

WORKING TOGETHER, LET'S CAPTURE THE OCEAN'S POWER IN OUR ENERGY MIX.

\$3 billion dollars a year leave Hawaii to pay for imported oil to power our cars, jet planes and boats -- and to generate electricity.

We owe it to ourselves, to our children and grandchildren to make ocean energy a major part of Hawaii's future.



HOW DO WE POWER OUR FUTURE?

ONE ANSWER LIES IN THE OCEAN ALL AROUND US.



THE OCEAN'S POTENTIAL

The ocean is a vast energy storehouse. Technologies being tested and implemented around the world could tap this virtually endless source of renewable energy. The waters around Hawaii hold great promise for many of these technologies.

SEA WATER AIR CONDITIONING (SWAC)

Air conditioning is among the largest, and fastest growing, use of electricity in Hawaii homes and businesses. With SWAC, cold sea water is pumped from hundreds of feet below the surface to a cooling station on shore. Here the deep ocean's coldness is transferred to fresh water. The cold, fresh water then circulates in a closed pipe that carries it to nearby buildings. SWAC can deliver reliable cooling using far less electricity than conventional air conditioning.

This kind of cooling system is a proven technology, in use at several locations -- especially Sweden. Hawaii is a leader in deep sea pipeline development and installation.

Hawaiian Electric supports the SWAC technology proposed by others for downtown and Waikiki and encourages building owners and managers to consider participating. We hope to be among the first to use SWAC in our downtown headquarters.

OCEAN THERMAL ENERGY CONVERSION (OTEC)

OTEC makes electricity using the temperature difference between deep, cold sea water and warm surface water. The Natural Energy Laboratory of Hawaii Authority in Kailua-Kona is one of the world's leading facilities in developing OTEC technology.

WAVE AND CURRENT ENERGY TECHNOLOGIES

Several promising demonstration technologies are in research and development around the world. They include:

BOBBING BUOYS: The rising and falling of waves cause a "smart" buoy anchored to the ocean floor to move freely up and down. The mechanical stroking drives a hydraulic pump that turns an electrical generator. HECO is participating in the Office of Naval Research demonstration of this technology off of Marine Corps Base Hawaii in Kaneohe.

SEA SNAKE: A semi-submerged series of closed tubes, like a four-car train, is anchored at both ends to the ocean floor. As a wave passes down the length of the "snake," hinged joints allow the tubes to move up and down and side to side. This motion drives hydraulic pumps that turn generators. Developers of this technology have visited Honolulu to confer with energy experts, including at HECO.

OSCILLATING WATER COLUMN: A chamber rig (like an artificial blowhole) is moored off shore. The motion of waves forces air in and out of the chamber, turning a special turbine to produce electricity.

UNDERWATER "WINDMILLS": Like giant wind turbines turned upside down, these propellers are turned by ocean or harbor currents to generate electricity.

For the future, energy from the ocean can give us:

-  **CLEAN, LOCAL** POWER
-  GREATER **DIVERSITY** IN OUR ENERGY RESOURCES
-  A POWER SUPPLY WITH A **SMALLER FOOTPRINT** AND LOW VISUAL IMPACT
-  **REDUCED IMPACT** ON GLOBAL CLIMATE CHANGE
-  **RENEWABLE ENERGY** FOR GENERATIONS TO COME

WHAT YOU CAN DO TO HELP.

Achieving a renewable future requires the cooperation and support of everyone...land owners, business leaders, government, utilities and communities.

To learn more, visit hawaiisenergyfuture.com.



Hawaiian Electric Company