

**DOCKETED**

<b>Docket Number:</b>	25-EPIC-01
<b>Project Title:</b>	Electric Program Investment Charge 2026–2030 Investment Plan (EPIC 5)
<b>TN #:</b>	265474
<b>Document Title:</b>	National Renewable Energy Lab Comments - Offshore Geohazards Environments
<b>Description:</b>	N/A
<b>Filer:</b>	System
<b>Organization:</b>	National Renewable Energy Lab
<b>Submitter Role:</b>	Public
<b>Submission Date:</b>	8/8/2025 3:09:52 PM
<b>Docketed Date:</b>	8/8/2025

*Comment Received From: National Renewable Energy Lab  
Submitted On: 8/8/2025  
Docket Number: 25-EPIC-01*

## **Offshore Geohazards Environments**

*Additional submitted attachment is included below.*



## Electric Program Investment Charge 2026–2030 (EPIC 5) Research Concept Proposal Form

The California Energy Commission (CEC) is currently soliciting research concept ideas and other input for the Electric Program Investment Charge 2026–2030 (EPIC 5) Investment Plan. For those who would like to submit an idea for consideration, please complete this form and submit it to the CEC by **August 8, 2025**. More information about EPIC 5 is available below.

To submit the form, please visit the e-commenting link:

<https://efiling.energy.ca.gov/EComment/ECommentSelectProceeding.aspx> and select the Docket **25-EPIC-01**. Enter your contact information and then use the “choose file” button at the bottom of the page to upload and submit the completed form. Thank you in advance for your input.

1. Please provide the name, email, and phone number of the best person to contact should the CEC have additional questions regarding the research concept:

Felipe Moreno, [Felipe.Moreno@nrel.gov](mailto:Felipe.Moreno@nrel.gov), 720-965-6569

2. Please provide the name of the contact person’s organization or affiliation:

National Renewable Energy Laboratory

3. Please provide a brief description of the proposed concept that you would like the CEC to consider as part of the EPIC 5 Investment Plan. What is the purpose of the concept, and what would it seek to do? Why are EPIC funds needed to support the concept?

This concept proposes the development of solutions to mitigate geohazard risks on anchors and power cables in California offshore wind farms. The California offshore environment poses considerable risks to offshore infrastructure due to seabed mobility and seismic activity. The risks to anchors and subsea cables include the following:

- Seismic activity can reduce significantly the holding capacity of the anchors and damage cable burial
- Underwater landslides can cause powerful cascading failures in the mooring systems
- Steep slopes complicate load distribution on anchors and increase instability due to uneven seabed contact
- Fault lines present integrity risks for structural elements and define exclusion zones

- Turbidity currents can induce local pressure variations, scour and buckling. They have the potential to lead to sudden loss of integrity and emergency repairs for anchors and power cables
- Mobile sediments can bury or expose anchors and cables over time, altering the performance for which they were designed

The lack of assessment of these risks, integrated digital tools to plan around these risks, and technology innovations to mitigate these risks is a barrier to large-scale offshore wind development in California. These innovations are needed to support early-phase layout planning in geologically complex regions like offshore California.

EPIC should consider funding research into the following areas:

- Support the development of geohazard data analysis methods and tools.
- Accelerate industry adoption by integrating outputs into existing design workflows and planning platform layouts.
- Visualization tools to adjust and validate solutions.
- Software tools that leverage data and machine learning to optimize anchor and cable layouts given geohazards.
- Other technologies that mitigate geohazard risks for anchors and subsea cables.

4. In accordance with Senate Bill 96<sup>i</sup>, please describe how the proposed concept will "lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory energy goals." For example, what technical and/or market barriers or customer pain points would the proposed concept address that would lead to increased adoption of clean energy technology or innovation? Where possible, please provide specific cost and performance targets that need to be met for increased industry and consumer acceptance. For scientific analysis and tools, provide more information on what data and information gaps the proposed concept would help fill, and which specific parties or end users would benefit from the results, and for what purpose(s)?

California's deep and complex seafloor conditions poses multiple barriers to offshore wind energy development:

- Geohazard uncertainty reduces developer confidence and increases contingency costs.
- Current route planning techniques fail to scale to large areas.
- Lack of predictive models for site-specific geotechnical constraints delay project timelines.

This scope of work would:

- Enable hazard-aware routing for cables and anchors performance.
- Reduce risk of geohazard-induced failures.
- Inform preliminary layout designs with intelligent recommendations based on known failure modes (e.g., landslide risk zones, boulder fields, steep slopes).

A robust framework accelerates permitting, improves safety and ensures resilient energy infrastructure planning.

