

February 13, 2014

To: Docket@energy.ca.gov
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From: William Toman, Principal, Pacific Marine Renewables

California Energy Commission

DOCKETED

12-EPIC-01

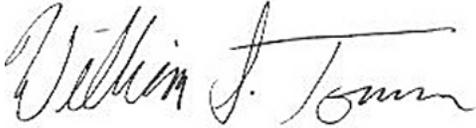
TN 72615

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Subject: Docket # 12-EPIC-01- "EPIC second investment plan"

On behalf of Pacific Marine Renewables, LLC, I am pleased to submit this Research Questionnaire under the Electric Program Investment Charge 2015-2017 Second Investment Plan for the initiative of founding a National Ocean Wave Energy Testing Center.

Sincerely,



William Toman
Principal



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EPIC TRIENNIAL INVESTMENT PLAN 2015-17

Proposed Energy Research Initiative

Questionnaire, Docket 12-EPIC-01

(This is a Request for Information only - Complete Pages 1 and 2 for each initiative)

Title of Proposed Initiative (Short and concise):

National Ocean Wave Energy Testing Center

Investment Areas (Check one or more) – For definitions, see *First Triennial Investment Plan, page 12*:

- Applied Research and Development
- Technology Demonstration and Deployment
- Market Facilitation

Electricity System Value Chain (Check only one): See CPUC Decision 12-05-037, Ordering Paragraph 12.a. http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF.

- Grid operations/market design
- Generation
- Transmission
- Distribution
- Demand-side management

Issues and Barriers:

Describe the issues and barriers that are impeding full market adoption of the proposed clean energy technology or strategy (such as cost, integration, or lack of information).

Issues that need to be overcome for renewable ocean wave energy technologies to be developed and deployed in significant quantities include: 1) siting and permitting barriers, 2) environmental research needs, 3) technical R&D issues, 4) policy issues, 5) market development barriers, 6) economics and financial issues, and 7) grid integration barriers.

Initiative Description and Purpose:

How will this technology or strategy help address the issue/issues? Describe knowledge to be advanced to overcome critical barriers. Include the recommended funding level (minimum and maximum) for each project under this initiative.

Other nations have been aggressively aiding the development of wave energy through comprehensive programs, which include industrial testing facilities for wave energy devices and appropriate economic incentives for wave energy technology developers.

It may be debatable whether Federal / State support is appropriate for particular emerging technologies, because it implies that the Federal / State governments would be, in effect, “picking winners.” To avoid bias, a clear role for government would be to facilitate the acceleration of an entire class of emerging wave energy technologies by the establishment of research, test, and demonstration centers.

A critical part of the solution for some the issues and barriers identified is to have an advanced open-ocean, deep-water, grid-connected wave energy testing facility to serve as the hub for wave energy technology development. It would be open to all potential users including universities, government researchers and private industry in exchange for an appropriate user fee. Conceivably, operational revenues from the sale of power generated at the test center and associated user fees could make the test center a profit making enterprise.

A U.S. Department of Energy (DOE) co-funded study of potential sites for a California based wave energy testing center

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has been initiated through California Polytechnic University, San Luis Obispo and will run through early 2015. The study will examine siting issues and permitting requirements as well as preliminary cost estimates for engineering, financing, constructing and operating the wave energy testing facility. Depending upon the location, size and operation requirements, the wave testing center is estimated to cost between \$25 million to \$50 million. A more precise estimate will be developed during the course of this year-long DOE study.

Stakeholders:

Identify the stakeholders who support the initiative.

- U.S. Department of Energy (DOE)
- U.S. Department of Interior (DOI)
- U.S. Air Force (USAF)
- Federal Energy Regulatory Commission (FERC)
- Office of California Lieutenant Governor Gavin Newsom
- Congresswoman Lois Capps, 23rd Congressional District, California
- California Energy Commission (CEC)
- California State Lands Commission (CSLC)
- California State University Council on Ocean Affairs, Science and Technology (COAST)
- California Polytechnic University, San Luis Obispo (Cal Poly, SLO)
- Humboldt State University (HSU)
- Scripps Institution of Oceanography at UC San Diego (Scripps)
- Electric Power Research Institute (EPRI)
- California operating companies interested in advancing wave energy

Background and the State-of-the-Art:

- What research development and demonstration has been done or is currently being done to advance this technology or strategy (cite past research as applicable)?

