm surface water and deep-ocean cold water.

Challenges

- Large Size of Equipment
  - Cooling Water Pipes
  - Heat Exchangers
- Cost
- Environmental

By Products

- Potable Water
- Minerals

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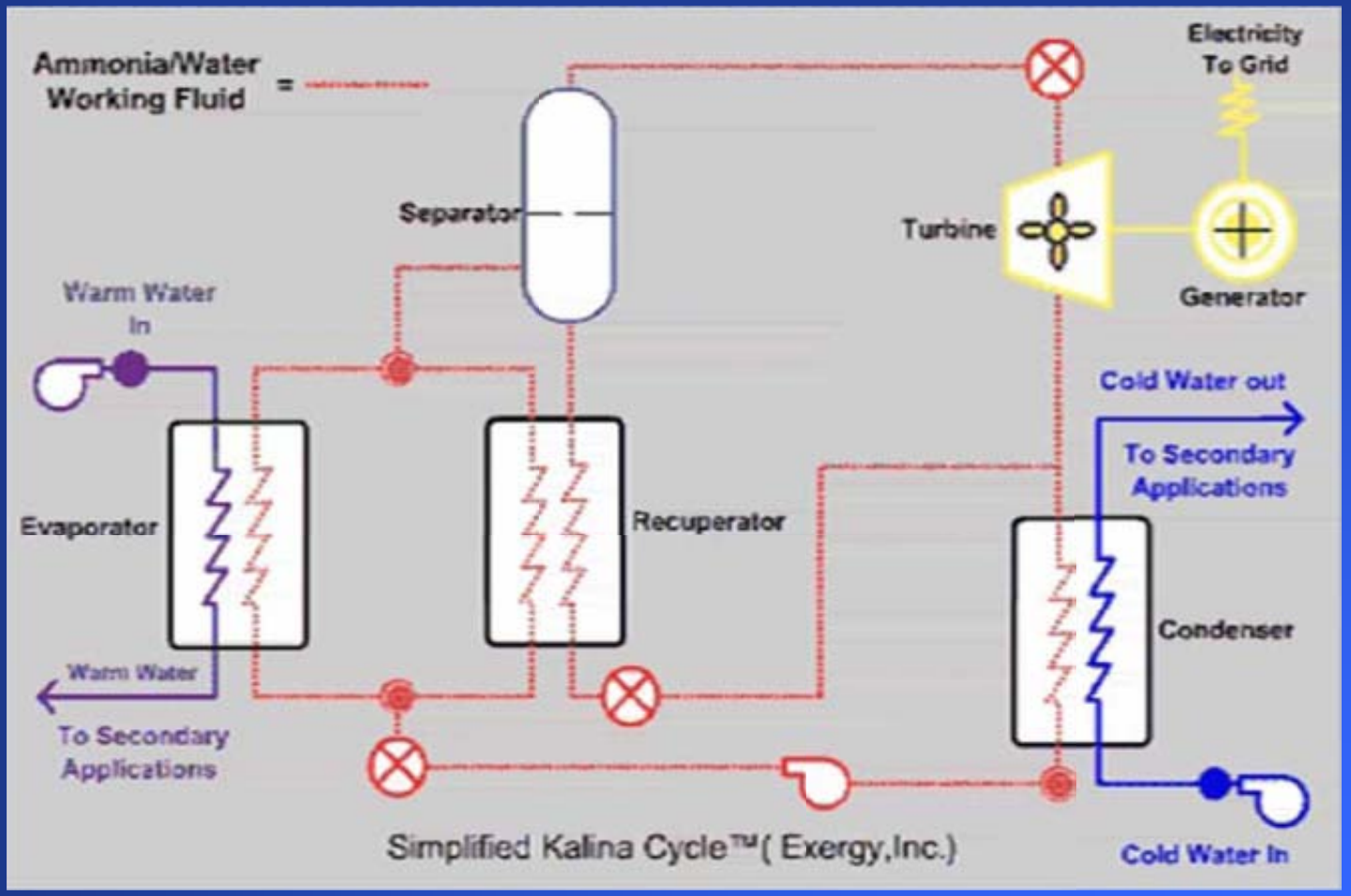
Ocean Thermal Energy Conversion



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Wave Generation

Basic Concept

- **Ocean wave interaction with a mechanical device produces motion**
  - Wave Interaction is used to categorize wave energy technologies
    - Terminator
    - Attenuator
    - Point absorber
- **Wave energy devices are commonly referred to as Wave Energy Converters (WECs)**
- **Challenges**
  - Large Size Of Equipment
  - Cost
  - Environmental

