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Draft Research Concept: Advance to Next-Generation Offshore Wind Energy Technology

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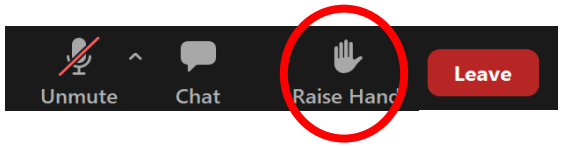
Energy Research and Development Division
October 22, 2020

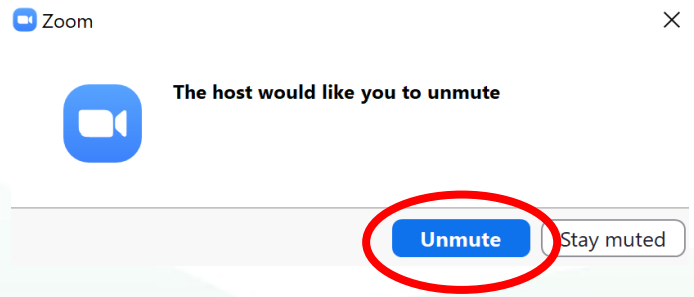
Agenda

- Introduction
- CEC Staff Presentation on the Research Concept
- Open Discussion based on prepared questions
- Q&A

Housekeeping

- Chat and Q&A boxes are available for questions and comments throughout the presentation.
- Participants on the phone will have the chance to provide questions and comments at the end of the presentation.
- "Raise hand" feature to answer the prepared questions and provide oral comments.
    - On a computer, click the "**raise hand**" icon in the webinar controls. When it is your turn, select "**unmute**" to speak.
    - On a phone, dial *9
    - **Provide your name and affiliation each time you speak**





- Email or call the Public Advisor's Office @:PublicAdvisor@energy.ca.gov

Or call (916) 654-4489 or Toll free at (800) 822-6228.

- All comments due by 5:00 p.m. on Friday, November 13, 2020.

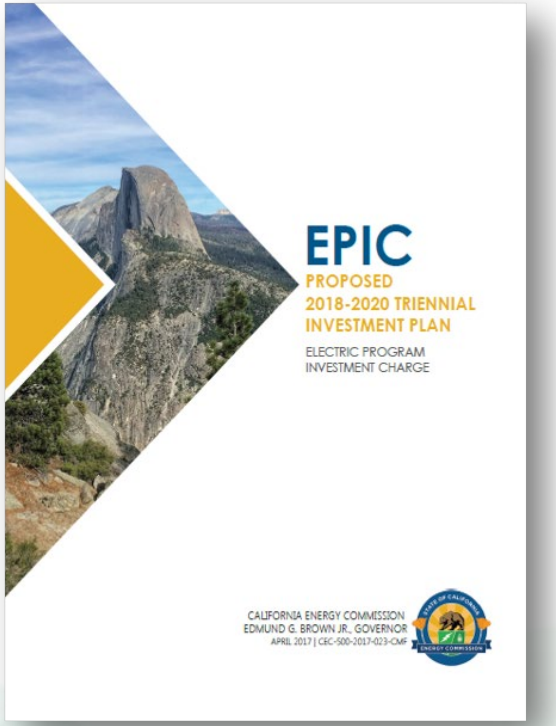
Electric Program Investment Charge (EPIC)

- **Electric Program Investment Charge (EPIC)— Oversee and monitor by the California Public Utility Commission (CPUC)**
  - Ratepayer-funded program to benefit ratepayers
  - Administered by the Energy Commission and three Investor Owned Utilities (PG&E, SCE, and SDG&E)
  - The EPIC program invests more than $130 million annually.
  - The EPIC program supports the development of new, emerging, and pre-commercialized clean energy technologies in California. These projects must be designed to produce electricity ratepayer benefits in the form of increased reliability, improved safety, and/or reduced electricity costs.

Source: https://www.cpuc.ca.gov/energyrdd/ ; https://www.energy.ca.gov/programs-and-topics/programs/electric-program-investment-charge-epic-program

Key EPIC Updates

- Recent solicitations, such as Next Wind, were released under the EPIC Third Investment Plan (2018-2020).
- CPUC decision to renew EPIC for 10 years (EPIC 4 and EPIC 5)
- CEC is in a transition period between EPIC 3 and EPIC 4, working on the preparation of an interim investment plan and EPIC 4 investment plan.
- This webinar will support staff to propose strategic initiatives on offshore wind for both investment plans.

