

Submission No: 104

CETO

Submission to

**House Standing Committee on Industry and
Resources**

**Inquiry into the development of the non-
fossil fuel energy industry in Australia: Case
study into selected renewable
energy sectors**

by

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Executive Summary

Carnegie Corporation Ltd, an Australian ASX-listed company, has developed and has the rights to exploit the ground breaking zero-emission technology, 'CETO', for the capture of wave energy and conversion to either electricity or desalinated water. After several years of development the company has proved this technology and is now embarking on bringing the CETO technology to market in areas of greatest need within Australia. The technology is simple and robust as it is based on arrays of non obtrusive submerged pumps that pressurise seawater and pump it ashore where conventional energy recovery is used to generate electricity and reverse osmosis plant can generate potable water. The arbitrage between fresh water output and electricity output is a unique feature of CETO technology that can tailor its output to the needs of specific communities.

CETO has been operating a test site in waters off Fremantle that are mostly sheltered but exposed enough to be subject to storm periods for extreme testing. Proof of concept and design work has moved the project to the point where a small commercial pilot plant can now be planned. Beyond that, a full-scale commercial project is envisaged, but due to the lead times involved and the complexity of addressing the needs of all stakeholders, it is important to get all affected parties engaged now and considering the issues involved in getting potential CETO capital works projects up and running, while CETO demonstrates the commercial feasibility of the technology from operation of a pilot scale plant.

Carnegie Corporation seeks to engage all levels of government and their relevant authorities with the view to demonstrating to them that CETO can offer zero-emission base load electricity generation capacity at a cost comparable to existing wind power and the capacity to supply potable water to major population centres using 100% clean energy.

We also call upon the Federal Government to implement a carbon based trading scheme to provide economic impetus and incentive to the fledgling wave energy industry in particular and the renewable energy sector in general.

About Wave Energy

Australia has the worlds' longest coastline exposed to the worlds' most reliable wave energy regime due to Australia's proximity to the circumpolar Southern Ocean and the West Wind drift (Figure 1) which geological evidence shows has operated continuously for over 20 million years. Australia has the worlds' greatest opportunity to convert, in time, its base load power to a totally renewable energy resource that abuts most of our capital cities.

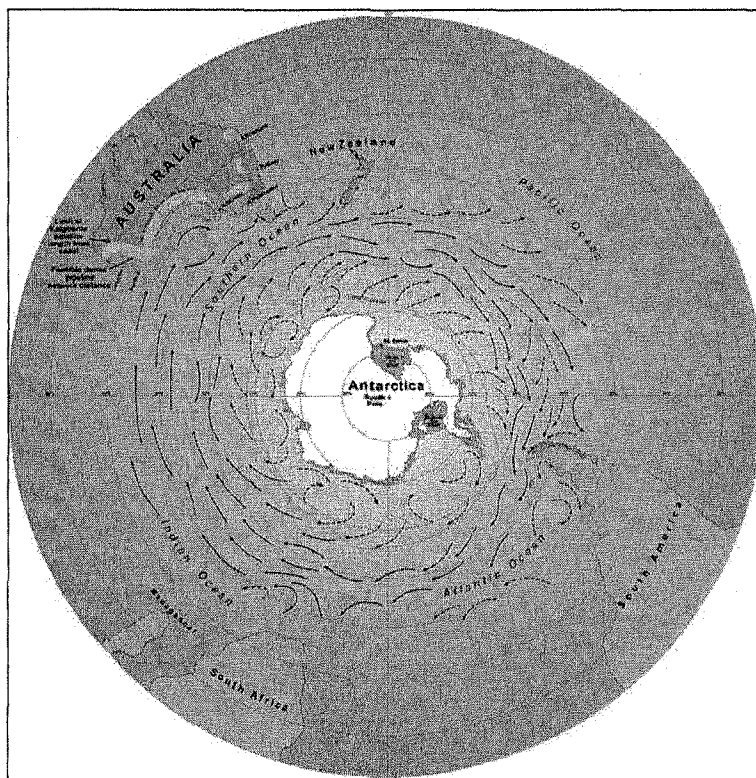


Figure 1 Circumpolar energy flow in the Southern Ocean and the West Wind drift

It is estimated that 1 million gigawatt hours of wave energy hits Australian shores annually, or more than four times Australia's total annual electricity consumption of 210,000 gigawatt hours (2004 figures). Harnessing just a fraction of that amount of wave energy in favourable sites around the coast and linking to nearby electricity transmission lines and water infrastructure could allow Australia to meet significant green energy targets for our electricity grids and contribute measurably to drought-proofing our cities' water supplies.

Wave energy development began in the 1970s and the market is currently moving from research, development and testing into pre commercial trials, with full-scale commercial production in sight. Wave power projects are operating in Scotland, Portugal and Hawaii and Australia with seven companies installing systems to date. The growing world-wide demand for renewable energy projects is being driven by rapidly increasing global energy consumption, and the availability of carbon and renewable energy credits. Renewable energy has entered a new phase with additional funding becoming available from governments, from socially responsible equity funds, and from public capital raisings.

