DOCKETED	
Docket Number:	25-EPIC-01
Project Title:	Electric Program Investment Charge 2026–2030 Investment Plan (EPIC 5)
TN #:	265495
Document Title:	Miguel Sanchez Gomez Comments - Characterizing severe metocean conditions for offshore wind reliability
Description:	N/A
Filer:	System
Organization:	Miguel Sanchez Gomez
Submitter Role:	Public
Submission Date:	8/8/2025 4:46:56 PM
Docketed Date:	8/8/2025

Comment Received From: Miguel Sanchez Gomez
Submitted On: 8/8/2025
Docket Number: 25-EPIC-01

Characterizing severe metocean conditions for offshore wind reliability

Additional submitted attachment is included below.

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

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:

   Miguel Sanchez Gomez, miguel.sanchezgomez@nrel.gov , 303-514-5505

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?

   The CEC should consider funding research to better characterize severe meteorological and oceanographic (metocean) conditions off California's coast to de-risk future floating offshore wind projects. The U.S. west coast experiences frequent severe wind and wave conditions, like atmospheric rivers, extratropical cyclones, and high-wave events, that can affect installation, operations, and long-term performance and reliability of offshore wind energy systems. Quantifying their frequency, characterizing severe wind and wave conditions relevant to turbine operation and reliability, and assessing impacts across deployment and operation stages are critical to reducing risk, lowering costs, and ensuring offshore wind infrastructure in California remains resilient under future climate conditions.

4. In accordance with Senate Bill 96[i], 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 statutory clean energy and climate goals require large-scale offshore wind deployment, but a limited understanding of extreme meteorological and oceanographic (metocean) conditions in Pacific waters relevant for wind turbine operation and reliability adds uncertainty to the long-term resiliency of floating wind energy systems. Severe weather and ocean conditions can impact the installation, performance, and reliability of offshore wind turbines by producing fast and turbulent winds, intense rainfall, and/or large wave heights. Quantifying the frequency, characterizing site-specific conditions, and assessing the impact severe metocean conditions will enable wind developers and regulatory bodies to plan and manage the risk of these events. This research would utilize and generate new datasets of severe metocean conditions relevant for floating wind turbine design, installation, and operation. In addition, the impact of these adverse metocean conditions on wind turbines will be evaluated. The resulting datasets and design criteria will enable developers, engineers, and regulators to optimize turbine and mooring designs, reduce installation downtime, and enhance long-term system reliability to lower costs and accelerate large-scale offshore wind deployment in California.

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,[ii] reliability,[iii] affordability,[iv] environmental sustainability,[v] and equity?[vi]

   The proposed research concept has the potential to reduce costs for floating offshore wind projects. Understanding the severe metocean conditions will enable adequate selection of a site-specific wind turbine class, which improves reliability of offshore wind deployment, and will reduce operation and maintenance costs throughout the project lifetime. Understanding metocean conditions can also provide guidance during wind turbine installation to mitigate hazards. In addition, understanding and characterizing severe metocean conditions and their impact on floating wind turbines enables accurate risk

assessment for insurance purposes. Lastly, a large-scale deployment of wind energy systems that is informed by severe metocean conditions will mitigate environmental hazards associated with damage to the offshore wind infrastructure.

6. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed research concept.

   Understanding severe metocean conditions will help reduce installation, operation and maintenance, and insurance costs of offshore wind projects. Characterizing the frequency and impact of severe metocean conditions in the region will enable more accurate risk assessments for project lifetimes. Furthermore, typical adverse conditions during the installation phase of the wind turbines will enable optimized solutions to address the metocean challenges. Additionally, operation and maintenance costs can be lowered by utilizing turbine designs that can withstand the specific offshore environment off the coast of California.

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.

   Waliser, D., Guan, B. Extreme winds and precipitation during landfall of atmospheric rivers. *Nature Geosci* **10**, 179–183 (2017). https://doi.org/10.1038/ngeo2894

   Pagano, T. J., D. E. Waliser, B. Guan, H. Ye, F. M. Ralph, and J. Kim, 2021: Extreme Surface Winds during Landfalling Atmospheric Rivers: The Modulating Role of Near-Surface Stability. J. Hydrometeor., 22, 1681–1693, https://doi.org/10.1175/JHM-D-20-0165.1.

   Bech, J. I., Hasager, C. B., and Bak, C.: Extending the life of wind turbine blade leading edges by reducing the tip speed during extreme precipitation events, Wind Energ. Sci., 3, 729–748, https://doi.org/10.5194/wes-3-729-2018, 2018.

   Wang, J., and Coauthors, 2024: Impact of Tropical and Extratropical Cyclones on Future U.S. Offshore Wind Energy. Bull. Amer. Meteor. Soc., 105, E1506–E1513, https://doi.org/10.1175/BAMS-D-24-0080.1.

   M. Sanchez Gomez, J. Lundquist, G. Deskos, S. Arwade, A. Myers, J. Hajjar Wind fields in category 1–3 tropical cyclones are not fully represented in wind turbine design standards J. Geophys. Res. Atmospheres, 128 (2023), Article e2023JD039233, 10.1029/2023JD039233

   Duffy, Patrick. 2025. Assess Floating Offshore Wind Energy Costs and Performance - FLOWIN Voucher: Cooperative Research and Development Final Report, CRADA Number CRD-2323792. Golden, CO: National Renewable

Energy Laboratory. NREL/TP-5000-93380. https://www.nrel.gov/docs/fy25osti/93380.pdf.

8. The EPIC 5 Investment Plan must support at least one of five Strategic Goals:[vii]
    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.

    The proposed research concept supports goal (d) of Achieving 100 Percent Net-Zero Carbon Emissions and the Coordinated Role of Gas, by accelerating the deployment and improving the reliability of offshore wind in California. By improving the understanding of severe metocean conditions offshore, this work reduces uncertainty and risk associated with the design, installation, and operation of floating wind turbines off the coast of California. This, in turn, enables more efficient project development and supports de-risking offshore wind, fostering a sustainable and long-term deployment.

[i] See section (a) (1) of Public Resources Code 25711.5 at: https://leginfo.legislature.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

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