

CALIFORNIA ENERGY COMMISSION

1516 NINTH STREET
SACRAMENTO, CA 95814-5512
www.energy.ca.gov



January 27, 2014

To: Researchers and Other Interested Parties: QUESTIONNAIRE for 2015-2017 Triennial Investment Plan for the Electric Program Investment Charge

Questionnaire for applied research and development, technology demonstration and deployment, and market facilitation

California Energy Commission

DOCKETED**12-EPIC-01**

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The Electric Program Investment Charge (EPIC) provides electric public interest investments in applied research and development, technology demonstration and deployment, and market facilitation for clean energy technologies in accordance with California Public Utilities Commission's May 31, 2012, Phase 2 Decision 12-05-037, as modified.¹ The California Energy Commission, Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE), as the four administrators of the program, submitted coordinated investment plans to the CPUC for consideration on November 1, 2012. In November, 2013, CPUC Decision 13-11-025 modified and approved the first triennial investment plans of each program administrator. The portion of the EPIC Program administered by the Energy Commission will provide funding for applied research and development, technology demonstration and deployment, and market facilitation for clean energy technologies and approaches for the benefit of ratepayers of PG&E, SDG&E, and SCE.

Energy Commission staff is implementing its first EPIC investment plan, as modified and approved by the CPUC.² Competitive solicitations for initiatives in the first EPIC investment plan will be published soon. A schedule of upcoming EPIC funding opportunities and feedback opportunities for the Energy Commission's first EPIC investment plan is available online at www.energy.ca.gov/research/epic/.

The CPUC EPIC schedule calls for EPIC administrators, including the Energy Commission, to submit a proposed second EPIC investment plan by May 1, 2014.³ To meet this schedule, Energy Commission staff is now developing the second triennial investment plan for EPIC funds collected in 2015-17. The plan must be approved by the CPUC. Staff estimates the plan may include \$340 million for applied research and development, technology deployment and demonstration, and market facilitation. As part of this information gathering process for the second EPIC investment plan, the Energy Commission seeks ideas from interested parties on proposed initiatives in the topic areas of the electricity system "Value Chain," specifically grid operations/market design, generation, transmission, distribution, and demand-side management. The Energy Commission's second EPIC investment plan will build upon and follow the initiative format of the first triennial EPIC investment plan located at: www.energy.ca.gov/research/epic/documents/final_documents_submitted_to_CPUC/2012-11-01_EPIC_Application_to_CPUC.pdf as modified and approved by the CPUC in Decision 13-11-025, <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M081/K773/81773445.PDF>.

¹ http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF

² Energy Commission, October 2013, The Electric Program Investment Charge: Proposed 2012-14 Triennial Investment Plan, in Application of the California Energy Commission for Approval of Electric Program Investment Charge Proposed 2012 through 2014 Triennial Investment Plan, Attachment 1, http://www.energy.ca.gov/research/epic/documents/final_documents_submitted_to_CPUC/2012-11-01_EPIC_Application_to_CPUC.pdf, as modified and approved by the CPUC in Decision 13-11-025, <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M081/K773/81773445.PDF>.

³ CPUC Decision 12-05-037, Phase 2 Decision Establishing Purposes and Governance for Electric Program Investment Charge and Establishing Funding Collections for 2013-2020, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF, page 31. CPUC Decision 13-04-030 modified Decision 12-05-037.

This is only a Request for Information; please do not submit proposals for funding.

Initiative ideas received, in response to this request, will be considered by Energy Commission staff in developing the second EPIC investment plan for funds collected in 2015-2017.

If you have applied research, development, technology demonstration, deployment or market facilitation ideas, please complete the attached initiative template. This template asks you to discuss your idea, identify why this research is appropriate for public funding, and include the issues/barriers that are impeding full market adoption of the clean energy technology/strategy addressed. Proposed initiatives will be compiled and posted on the Energy Commission website at: www.energy.ca.gov/research/epic/.

Here are some guidelines for completing the template:

1. The information contained in your initiative should be no more than three pages.
2. Complete one template per initiative. Multiple templates may be submitted, one for each separate initiative.
3. All proposed initiatives must advance science or technology and offer a reasonable probability of providing benefits to California Electric Investor Owned utilities (IOU) ratepayers and must meet the following criteria:
 - a. Focus on energy efficiency and demand-side management, generation, transmission and distribution, grid operation and market design issues.
 - b. Support state energy policy.
 - c. Consider opportunities for collaboration and co-funding with other entities.

Please e-mail suggested initiatives in a downloadable, searchable format such as Microsoft® Word (.doc) or Acrobat® (.pdf) by February 13, 2014. Please include the docket number 12-EPIC-01 and indicate "EPIC second investment plan" in the subject line. Send the completed initiative questionnaire to:

docket@energy.ca.gov and include in the CC line: Prab.Sethi@energy.ca.gov

A public workshop is scheduled in February, 2014 to focus on market facilitation. A draft second investment plan will be released in March, 2014 and a public workshop will be conducted to receive comments on the draft second investment plan.