Pacific Gas and Electric Company (PG&E) pursued a research, siting and permitting program for wave energy called [WaveConnect](#) from 2007 to 2010 which was funded by a [\\$1.2 million grant from DOE](#) and [\\$4.8 million in PG&E ratepayer funds](#) from the Emerging Renewable Resource Program (ERRP) as allowed by the California Public Utilities Commission (CPUC). An [extensive record](#) of the findings and knowledge gained by the WaveConnect program was published by DOE in 2011 and is in the public domain. Permitting activities for the two WaveConnect sites (Humboldt and Santa Barbara Counties) identified the critical environmental and stakeholder issues for siting a California wave energy project.

- Describe any public and/or private successes and failures the technology or strategy has encountered in its path through the energy innovation pipeline: lab-scale testing, pilot-scale testing, pre-commercial demonstration, commercial scale deployment, market research, workforce development.

The wave energy industry of the United Kingdom (U.K.) is significantly ahead of its U.S. counterpart partially because of the availability of state-of-the-art wave energy testing centers that are funded by U.K. regional and national governments. The [European Marine Renewable Energy Centre \(EMEC\)](#) in Scotland and the [U.K. Wave Hub](#) in the Cornwall region of southwestern England are examples of the testing center resources that have help accelerate the technology development of wave energy devices in Europe.

- Identify other related programs and initiatives that deal with the proposed technology or strategy, such as state and federal programs or funding initiatives (DOE, ARPA-E, etc.).

The [U.S. Department of Energy's Water Power Program](#) focuses on technological development and deployment of innovative technologies capable of generating electricity from water. The program funds research and

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development activities through competitive solicitations.

Justification:

Describe how this technology or strategy will provide California IOU electric ratepayer benefits and provide any estimates of quantified annual savings/benefits in California, including:

- Name of sector and estimated size and energy use.

California electric power supply sector. In 2012, [Californians consumed](#) nearly 260,000 Gwh of electricity worth \$35 billion. Ocean wave energy is considered renewable energy under California's Renewable Portfolio Standard requiring that 33% of the electricity sold in the state be renewable by 2020.

- Quantifiable performance improvements for the proposed technology/strategy.

Wave energy is an emerging energy technology. The primary quantifiable goals for developing this technology are increasing the reliability of the wave energy devices and reducing the lifecycle delivered Cost of Energy .

- Maximum market potential, if successful.

The California Energy Commission estimates that 7,500 MW of generation capacity is possible with wave energy offshore of California.

- Number of direct jobs created in California.

No estimate available at the time.

- Why this research is appropriate for public funding.

The U.K. experience has shown that wave energy technology advances are founded upon the availability of appropriate testing facilities in realistic environments. A national wave energy testing center can serve to accelerate the U.S. wave energy industry.

Ratepayer Benefits (Check one or more):

- Promote greater reliability
- Potential energy and cost savings
- Increased safety
- Societal benefits
- Environmental benefits - specify
Reduced impact on ocean resources
- GHG emissions mitigation/adaptation in the electricity sector at the lowest possible cost
- Low emission vehicles/transportation
- Waste reduction
- Economic development

Describe specific benefits (qualitative and quantitative) of the proposed initiative

By having a single advanced wave testing center offshore of California, open to all users, this minimizes the total cost of testing infrastructure and also minimizes the environmental impacts of testing vis. multiple locations. Locating a national

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wave testing center in California will also incubate and expand the port and industrial supply chain underpinning this new industry creating new, high quality jobs.

Public Utilities Code Sections 740.1 and 8360:

Please describe how this technology or strategy addresses the principles articulated in California Public Utilities Code Sections 740.1 and 8360. The California Public Utilities Code is available online at www.leginfo.ca.gov/cgi-bin/calawquery?codesection=puc.

The establishment of a national wave energy testing center will accelerate the development of a California focused wave energy industry which will provide low cost renewable electricity to consumers. This project is an extension of the work started with the PG&E WaveConnect program and therefore leverages the previous public investment in this field. The initiative described herein will provide benefits to ratepayers, has a high probability of success, does not duplicate existing research, will protect the environment and will promote the development of technology to use renewable resources.

Through previous WaveConnect ERRP funding, the CPUC has found wave energy research and development to be consistent with California Public Utilities Code Sections 740.1 and 8360.