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OCEAN THERMAL ENERGY CONVERSION

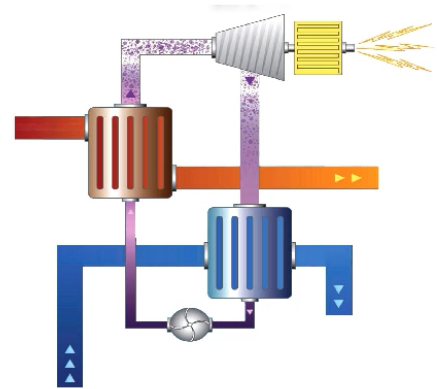
OCEAN THERMAL ENERGY CONVERSION

Ocean Thermal Energy Conversion (OTEC) is a game-changing technology that leverages the temperature difference in the ocean between cold deep water and warm surface water in the tropics and subtropics to generate unlimited energy without the use of fossil fuels. It boasts a competitive advantage over alternative sources of electricity production regarding accessibility, predictability, affordability, and emissions.

Competitive Issue	OTEC	Nuclear	Coal, Oil & Gas	Wind & Solar	Wave	Current
Source of Fuel	Local renewable	Often Imported internationally-restricted trade	Mostly Imported in our target markets	Local renewable	Local renewable	Local renewable
Is Fuel Accessible?	Yes	Not always country-specific Internationally-restricted trade	Not always requires considerable port & storage areas in target market	Yes	Not always dependent on wave density and frequency	Not always site dependent
Predictable Energy Supply	Yes base load power	Yes base load power	Yes base load power	No unpredictable and usually much lower at night	No	Yes usually predictable
Meeting Load Profile	Constant generation	Constant generation	Constant generation	Unpredictable source	Unpredictable source	Constant generation
Land Required	Small area	Buffer zone required	Fuel handling and storage	Large amounts of real estate	Must be underwater	Must be underwater
Affected by Typical Weather	No unlikely to be affected	No unlikely to be affected	No unlikely to be affected	Yes weather changes cause power output to vary	Yes weather changes cause power output to vary	Yes weather changes cause power output to vary
Affected by Tropical Storms/Hurricanes	No buried pipelines and equipment	No protected equipment usually unaffected	Yes shipping, storage and port facilities vulnerable	Yes structures usually exposed and vulnerable	Yes structures very exposed and vulnerable	Yes structures very exposed and vulnerable
Emmissions/Waste	No Fuel	Problematic waste	High level of pollution	No Fuel	No Fuel	No Fuel

HOW IT WORKS

Eighty percent of the sun's solar energy is absorbed into the surface of the world's oceans, and it is replenished daily regardless of weather patterns. In a closed cycle OTEC system, water flows through a large pipe and heat exchanger, which heats a liquid with a low boiling point, such as ammonia. As the boiling ammonia creates steam, it turns a turbine generator to produce electricity. A second pipe extracts cool deep water from the ocean, which condenses the steam back to liquid form. As the ammonia is recycled, the process repeats, creating unlimited clean energy 24 hours a day, 365 days a year. This process is known as the [Rankine cycle](#), commonly found in typical oil, coal, or nuclear power generation plants. The difference with OTEC is that it uses the solar energy from the ocean - **no fossil fuels are used in OTEC's power generation.**



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Click the graphic for a virtual demonstration

OTEC BRINGS SUSTAINABILITY

Onshore OTEC plants can be configured to support Seawater/Lake Water Air Conditioning (SWAC/LWAC) systems for refrigeration and cooling, agriculture, and desalination systems for water purification.



ECONOMIC BENEFITS



- Reduced fuel imports
- Stable utilities pricing
- Reduced capital expense to Power Company and Government
- Allows for power usage to be increased affordably
- Reduced burden on existing utilities
- Significant energy cost savings
- Up to 90% reduction in electricity usage

SOCIAL BENEFITS



- Affordable fresh water production
- Promotes aquaculture
- Creates jobs and export opportunities
- Diversifies fuel options and provides energy independence
- World leadership role in eco-awareness

ENVIRONMENTAL BENEFITS



- Environmentally Responsible
- Limitless renewable energy from local resources
- Fossil fuel avoidance - OTEC can save up to 15,000 bbls of oil per year per MW
- Zero emissions - OTEC saves nearly 7,000 tons of CO2 per year per MW

THE HISTORY OF OTEC

Ocean Thermal Energy Conversion was originally conceived in the 1880s, although the first net power producing facility wasn't developed until the 1990s. Located in Hawaii, USA at the [Natural Energy Laboratory of Hawaii Authority \(NELHA\)](#), the plant was funded by the US Department of Energy. Today, this demonstration OTEC plant is the world's first net power producing facility connected to the grid.

In recent years, technological advances in deep water piping have made large-scale pipes commercially available for OTEC plants as outlined in this 2009 [NOAA report](#). This development, in conjunction with volatile oil prices and global renewable energy mandates, makes today the opportune time to bring OTEC to market.

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