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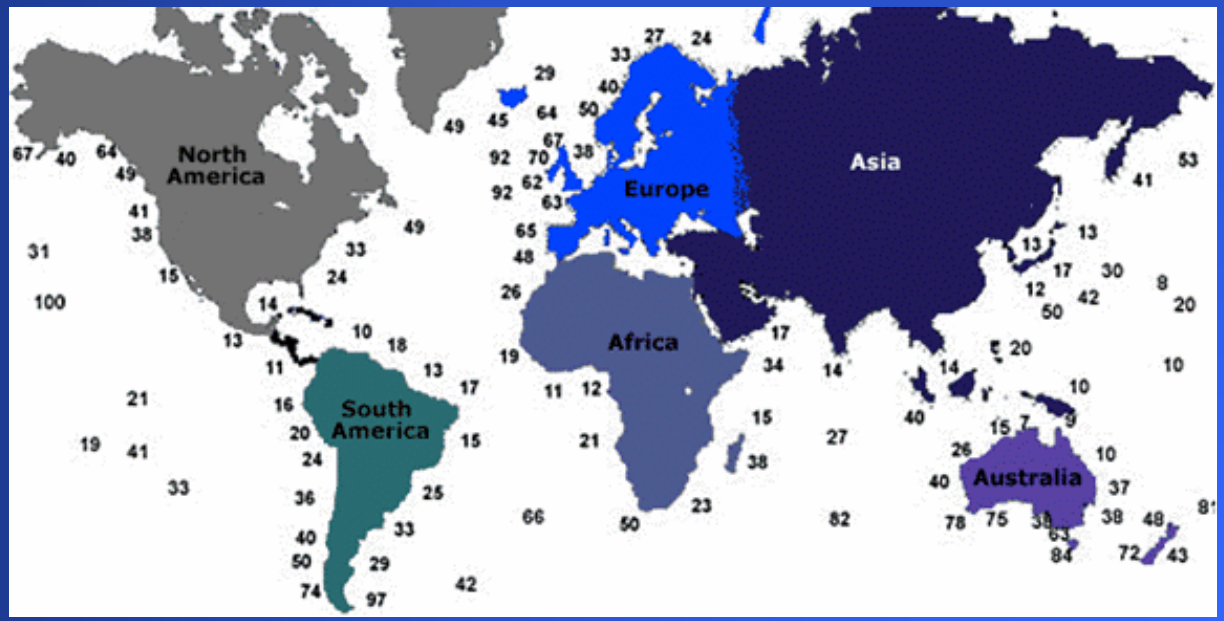
Wave Generation

Wave energy maps indicate the average energy generated by waves expressed in units of kilowatt per meter of wave front. In general, the average wave energy incident on the shoreline varies from 10 kW/m at the equator to 80 kW/m above and below equatorial latitudes



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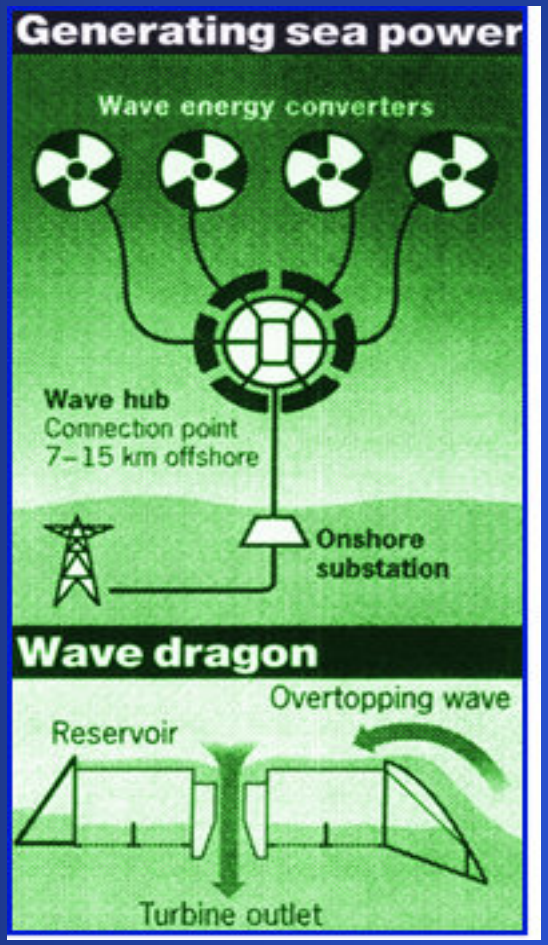
Wave Generation Examples



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Tidal Generation

Basic Concept

- **Tides create a current**
  - The power available from the energy of tidal currents tapped to generate power

—Large Bays and Estuaries along the coast

—Pacific Atolls?