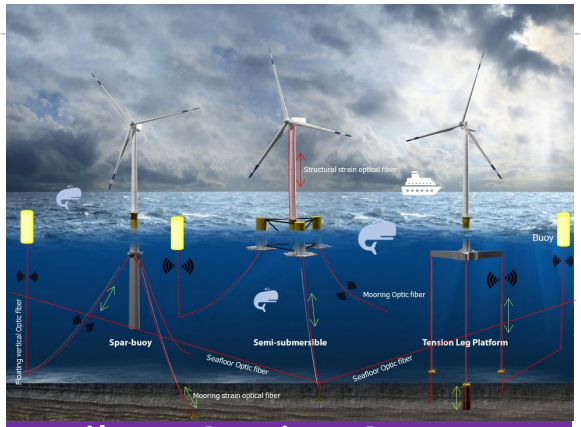


Current CEC Research Efforts on OSW

- Four research projects on offshore wind awarded under Next-Wind Solicitation:
  - *NextWind Real-Time Monitoring System* (Prime: Aker Solutions)
  - *Integrated Distributed Fiber Optic Sensing for Real-Time Monitoring of OWT Gearbox and Tower Operation and Marine Animal Activities* (Prime: LBNL)
  - *A Risk Assessment Framework to Evaluate Effects of Offshore Wind Farms on the California Upwelling Ecosystem* (Prime: Integral Consulting Inc.)
  - *Seabird 3D Distribution and Relative Risk from California Offshore Wind* (Prime: Humboldt State University Sponsored Programs Foundation)

- Fifth Next-Wind project focused on both land-based and offshore wind energy applications: *On-site 3D Concrete Printing for Next-Generation Low-Cost Wind Plants* (Prime: RCAM Technologies)
- *Utility-Scale Renewable Energy Generation Technology Roadmap.* Eight (8) technologies studied, including offshore wind (Prime: Energetics)
- Small Contract: *Research and Development Opportunities for Offshore Wind Energy in California* (Prime: Guidehouse)

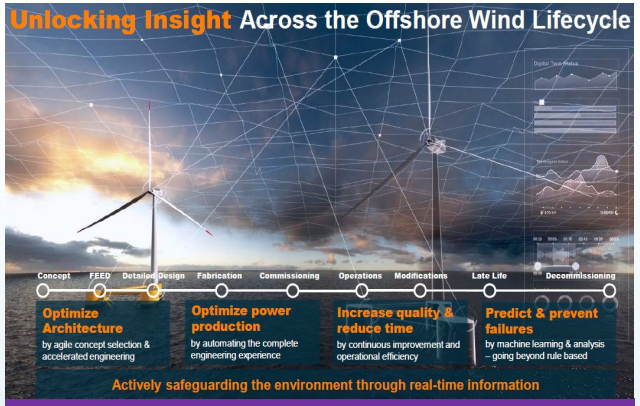
NextWind (Monitoring Systems) Projects



Fiber Optics System for a Real-Time Monitoring

- Develop a novel fiber optical sensing system for real time and continuous monitoring of offshore wind technologies (gearbox, direct drive, tower) and marine mammal activities near offshore wind platforms.
- Test and validate the technical feasibility of fiber optical sensing to monitor the offshore wind energy technology and observe marine animal life activities near offshore wind platforms.
- Develop data processing capabilities to correlate the fiber optic sensing strain/ temperature/ vibration/ acoustic signals with operation conditions or marine mammal activities.

(Recipient: LBNL with UC Berkeley)

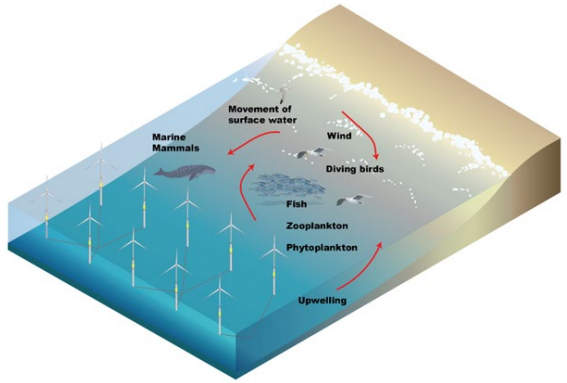


Twin Platform for Real-Time Monitoring

- Design and develop a holistic digital platform representing a floating offshore wind installation and its surrounding environment.
- Develop, test, and validate operational and environmental use cases for product optimization, condition monitoring, data sharing, and provide applications for analytics and advanced analytics.