Interesting statistics: The US Department of Energy recently forecast a 40% increase in world electricity consumption by 2010. Many governments are currently aiming to produce 10% to 20% of their energy from non CO2 renewable sources by 2010. The World Energy Council has estimated that approximately 2 terawatts, about double current world electricity production, could be produced from the oceans via wave power.

This is an excerpt from a report by the Electric Power Research Institute (USA) titled A Compelling Case for Investing in Wave Energy RD&D, published 14 January 2005:

'In addition to economics there are other compelling arguments for investing in offshore wave energy technology. First, with proper siting, converting wave energy to electricity is believed to be one of the most environmentally benign ways to generate electricity. Second, offshore wave energy offers a way to minimise the 'Not In My Backyard' issues that plague many energy infrastructure projects, from nuclear to coal and to wind generation. Because these devices have a low profile and are located at a distance from the shore, they are generally not visible. Third, because wave energy is more predictable than solar and wind energy, it offers a better possibility than either solar or wind of being dispatch able and earning a capacity payment.

A characteristic of wave energy that suggests it may be one of the lowest cost renewable energy sources is its high power density. Processes in the ocean concentrate solar and wind energy into ocean waves, making it easier and cheaper to harvest. Solar and wind energy sources are much more diffuse, by comparison. Lastly, since a diversity of energy sources is the bedrock of a robust electricity system, to overlook wave energy is inconsistent with national needs and goals. Wave energy is an energy sources that is too important to overlook.'

Wave Energy Companies in Australia

Aside from CETO, there is Oceanlinx (formerly Energetech Australia Pty Ltd.) with projects under development in Australia at Port Kembla in New South Wales, Portland in Victoria, and King Island in Tasmania; and Ocean Power

Technologies (Australasia) Pty Ltd.- Australasia, representing Ocean Power Technologies' technology in Australia. We are not aware of any active proposals on behalf of OPT Australia for small or large scale wave farm deployment. Finally there is BioPower Systems Pty. Ltd. who are at an early stage of development of a biomimetic wave energy capture system.

CETO Technology

The CETO device consists primarily of a novel pump anchored to the seafloor and driven by a spherical buoyant actuator that collects the wave energy and transmits it to the pump. High pressure seawater is delivered ashore where it can be used to drive a turbine to generate electricity or passed through a reverse osmosis desalination unit to produce freshwater.

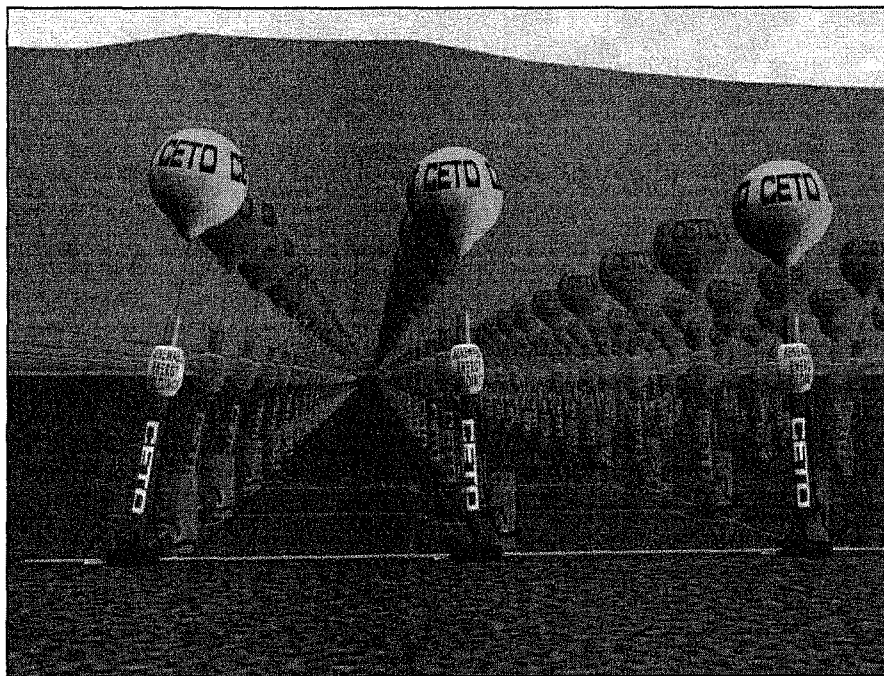


Figure 2: Schematic of a commercial CETO III wave farm comprising several hundred CETO units

One CETO III unit can produce at least 500,000 litres of freshwater per day when operated in water production mode, and has an installed clean electrical capacity of 180kW in electricity generation mode. Average, or base load, electrical capacity is around 100 kW per CETO unit. A wave farm of 200 units such as the one illustrated above could supply at least 36 GL of freshwater annually, or would have a maximum installed capacity of 36 MW of clean electricity – enough to power to supply a town of 40,000 people.

The actual mix of electricity and water production from a CETO wave farm can be varied to suit the needs of the local community it serves.

