



October 1, 2012

California Energy Commission
Dockets Office, MS-4
1516 Ninth Street
Sacramento, CA 95814-5512



Subject: Docket No. 12-EPIC-01 – Comments of Ocean Wave Energy Aspects of the EPIC Proposed Triennial Investment Plan

To the California Energy Commission:

My name is Sean D. Moore of Moore Commerce Pty Ltd in Perth, Western Australia, Australia. I am writing to support the funding of ocean wave energy projects under the Proposed Triennial Investment Plan. As a developer of ocean wave energy technology, I specifically support the following elements of that plan:

S4.5– Proposed Funding Initiative - Investigate the Economic, Environmental and Technical Barriers to Wave Energy Conversion in California (page 67).

S10.2 – Proposed Funding Initiative – Support Demonstration Testing and Verification Centers to Accelerate the Deployment of Pre-Commercial Clean Energy Technologies (page 104).

The technology I developed is called the Protean™ wave energy converter, which has been licensed exclusively in North America to Protean North America, Inc.; a California company. Since 2008 the Protean technology has been the subject of multiple well received visits to California, including meetings with all the California Investor Owned Utilities (IOU), State agencies including the State Lands Commission, Coastal Commission, multiple ports and other industrial facilities, and establishment of working relationships with the U.S. Navy wave energy research team at Port Hueneme, California.

Although there are many other states of the United States which are seeking to become the leader in ocean wave energy, I believe that California is particularly well suited for creating a viable and profitable ocean wave energy industry. For decades California has been a center for both the maritime industry and technology commercialization, add to this its extensive coastline and natural wave energy resources and I believe that California has the potential to be the world leader of ocean wave energy.

Becoming a world leader in ocean wave energy represents a substantial opportunity which is set to stimulate and create a new local industry. Ocean wave energy is projected to grow at a rate of over 20% per year for the next 4 decades and expected to be worth globally c.£345bn (~\$565bn) by 2050¹. Additionally the wave energy sector is projected to create 50,000 jobs¹ in the United Kingdom alone and foster the development of specialized skills and knowledge based employment for: installation, operation and maintenance, connections, electrical and manufacturing to name a few.

The direct and indirect benefits of wave energy for California are far reaching: **Local** (industry, knowledge, investment, jobs, and energy security), **National** (sales and energy security) and **International** (exports, and local port jobs). Historically it has been California which has lead the United States when it came to new technology commercialization and I understand that one of the primary objectives of the California Energy Commission is to launch a new base of renewable energy industries to leverage California's strong technology commercialization expertise and achieve these very same outcomes.

¹ Carbon Trust. *Marine Renewables Green Growth Paper*. March 2011, United Kingdom



By way of explanation of how the Protean technology could be applied to California and contribute to its growth and benefit I have created a short outline of some of the design features core to the Protean™. Further details can be found in the enclosed technology factsheet.

- The Protean technology was designed to be easy to manufacture, produce lower cost and consistent energy, be environmentally friendly, have strong power output capabilities, easy to use and move. There are four U.S. patents on the Protean wave energy technology and approximately 60 patents worldwide.
- In brief the Protean technology comprises a large surface located buoy, approximately 15-feet wide, complementary to this surface buoy is a subsea weight used in mooring and energy conversion. The surface buoy is connected with multiple cables to the subsea weight and seafloor mooring. The wave energy conversion is done inside the surface buoy through a simple, robust and effective mechanical system which converts the movement of the surface buoy directly into a usable form, such as electricity or desalinated water.
- The material of choice for the majority of the Protean's construction is that of inert plastic which is food and water safe; in using this material the Protean itself becomes fully recyclable.
- Another benefit in the material selection is that the Protean can be economically manufactured locally; there is no need to outsource to be competitive.
- The Protean is highly diverse, with markets already identified including electricity generation, desalinated water and military applications; all of which are areas of strength, need and opportunity for California. Thus far we have had discusses with the U.S. Navy and others about using the Protean with modular desalination to create a decentralized local desalinated water supply.