(Recipient: Aker Solutions and Cognite)

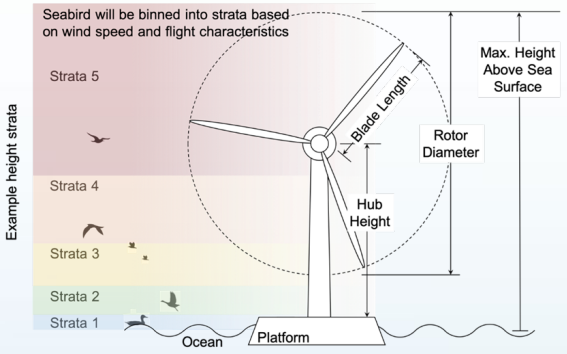
NextWind (Environmental Risk) Projects



Effects of Offshore Wind Farms on Upwelling

- Determine potential changes in California coastal upwelling due to offshore wind project development
- Quantify changes to physical oceanographic circulation that drives ecosystem function and services.

(Recipient: Integral Consulting Inc. with UC Santa Cruz and Sandia National Laboratories)



Seabird 3D Distribution

- Develop a 3D model of seabird occurrence in California including flight height
- Create power generation profiles for different offshore wind farm scenarios that include different locations and turbine dimensions
- Compare the relative risk to seabirds from offshore wind scenarios
- Evaluate tradeoffs between bird mortality risk and wind farm performance

(Recipient: Humboldt State University Sponsored Programs Foundation with H.T. Harvey)

Research and Development Opportunities for Offshore Wind Energy in California

Figure 2: Project Process

Table 4: Stakeholder Interviews

Stakeholder Group	Number of Interviews
Research institutes	7
Technology developers	7
Project developers	4
Planning agencies and Load-Serving Entities	9
Interest groups	4
Total	31

Source: https://ww2.energy.ca.gov/2020publications/CEC-500-2020-053/CEC-500-2020-053.pdf https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/offshore-renewable-energy/offshore-wind-research-and

Research and Development Opportunities for Offshore Wind Energy in California

Table 5: Technology and Infrastructure Research Recommendations

#	Technology and Infrastructure Research Recommendations	Barrier Addressed
1	Advance technologies for mooring, cabling, and anchors including interarray cabling webs and dynamic cabling.	4, 7
2	Develop technologies to ease O&M in extreme wind and wave conditions, including remote monitoring and robotic maintenance.	4
3	Develop technical solutions to integrate offshore wind, including facilitating technologies such as advanced hydrogen and subsea storage.	1, 8
4	Develop manufacturing approaches to use and optimize existing supply chain and manufacturing or assembly solutions in California.	3,7
5	Study the seismic vulnerability of floating platform mooring systems.	4
6	Conduct a comprehensive study on port infrastructure in California and develop technical solutions to identified gaps.	2, 3

Table 6: Environment and Resource Research Recommendations

#	Environment and Resource Research Recommendations	Barrier Addressed
7	Conduct additional LIDAR wind resource studies offshore of California.	1, 7, 10
8	Advance technologies to prevent wildlife impacts, including smart curtailment and deterrence.	3, 10
9	Conduct state-led environmental studies along the California coast to fill gaps in existing research.	6

Table 7: Other Recommendations

#	Other Recommendations	Barrier Addressed
10	Assess the offshore wind installed capacity that is complementary to solar generation and feasible to support a reliable, cost-effective, and low carbon energy system.	1, 3, 5, 8
11	Conduct a comprehensive study on the total value proposition of offshore wind development, including grid and macroeconomic benefits.	7, 8

Source: https://ww2.energy.ca.gov/2020publications/CEC-500-2020-053/CEC-500-2020-053.pdf https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/offshore-renewable-energy/offshore-wind-research-and

Research Concept

Advance to Next-Generation Offshore Wind Energy Technology

Goal

This research concept aims to solicit comments/feedback from research community, stakeholders, and interested parties to support staff in the preparation of strategic initiatives on offshore wind for the EPIC interim Investment Plan (transition from EPIC 3 to EPIC 4) and EPIC 4 investment plan (2021-2025).

The research concept includes research ideas for potential projects

Research Ideas

- Literature review, stakeholder discussions, and results from the CEC research roadmap for utility-scale of renewable energy technologies, and CEC study on R&D opportunities for OSW in California."

- Innovation on floating substructure and foundation design, installation, and inspection and monitoring are identified as key in reducing FOSW's levelized cost of energy (LCOE).
- Need of increasing the understanding of how floating offshore wind installation and operation may affect sensitive species and habitats in California.

- Need of developing a synergy between technology innovation and environment and wildlife.