Sincerely,

Laurie ten Hope
Deputy Director
Energy Research and Development Division

EPIC TRIENNIAL INVESTMENT PLAN 2015-17

Proposed Energy Research Initiative

Questionnaire



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

Title of Proposed Initiative (Short and concise):

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).

Ocean Motion International llc (OMI) is a privately held company that is in its final phases of startup. As a startup that has been principally self-funded, other than a 2013 fabrication and testing project partially funded by a grant from the Oregon Wave Energy Trust, OMI is prepared to propose applying its proprietary technology for wider audiences along the west coast of the U.S. As such, it is critical for OMI to begin partnering with electric utility investors, developers, owners, operators and other stakeholders to ensure that its innovative WavePump does not fall into the technology "valley-of-death", but instead is properly transitioned from technology demonstration to well-managed deployment.

ISSUE: New technology with little foundational knowledge in academia, government or industry.

Although the OMI WavePump offers vast potential benefits that include cost savings, environmental improvements and jobs creation in a leading edge technology space, its "newness"

is also characterized by unfamiliarity from key stakeholders. Any development supported by the California Energy commission will advance the body of knowledge in these and other key areas.

ISSUE: Electric power generation technology development is capital-intensive.

Through self-funding, OMI has provided a demonstrable WavePump that can be evaluated and scaled for application with low to moderate technical risk. However, further development is dependent on forming appropriate partnerships and projects that can provide the funding needed by OMI. This funding must come from sources that have broader and longer-term views than common sources of innovative startup funding.

ISSUE: Complex electric power industry.

High investment requirements, environmental concerns, regulatory constraints, grid operation and ownership, and other related factors make it essential for OMI to team with organizations such as the California Energy Commission, who represent the interests of consumers (rate-payers); understand and can help enable/drive/coordinate targeted technology development and deployment; and provide a longer vision than other typical investment sources.

ISSUE: Difficulty communicating the potential positive impact of OMI's WavePump to utility project decision-makers.

OMI is negotiating partnerships with organizations that include commercial energy companies, equipment manufacturers and financial resources. These relationships will be used to complement OMI work with the California Energy Commission.

ISSUE: Securing locations for demonstration, pilot and full-scale projects.

Working with the California Energy Commission will allow OMI to approach local managers with a powerful incentive to consider its innovative solutions for micro-grids, replacement of generation technology and new development.

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.

Describe approaches

Building on results from a 2013 performance test and evaluation project at the Scripps Institute of Oceanography, OMI plans to fabricate additional scale Wave Pumps, using upgraded materials for the next phases of testing, which will prioritize projects in open ocean environments and integrated with commercially available components to generate electricity.

Knowledge to overcome barriers will include in-situ performance data that documents costs, scalable utility outputs and equipment survivability. This information will provide the basis for planning operational deployment of OMI WavePumps to support California electricity consumers.

Stakeholders:

Identify the stakeholders who support the initiative.

The following are representative but not a complete list of potential stakeholders:

- California electricity ratepayers
- Pacific Gas and Electric
- San Diego Gas and Electric
- Southern California Edison
- California Coastal Commission (letter of support on file)
- Environmentalists
- Overseas Private Investment Corporation (to provide leading edge U.S. green energy technology goods and services abroad)
- Coastal communities needing additional potable water supplies
- Hydrogen automobile makers

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)?

The OMI WavePump is a unique technology. (a) OMI has developed and patented an innovative WavePump that uses an integrated ballast and buoyant vessel to produce a steady supply of high pressure / flow-rate seawater. Using this seawater supply, OMI has designed a utility production system, its Combined Energy System (CES), to drive a hydro-turbine generator to produce electricity. (b) In partnership with the Oregon Wave Energy Trust, OMI fabricated a scaled unit to operate and performance test in the wave tank at Scripps Institute of Oceanography in La Jolla, California during 2013.

Test results obtained at the Scripps facility identified multiple, detailed improvements which will require additional development and validation testing prior to building a full-scale WavePump(s) and deploying into the ocean environment for commercial utility generation.

- 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.

OMI has secured patents for its technology.

In partnership with the Oregon Wave Energy Trust, OMI fabricated a scaled unit to operate and performance test in the wave tank at Scripps Institute of Oceanography in La Jolla, California during 2013. Data gained include pressures, flows and energy conversion efficiency.

- 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.).

Just as the California Energy Commission is exploring emerging technology for application to its energy challenges, other organizations are beginning to demonstrate interest as well, other initiatives include the U.S. Department of Energy (\$750k current funding to Cal Poly for wave energy technology testing work); Oregon Wave Energy Trust (Provided a matching funds grant to OMI in 2013); and Dynegy in California ("Dynegy closes gas-fired power plant, may replace with wave energy project" - <http://www.pennenergy.com/articles/pennenergy/2014/02/dynegy-closes-gas-fired-power-plant-may-replace-with-wave-energy-project.html>).

EPIC TRIENNIAL INVESTMENT PLAN 2015-17
Proposed Energy Research Initiative
Questionnaire**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.

(Green) Electric power generation sector. OMI's WavePump could produce electric power for consumers that range from small developments that incorporate local micro-grids to full-scale generation for connection to existing grid infrastructure. OMI's technology is readily scalable for these various applications.

