

CETO Wave Energy Technology

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Zero-emission electricity and zero-emission desalinated water in a single package is a revolutionary concept that could change the way that much of the world obtains its power and water.

Perth-based clean energy company Carnegie Corporation Ltd, in collaboration with Renewable Energy Holdings, is developing a zero-emission wave energy technology called CETO. CETO has the potential to significantly contribute to future power and water needs, both in Australia and overseas.

Named after the Greek sea goddess, the CETO technology converts renewable energy from the ocean's waves into base load power or freshwater for distribution to consumers.

CETO DESIGN

The CETO system consists of an array of submerged buoys, tethered to seabed pump units. These units are biomimetic in design, which means they mimic the behaviour of a kelp forest in the way that they move – swaying back and forth with the swell, moving in harmony with the motion of the passing waves.

This movement drives the seabed pumps, pressurising the seawater which is delivered ashore via a pipeline. On land, the high-pressure seawater is then used to supply a reverse-osmosis desalination plant and can also be used to drive hydro turbines, generating zero-emission electricity.

ENVIRONMENTAL IMPACTS

As the CETO system rests on the ocean floor, fully submerged, it has no aesthetic impact on the environment and is well protected against storms.

Environmental cross-sections at Carnegie's CETO research and development site off the coast of Fremantle, Western Australia, have shown dramatic increases in marine life after the deployment of the CETO prototypes. Similar to an artificial reef, CETO units provide a point of nucleation, attracting marine life to the area.

The CETO units are seawater lubricated; meaning that there are no other fluids in the system that can leak or spill into the



Above: Deployment of CETO 2 Prototype at CETO test site, Rous Head, Fremantle. Photograph by Harry Fisher. Right: Carnegie inventor Alan Burns inspects initial subsea testing of CETO in April, 2007. Photograph by Jason Thomas.

ocean and harm the environment. Also, because breaking waves result in energy dissipation, CETO units are placed in deep water away from surf breaks.

CETO DEVELOPMENT

Invented by Carnegie Chairman Alan Burns, CETO has been under development in Fremantle for nearly 10 years. The first in-sea prototype was built in 2004 and the concept proved via the delivery of high-pressure seawater ashore in 2005.

In 2006, the CETO 1 prototype generated the first zero-emission power and desalinated water. This allowed the team to move towards the development of the commercial CETO design. Preliminary commercial design work was carried out in a purpose-built computerised, virtual wave tank using world-class computational fluid dynamics and was subsequently validated through in-sea trials in 2007. In January 2008, the CETO 2 prototype was deployed at the Fremantle site and has performed as expected, proving its design in real ocean conditions.

THE FUTURE

This year-will see further deployment of units for performance monitoring and design development in varying sea states, followed by final full-scale tests. After another 12–18 months of development, commercial rollout is expected to begin.

The best wave energy sites in the world, such as most of the southern half of the



Australian coastline, receive sufficient wave energy for CETO to generate power for more than 90% of the time, making CETO a base load, renewable energy technology.

Between Perth and Brisbane, Carnegie estimates that there is around 500 GW of recoverable wave energy available in our oceans. This is more than 10 times the current installed power generation capacity in Australia.

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