

**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):

Assessing the Effects of Marine Renewable Energy Technologies on Environmental Health and Function

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

- X Applied Research and Development
- X Technology Demonstration and Deployment
- X 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](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).

The impacts of marine renewable energy technology (e.g., wave and tidal energy conversion devices) on marine life and the marine environment are largely unknown in California. The effects on the substrate, benthic environments, pelagic species, marine mammals, turtles, birds and coastal geomorphology must be more fully quantified before large-scale implementation can proceed.

**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.

With more knowledge of the effects of marine renewable energy technologies on the environment, developers can identify locations for projects that minimize unnecessary damage to vulnerable marine and coastal species and habitats. Additionally, it may be possible to incorporate design elements into the technology itself that minimize or eliminate negative impacts. Once the impacts are understood, plans can be implemented to reduce or mitigate those impacts, thus providing for large-scale use of the technology.

## EPIC TRIENNIAL INVESTMENT PLAN 2015-17

### Proposed Energy Research Initiative Questionnaire

- Acoustic impacts of wave energy conversion devices to marine mammals: \$2.5M
- Effects of de facto fish aggregating devices and electro-magnetic fields (EMF) on commercially and recreationally important fish species: \$7.5M (\$2.5M for salmonids)
- Predicted changes in coastal geomorphology, coastal retreat, and shorelines from wave energy absorption and concurrent sea level rise: \$5M
- Changes in benthic habitat structure from siting marine renewable energy (offshore wind and wave) technology: \$2.5M

#### Stakeholders:

Identify the stakeholders who support the initiative.

Marine renewable energy technology developers  
Coastal and marine resource managers  
Scientific community

#### 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)?

- Amy E. Davis. Potential Impacts of Ocean Energy Development on Marine Mammals in Oregon. College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR 97331  
<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/19586/Amy%20Davis%20review%20paper.pdf?sequence=1>
- Robin Pelc, Rod M. Fujita. 2002. Renewable energy from the ocean. Marine Policy. Volume 26, Issue 6: pp. 471–479. [http://dx.doi.org/10.1016/S0308-597X\(02\)00045-3](http://dx.doi.org/10.1016/S0308-597X(02)00045-3)
- Glenn Cada, James Ahlgrimm, Michael Bahleda, Tom Bigford, Stefanie Damiani Stavarakas, Douglas Hall, Russell Moursund & Michael Sale. 2007. Potential Impacts of Hydrokinetic and Wave Energy Conversion Technologies on Aquatic Environments. Fisheries. Volume 32, Issue 4: pp. 174-181. DOI:10.1577/1548-8446(2007)32[174:PIOHAW]2.0.CO;2
- Olivia Langhamer, Kalle Haikonen, Jan Sundberg. 2010. Wave power—Sustainable energy or environmentally costly? A review with special emphasis on linear wave energy converters. Renewable and Sustainable Energy Reviews. Volume 14, Issue 4: pp. 1329–1335.

· 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.).

Additional funding could be sought from the National Science Foundation, specifically the Coastal SEES program, DOE, National Sea Grant College Program, and the California Ocean Protection Council.

## 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.
- Quantifiable performance improvements for the proposed technology/strategy.
- Maximum market potential, if successful.
- Number of direct jobs created in California.
- Why this research is appropriate for public funding.

This is critical research that will allow the inclusion of marine renewable energy technology in California's portfolio of clean energy technology. Understanding, reducing and mitigating the impacts of these technologies so that they can be incorporated responsibly will lead to greater public acceptance of them and less resistance by environmental advocacy groups. It is in California's best interest to fund this type of research, as it will result in significant cost savings over long-term scales and sustainable use of our natural resources.

##### Ratepayer Benefits (Check one or more):

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

Wide-scale use of offshore wind, wave and tidal energy in California will result in increased reliability and significant cost savings over the long term while reducing GHG emissions and protecting the environment. It must be done responsibly however and the research proposed here is critical in meeting that objective.

##### 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](http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=puc).

The initiative described herein will provide benefits to rate payers, 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.