General Objective

- The proposed research concept focuses on supporting the development and pilot demonstration of innovative floating offshore wind component(s) and installation processes that advance the readiness, reliability, and cost-competitiveness of floating offshore wind in California, while increasing the understanding of how floating offshore wind installation and operation may affect sensitive species and habitats.

Specific Objectives

1. Innovate manufacturing/assembly/installation processes and materials for FOSW component(s) (e.g. substructure and foundation) and demonstrate at a pilot scale to validate the expected benefits, such as LCOE reduction and increase the understanding of potential environmental and wildlife impacts of FOSW projects.
2. Test and validate a monitoring system for FOSW applications that support reduction of installation and O&M costs and increase commercial readiness.
3. Develop tools or methods for assessing and monitoring the environmental impacts (e.g. on marine biodiversity or habitat, currents and upwelling) related to manufacturing/assembly/installation processes and operation of FOSW component(s).
4. Build a consortium that works on the development of parallel solutions for technical and environmental challenges that facilitate the deployment of cost-effective and environmental-friendly FOSW projects in California

Requirements

1. Meeting the specific objectives mentioned above.
2. For field testing and validation, securing a site and associated permissions, with permitting and site assessments underway or complete, and all construction engineering and hardware selection underway.
3. For test facilities, demonstrating commitment of the testing site manager to collaborate with the project.
4. Identifying solutions for the end-of-life of the FOSW component(s) developed, tested, and installed under the proposed project.

Metrics

1. Achieve a LCOE for offshore wind energy lower or equal to $75/MWh.

2. Advance the FOSW component and monitoring technology to TRL7-8.

Examples 1

- Develop, test, and validate an onsite manufacturing or assembly approach for a floating substructure or foundation components designed to reduce FOSW LCOE and avoid or minimize marine species and ecosystem risks when the components are in operation.
- The project includes the test and validation of inspection and monitoring systems of substructure or foundation components that support O&M activities and help increase the understanding associated with distribution of invasive species, sea surface and seafloor disturbances, turbidity and other related interaction risks due to the operation of floating substructure or foundation components.

- Potential Project Budget: $4 – 5 Million
- Potential Project term: 3 years
- Match Funds: 25%

Example 2

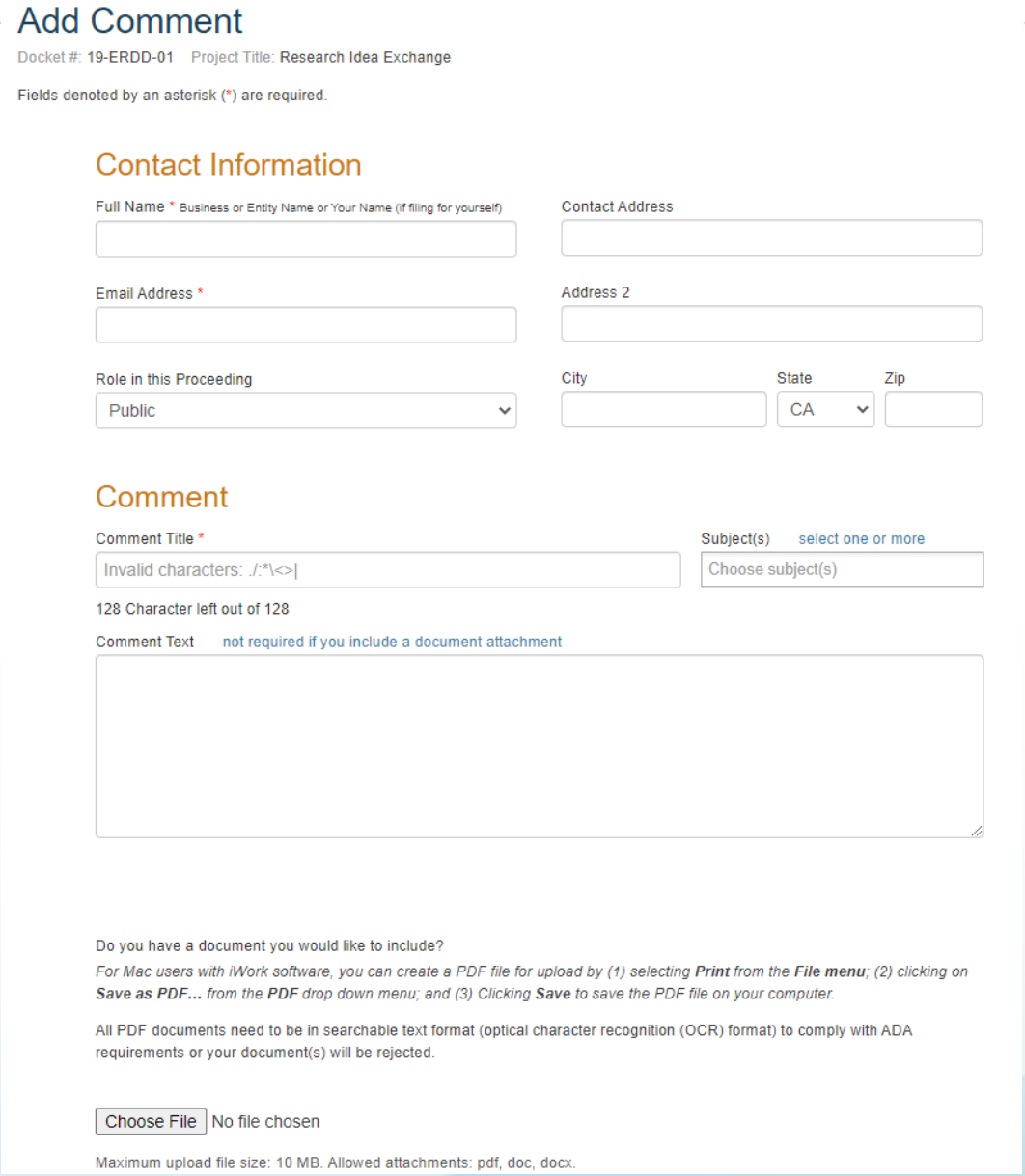
- Develop, test, and validate innovative design of anchoring and mooring systems that reduce FOSW LCOE and the acoustic impacts and risk of marine mammal entanglement during the construction, installing, and operation of these systems.
- The underwater acoustic impacts can be analyzed either by measuring sound levels during installation and construction or modeling the sound levels and comparing them to the hearing capacity of marine mammals and perhaps other species groups.
- The project includes the test and validation of inspection and monitoring systems that support installation, operation, maintenance activities of anchoring and mooring systems, and help increase the understanding of underwater acoustic impacts.