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Ocean Current

Basic Concept

- The power available from the energy of Ocean currents tapped to generate power
- Challenges
  - Large Size of Equipment
  - Cost
  - Environmental

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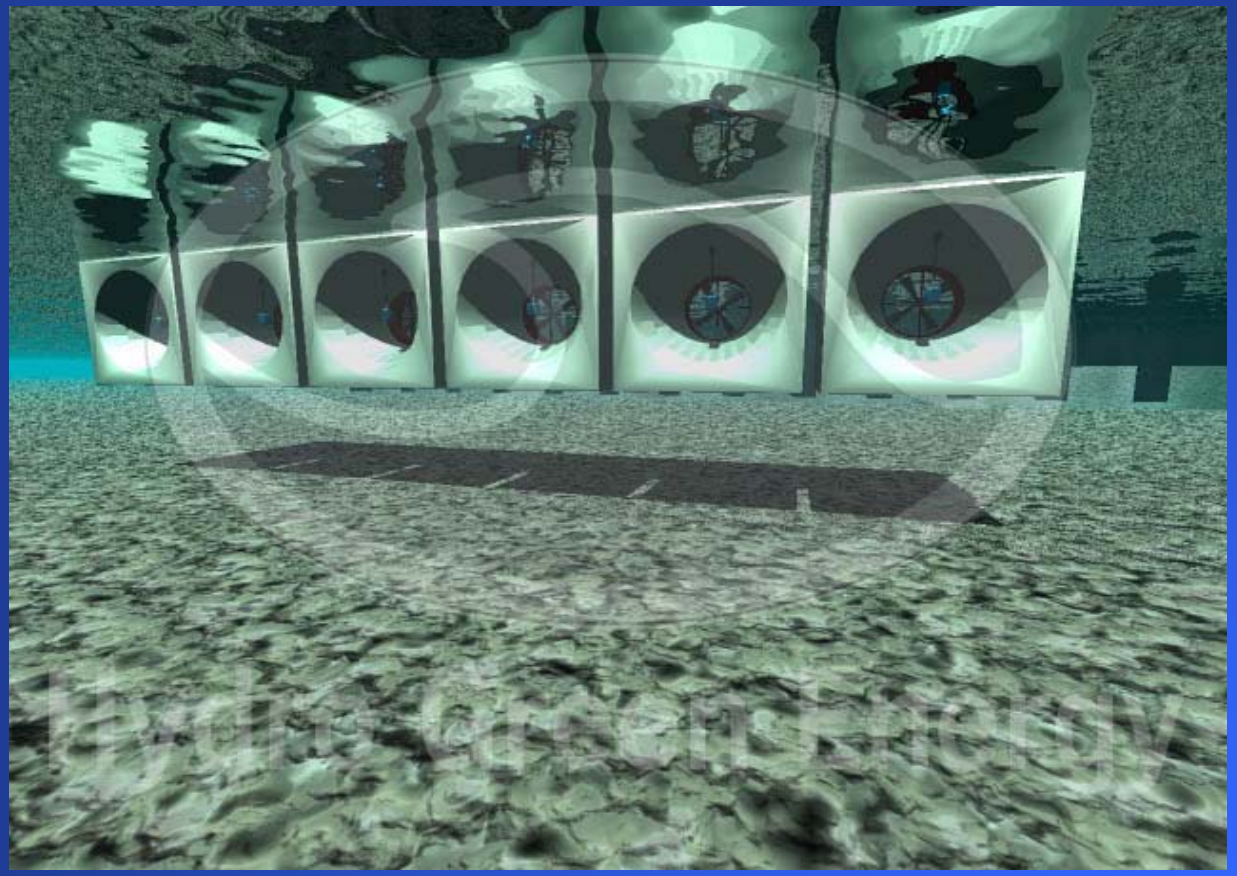
Ocean Current