Status of Readiness of CETO

The proof of concept design CETO I was successfully deployed and operated at the Fremantle test site over a two-year period. All of the proprietary pumping technology has been proven in CETO I.

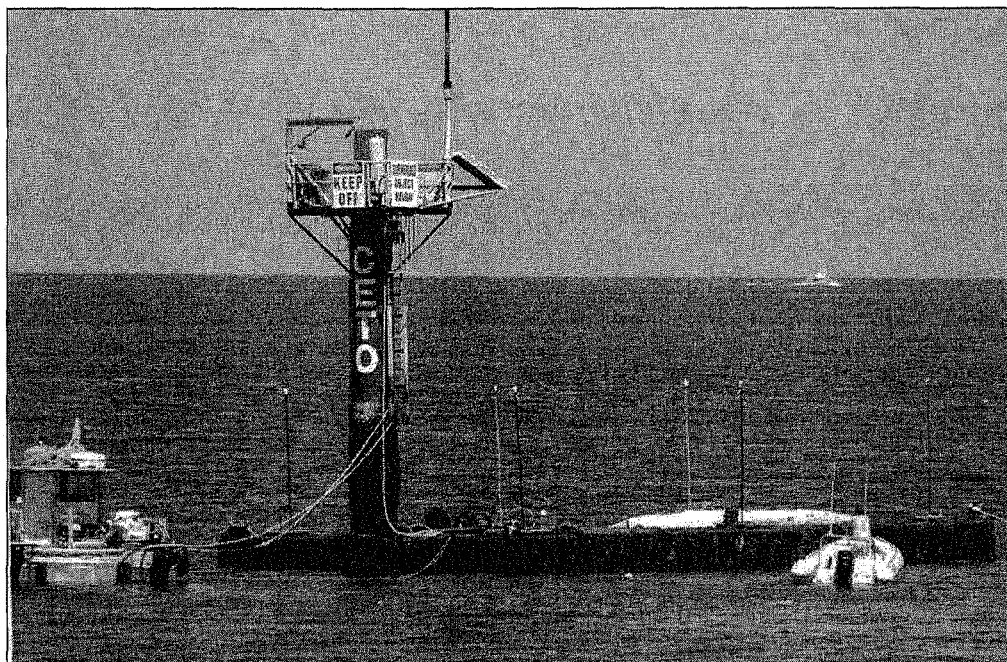


Figure 3 Decommissioning of the CETO 1 underwater laboratory. Over \$11 million of private funds in addition to \$700,000 of grant funds have been expended over 10 years to bring the CETO technology to commercial standard

The pre-commercial demonstrator version, CETO II, was developed using experience gained from earlier CETO designs, and by applying design rules for capacity, survivability, and reliability. Pre-commercial demonstrator CETO II is currently being deployed at the same Fremantle test site and is undergoing rigorous testing. The full commercial version, CETO III, is expected to be deployed initially as a small wave farm within 1-2 years with the capability to be scaled up to a commercial size plant of 50 MW and 50GL/yr thereafter. We expect such a wave farm, if located in favourable wave energy site, to be able to demonstrate base load electricity generation within the broader outcome of commercial viability.

Our Approach to Commercialization within Australia

We plan to demonstrate the commercial feasibility of CETO technology through a small commercial scale pilot project. The location of such a project is under active consideration by us in consultation with a number of interested groups spanning a range of sites and local requirements.

This process is gaining momentum and in parallel we also want to address the 'bigger picture' issues of how future CETO projects could meet the needs of green electricity for large populations in Australia and how CETO farms, configured for potable water production, could help drought proof many of the key coastal and inland population centres that are experiencing ongoing water stress.

Benefits to Australia of CETO Technology

- ✓ Home grown technology;
- ✓ Employment opportunities and employment growth in sectors manufacturing, commissioning, operating and maintaining wave power plants;
- ✓ Greenhouse gas emissions free technology;
- ✓ Ability to meet water shortage needs through a number of mechanisms:
 - Direct seawater reverse osmosis in dedicated onshore plant;
 - Green energy generation to meet needs of planned desal plants Australia-wide;
 - 'Offsetting the energy requirements of desalination plants by supplying a source of pressurised water to the plant from co-located CETO wave farms' and
- ✓ Economic flow-on benefit including potential to establish an Australian manufacturing base supplying CETO components globally.

Our Preferred Outcomes

We would like to see the following occur in order to move wave power closer to commercialisation:

- Develop understanding within state and federal government agencies that a combination of CETO technology, appropriate site selection and grid interconnection, can provide base load electricity at prices comparable to existing wind power;
- Work with federal, state and local governments to identify areas of greatest need for both water and electricity;
- Gain approval for a commercial scale pilot program to demonstrate base load electricity generation capability;
- Gain assistance in the form of lead-in tariffs to allow CETO to become a power and water retailer;

- Integrate the wave energy option into future planning for new base load and water supply provisions in all major population centres; and
- Institute an Australia-wide carbon trading scheme to level the competitive playing field.

We humbly present this submission to the committee and beg due consideration of it.