- Quantifiable performance improvements for the proposed technology/strategy.

Reproduction of 2013 performance testing results in an open-ocean environment.

Validation of output pressures, flow rates and energy conversion efficiencies using new materials to support in-ocean application.

- Maximum market potential, if successful.

California, the state which leads the world with technology and growth, will be our initial target. Even though platforms in the ocean viewing window are frowned upon, the government is showing signs of support. So great are the developing need, demand has out-stripped the state's ability to supply power at a reasonable cost and consumers battered by utility rate hikes are likely to be supportive of investment in green energy solutions that offer future cost savings.

As consumable utility products, our product lines will always be in demand and as needs change we can customize the product mix to suit local markets. For instance, if a coastal community only wants to produce drinking water, the system can be designed to simply filter seawater which is largely a mechanical process (this application has not been presented in this response, but can provide additional economy of scale benefits as OMI develops desalinated water applications to complement electric power generation). For desalination operations, only enough electricity need be produced to run the system monitoring and controls. In fact, even a shore-based desalination plant that has been decommissioned because of the cost of electricity can be retro-fitted with a pipeline from an offshore pumping platform to feed the facility's onshore filtration system. This would eliminate the electric production cost and in relatively short time would pay off the capital cost for the pumping station.

Theoretically, growth of our market is tied to world population growth, but with so much pent-up demand for fresh water, even if there were no increase in world population, which is not likely, we will have the next 15 years to catch up. In 1991, "The Water Encyclopedia" listed 14 countries where 87% of the population did not have access to safe drinking water. Today, with substantial population growth around the world, the list has expanded as the scarcity of safe drinking water reaches crisis levels.

- Number of direct jobs created in California.

Unknown

- Why this research is appropriate for public funding.

This proposed project is designed to demonstrate solid evidence of performance under a range of simulated ocean wave conditions for a functional WavePump unit developed by Ocean Motion International, llc (OMI), to produce electricity. A WavePump, using OMI's patented technology, converts the peak and trough energy of an ocean wave into electrical power by pressurizing a feed line connected to a hydro-electric turbine. This technology cannot be fully developed and deployed by a small company without substantial partnerships with public interest organizations.

The OMI method for producing electricity, once proven, will demonstrate to California customers the full potential for producing electric power from waves with a low carbon footprint. California needs reliable, low cost and non-polluting sources of electric power. Deploying the WavePump to generate electricity will establish a dependable power source that is not influenced by fuel costs while at the same time reduces distribution system loads resulting in a benefit to all California electric customers.

Ratepayer Benefits (Check one or more):

- Promote greater reliability
- Potential energy and cost savings
- Increased safety
- Societal benefits
- Environmental benefits – specify

Generating electricity by capturing the energy stored in waves has very minimal environmental impact. There is a very small carbon footprint, no fossil fuel consumption, no potential for spills of toxic or hazardous waste and zero emissions into the environment.

- 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

We anticipate our electricity production cost will be substantially less than current rates and will not be dependent on rising costs and reliability of fuel. OMI anticipates urban areas from San Diego through Santa Barbara and from Monterey to San Francisco would be high target markets for WavePump deployment. Areas with less population density will not only power their local areas but plug into the power grid. California communities that rely on increasingly costly and

less reliable electric power will find the OMI technology very attractive once this concept is demonstrated feasible.

With full deployment, there will be sustained job creation and support. Each full sized pump will require a team to build, deploy, monitor and maintain. We are hoping because the environmental impact of this energy generation project is so small, some of the stringent coastal regulations will be reviewed and possibly revised.

However, we believe some alternatives to consider would be using decommissioned oil rigs. Or, using decommissioned coastal power plants (Morro Bay, San Onofre) that have intake/output lines on the ocean floor (used to anchor the wave pump) and transmission lines already in place. Both of these examples would require almost no additional impact to the environment to install a wave pump.

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.

Specifically, the OMI technology addresses the following PUC 740.1 Sections:

(a) Projects should offer a reasonable probability of providing benefits to ratepayers.

The testing of the wave pump at the Scripps facility provided detailed information on flow and pressure that will power a hydro electric generator. Because this technology does not use external energy sources, the production of electricity should be far less than traditional power generation. By adding less expensive cost of electricity into the power grid, the overall cost to California ratepayers will be reduced.

(d) Projects should not unnecessarily duplicate research currently, previously, or imminently undertaken by other electrical or gas corporations or research organizations.

OMI has a patented technology in the United States so no other duplicate research could be taking place without the expressed consent of OMI. OMI has not received any such notification to date. In addition, in discussions with other Countries regarding the OMI wave pump, we have not encountered another entity that has such developed technology.

(e) Each project should also support one or more of the following objectives:

- 4) Development of new resources and processes, particularly renewable resources and processes which further supply technologies.

The OMI wave pump transfers the naturally occurring energy contained in ocean waves into electricity using the wave pump. Using the wave pump, there are no emissions or other harmful discharges into the environment. If there is interest, additional components can be added to the wave pump to also produce potable water and hydrogen, two commodities also of great interest to the California citizens.