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Sea Water Air Conditioning

Basic Concept

- Utilize cold seawater as a coolant for air-conditioning systems
- In Use in several locations
  - Intercontinental Hotel Bora Bora
  - Cornell University
  - Downtown Honolulu under design

Challenges

- Large Size of Equipment
- Cost
- Environmental

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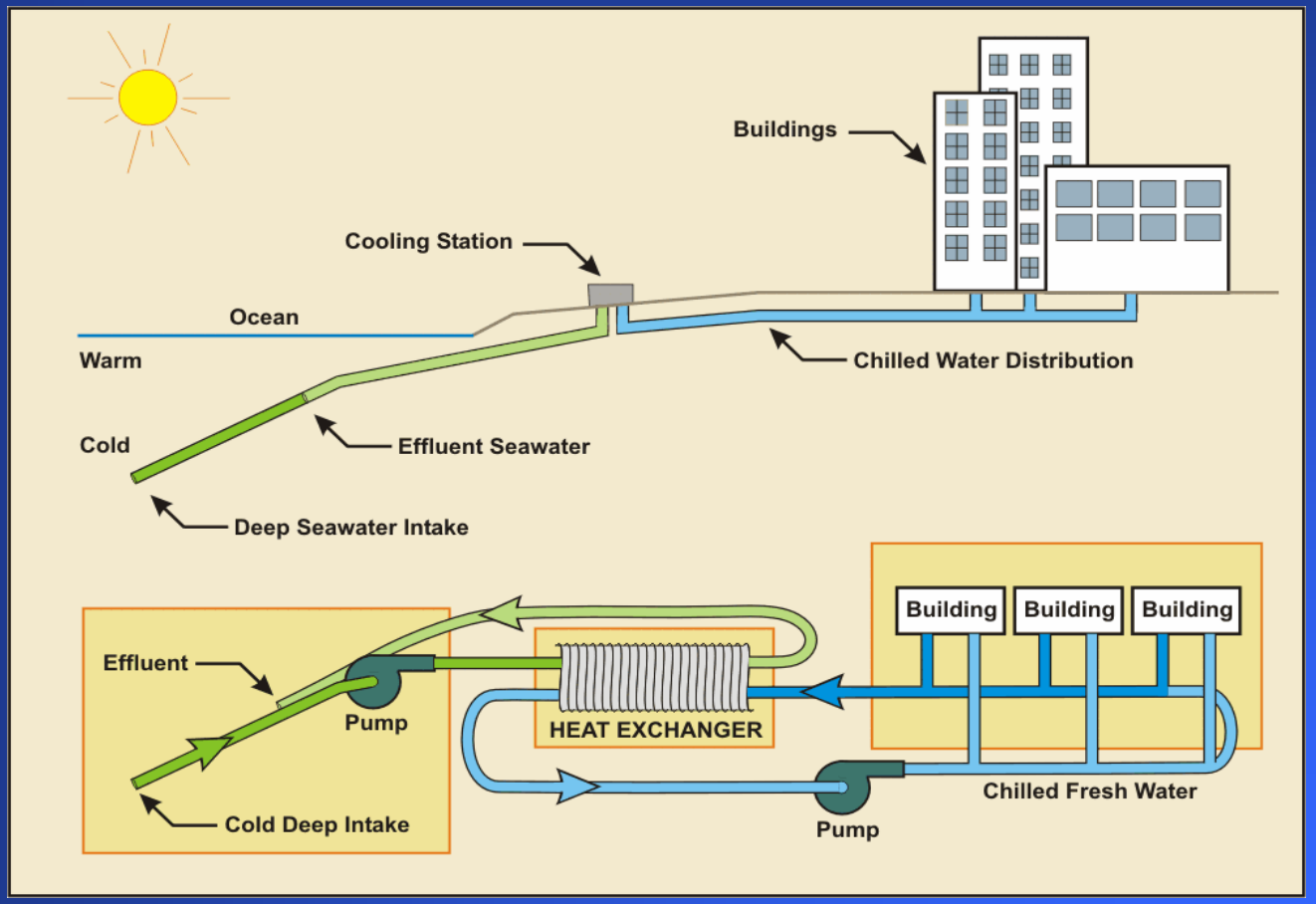
Sea Water Air Conditioning



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CURRENT NAVY INTEREST

Ocean Thermal Energy Conversion (OTEC)

- **Feasibility Study Kickoff Meeting Held 27 Feb**

Sea Water Air Conditioning (SWAC)

- **Site Investigation Underway**

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