5. Please describe the anticipated outcomes if this research concept is successful, either fully or partially. For example, to what extent would the research reduce technology or ratepayer costs and/or increase performance to improve the overall value proposition of the technology? What is the potential of the innovation at scale? How will the innovation lead to ratepayer benefits in alignment with EPIC's guiding principles to improve safety,<sup>ii</sup> reliability,<sup>iii</sup> affordability,<sup>iv</sup> environmental sustainability,<sup>v</sup> and equity?<sup>vi</sup>
  - Reduced risk of anchor/cable failure due to hidden seabed hazards.
  - Reduction in design time for preliminary routing and anchor layout stages.
  - Improved anchor performance and optimized cable routing leading to CAPEX/OPEX savings.
  - Avoided remediation costs by de-risking the initial route.
  - Outputs will support California's energy targets by improving precision and infrastructure reliability.
6. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed research concept.
  - Check the accuracy of verified geohazard zones.
  - Reduction in anchor placement within high-risk zones (e.g., slope, fault crossing, hydrates, debris flow area).
  - Relevant reduction in overall cable risk exposure or crossings.
7. Please provide references to any information provided in the form that supports the research concept's merits. This can include references to cost targets, technical potential, market barriers, equity benefits, etc.

California Department of Conservation "Geologic Hazard Maps"  
DOE-funded "Floating Array Design"  
CEC-funded "Comprehensive Shared-Mooring Solutions"  
NREL Technical Report "Reference Site Conditions for Floating Wind Arrays in the United States"  
NREL Technical Report "Investigation of the Challenges of Offshore Wind in Ultradeep Water"
8. The EPIC 5 Investment Plan must support at least one of five Strategic Goals:<sup>vii</sup>
  - a. Transportation Electrification
  - b. Distributed Energy Resource Integration
  - c. Building Decarbonization
  - d. Achieving 100 Percent Net-Zero Carbon Emissions and the Coordinated Role of Gas
  - e. Climate Adaptation

Please describe in as much detail as possible how your proposed concept would support these goals.

This project supports Goal (d): Achieving 100 Percent Net-Zero Carbon Emissions by:

- Enhancing infrastructure resilience for floating wind in hazardous offshore zones.
- Reducing uncertainty in early-phase development and enabling data-informed decisions.
- Improving the safety and reliability of power transmission through optimized cable layouts.

It also contributes to Goal (e): Climate Adaptation, by anticipating and mitigating geohazard impacts worsened by climate change (e.g., seismic activity, slope instability due to sediment shift or sea level rise).

## About EPIC

The CEC is one of four EPIC administrators, funding research, development, and demonstrations of clean energy technologies and approaches that will benefit electricity ratepayers of California's three largest investor-owned electric utilities.

EPIC is funded by California utility customers under the auspices of the California Public Utilities Commission.

To learn more about EPIC, visit: <https://www.energy.ca.gov/programs-and-topics/programs/electric-program-investment-charge-epic-program>

EPIC 5 documents and event notices will be posted to:  
<https://www.energy.ca.gov/proceeding/electric-program-investment-charge-2026-2030-investment-plan-epic-5>

Subscribe to the EPIC mailing list to stay informed about future opportunities to inform the development of EPIC 5:

<https://public.govdelivery.com/accounts/CNRA/signup/31897>

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i See section (a) (1) of Public Resources Code 25711.5 at:

[https://leginfo.ca.gov/faces/codes\\_displaySection.xhtml?lawCode=PRC&sectionNum=25711.5](https://leginfo.ca.gov/faces/codes_displaySection.xhtml?lawCode=PRC&sectionNum=25711.5).

ii EPIC innovations should improve the safety of operation of California's electric system in the face of climate change, wildfire, and emerging challenges.

iii EPIC innovations should increase the reliability of California's electric system while continuing to decarbonize California's electric power supply.

iv EPIC innovations should fund electric sector technologies and approaches that lower California electric rates and ratepayer costs and help enable the equitable adoption of clean energy technologies.

v EPIC innovations should continue to reduce greenhouse house gas emissions, criteria pollutant emissions, and the overall environmental impacts of California's electric system, including land and water use.

vi EPIC innovations should increasingly support, benefit, and engage disadvantaged vulnerable California communities (DVC). (D.20-08-046, Ordering Paragraph 1.) DVCs consist of communities in the 25 percent highest scoring census tracts according to the most recent version of the California Communities Environmental Health Screening Tool (CalEnviroScreen), as well as all California tribal lands, census tracts with median household incomes less than 60 percent of state median income, and census tracts that score in the highest 5 percent of Pollution Burden within CalEnviroScreen, but do not receive an overall CalEnviroScreen score due to unreliable public health and socioeconomic data.

vii In 2024 the CPUC adopted five Strategic Goals to guide development of the EPIC 5 Investment Plan. A description of the goals can be seen in Appendix A of CPUC Decision 24-03-007 available at:

<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M527/K228/527228647.PDF>