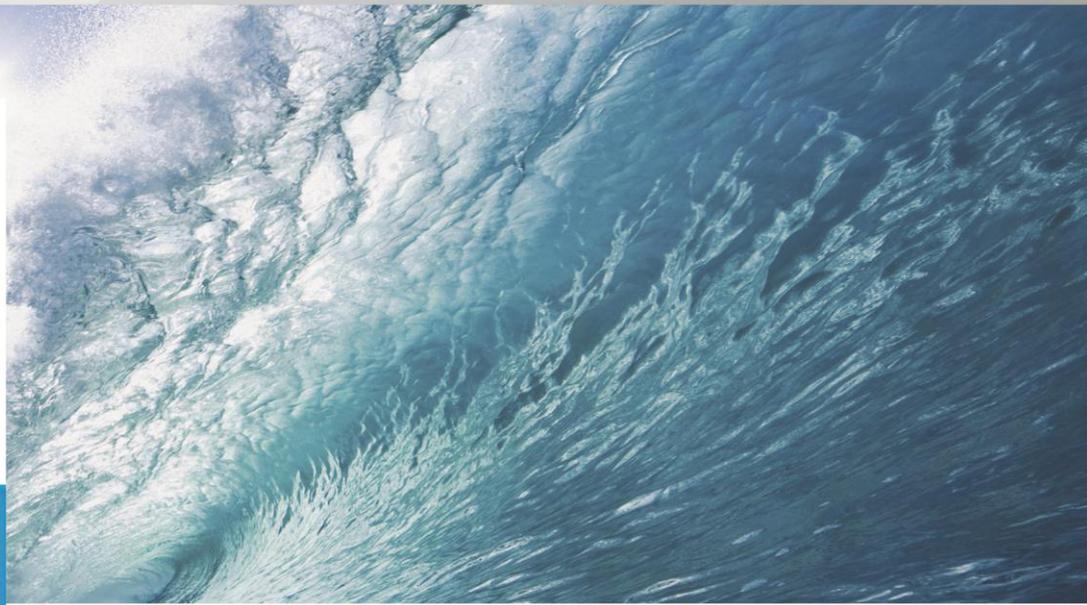
In summary, I believe strongly that the Protean technology will play a prominent part in the future of California. In preparation for the continued application of the Protean technology in California, Protean North America, Inc., was created. I believe that the support funding through the Research and Demonstration processes envisioned within the Proposed Triennial Investment Plan will be pivotal in fast-tracking the commercialization of the Protean, through Protean North America Inc., and indeed create an effective and profitable wave energy industry with substantial follow on benefits for the state of California as a whole.

Thank you for your kind consideration of the wave energy sector and more particularly the Protean technology and how it can contribute for the betterment of California.

Best regards,

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Enc.: Protean Technology Fact Sheet - 20120918.pdf



Protean™ Technology Factsheet

An Exciting New Wave in Energy Technology

POWER GENERATION MARKET OPPORTUNITY

- ✓ Global wave energy power generation market growth projected to be comparable to the historical wind energy sector;
- ✓ Wave energy power production projected to be up to 190GW globally by 2050;²
- ✓ High growth projected to be 14% per annum from 2020 – 2050 for wave energy;²
- ✓ Total cumulative, undiscounted wave energy market size (turnover) could be up to £335bn (c.\$550bn) by 2050;²
- ✓ Continuing growth potential with wave energy availability outstripping total global energy usage.

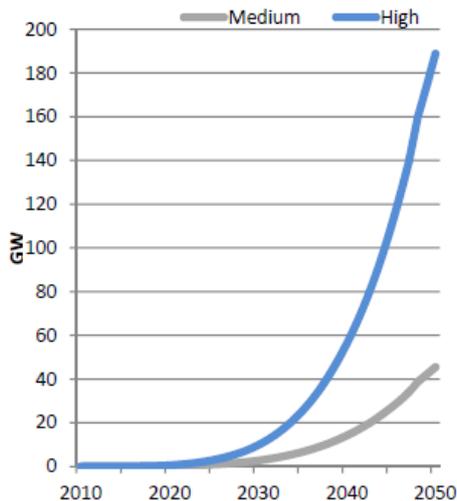


Figure 1: Wave - Global Installed Capacity 2010-2050 (source: Carbon Trust analysis)²

FIRST TO MARKET

- ✓ Major electricity suppliers from around the globe have been waiting for a commercially viable wave energy technology for years;
- ✓ In economic terms the **demand** is leading the **supply**, which is a terrific opportunity for the first economic wave energy technology;

*Protean energy – economically viable
\$0.092³ (c.£0.056 or c.€0.069) per kWh
of base load renewable energy*

PROTEAN™ MARKET

The Protean technology is a highly versatile technology able to be applied to multiple markets and uses. Some examples include:

- ✓ Electric power generation;
- ✓ Seawater desalination;
- ✓ Radio communications;
- ✓ Military and surveillance;

PROTEAN™ BENEFITS

- ✓ Base load renewable power generation;
- ✓ Wind-wave co-location;
- ✓ Multiple markets and revenue models;
- ✓ Cost competitive energy.³

BASE LOAD POWER

- ✓ Wave energy is predictable typically 4 hours from peak waves to calm;
- ✓ Wave energy is reliable – well understood models mean that wave energy production and potential is calculable;

WIND-WAVE POWER CO-LOCATION

- ✓ Co-location optimises return on transmission investment;⁴
- ✓ Wave energy increases power stability in a wind-wave co-location;⁴
- ✓ Wave power displays a more stable power generation than wind power and wind power displays more sudden variations;⁴

- ✓ Wave power continues to run at rated power some 4 hours after wind power output drops;⁵
- ✓ Wind and wave power shows good correlation to power demand.⁴

³ Sinclair Knight Merz. *Protean Energy Wave Energy Converter Independent Review Report, Rev 0. WP04183-EZ-RP0002*. 27 April 2011.

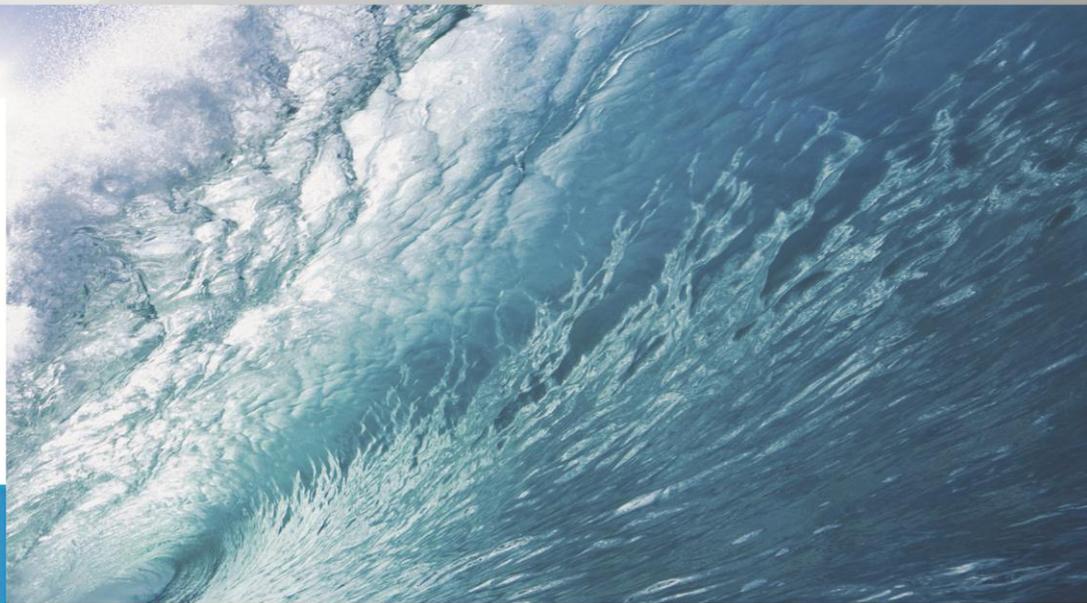
⁴ Magnus Andersson. *Wave Power Base Load Properties: A study on wave power base load properties and wind and wave power co-production*. April 2008. Sponsor: Vattenfall Research & Development AB

⁵ Bølgekraftanlæg ved Horns Rev – screening. *PSO-2004:5705 Co-production of wind – and wave power*. June 2005.

² *Marine Renewable Green Growth Paper*. Carbon Trust, May 2011.



Protean™ Technology Factsheet



An Exciting New Wave in Energy Technology

COMPETITIVE LANDSCAPE

Globally there are an estimated 80 active wave energy technology developers at varying stages of maturity⁶. An arbitrary list of leading developers can be seen in Table 1.

COMPANY	TECHNOLOGY	COUNTRY BASE
Aquamarine Power	Oyster	UK
BioPower Systems Pty Ltd	bioWave	Australia
Carnegie Wave Energy Limited	CETO	Australia
Ocean Power Technologies	Power Buoy	UK / USA
Oceanlinx	GreenWAVE / BlueWAVE	Australia
Pelamis Wave Power	Pelamis	UK
Protean Energy Limited	Protean™	Australia

Table 1 Arbitrary shortlist of active wave energy developers⁷

PROTEAN™ COMPETITIVE ADVANTAGES

The Protean technology has numerous competitive advantages. Some of these include:

- ✓ 6 degrees of freedom energy conversion;
 - Energy conversion from all movement including up-down, side-to-side, back-and-forth, and rotation.
- ✓ Surface located buoy;
 - Enhanced energy availability;
 - Navigational visibility.
- ✓ Simple robust design
 - Rapid manufacturing;
 - Tried and proven commonly available materials and equipment used;

- Proven technologies integration;
- Transportable;
- Long material service life;
- Durable design.
- Rapid deployments;
- Scalable and modular;
- Environmentally friendly materials and design;
- ✓ Independently verified;
 - Murdoch University in Western Australia; and
 - Sinclair Knight Merz (SKM).
- ✓ Versatile
 - Generation of electricity; or
 - Production of desalinated water; or
 - Production of desalinated water and electricity simultaneously.
- ✓ Cost effective base load renewable energy.

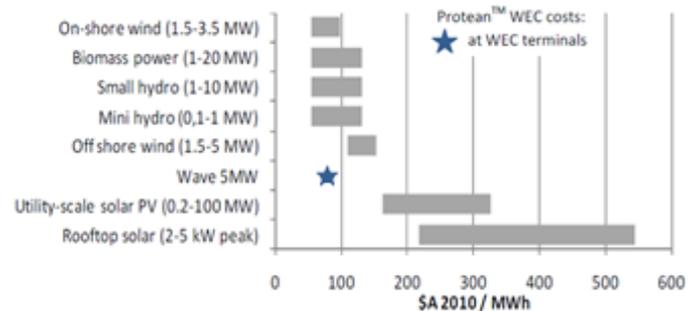


Figure 2: Power cost comparison³

MORE INFORMATION

For more information about the Protean™ technology please contact:

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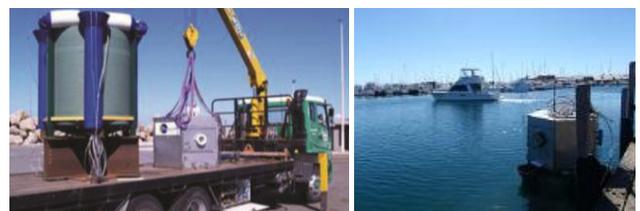


Figure 3 Protean™ being trial off the coast of Western Australia.

⁶ Marine Renewable Green Growth Paper. Carbon Trust, May 2011.

⁷ http://emec.org.uk/wave_energy_developers.asp