- Potential Project Budget: $4 – 5 Million
- Potential Project term: 3 years
- Match Funds: 25%

Open Discussion

1. Which key research areas were not (fully) addressed in the draft research concept, but should be taken into consideration?
2. What type of innovation is needed in design and material science that support the improvement of substructure and foundation components?
3. Floating substructures have been demonstrated outside California's environment and context; what are the R&D opportunities to reduce costs of floating substructures for potential projects in California?
4. What type of innovation is needed in design and material science that supports the improvement of inter-array and export cables?
5. What environmental studies are needed to complement current studies and support the deployment of FOSW in California? Please provide details.
6. What would be the appropriate level of project funding that would leverage private investments associated with the research proposed in this draft concept.
7. CEC-funded studies have recommended research projects on alternative transmission paths, such as green hydrogen production and energy storage, that avoid costly transmission upgrades in the short time. What type of research project do you identify as a critical to facilitate the deployment of alternative transmission paths in California?
8. CEC-funded studies have also identified port infrastructure as a market barrier to deploy FOSW projects in California. Which research projects do you identify as critical to advance port readiness to support FOSW?

Submitting Written Comments



- Submit comments via the CEC electronic commenting system
  - https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=19-ERDD-01

- Email Docket Unit: DOCKET@energy.ca.gov

  Reference "*Draft Research Concept on Advance to Next-Generation Offshore Wind Energy Technology*" in the subject line. If answering or providing comments to the specific prepared questions included in this presentation, please reference the question.

All comments due by 5:00 p.m. on Friday, November 13, 2020.

List Serv Notifications

Subscribe to Research and Development and Renewable List Servers to receive updates on the EPIC Program and upcoming solicitations:

https://ww2.energy.ca.gov/listservers/index_cms.html

RESEARCH AND DEVELOPMENT LISTS	RENEWABLE ENERGY LISTS
epic - Electric Program Investment Charge (EPIC) Program	epic - Electric Program Investment Charge (EPIC) Program
foodproduction - Food Production Investment Program	geothermal - Geothermal Energy
research - Energy RD&D programs	gosolar - Go Solar California PV Campaign
pierbuilding - PIER Pgm. - Residential and Commercial Bldgs. Program Area	solar_equipment - Solar Equipment
naturalgas - Natural Gas Research Program	ladwp_appeal - LA Department of Water and Power Appeal Regarding RPS Certification Eligibility
Note: uses main natural gas list	offshoreenergy - Offshore Renewable Energy
	wind - Wind Energy and Avian Mortality

Documents

- Please go to https://www.energy.ca.gov/event/workshop/2020-10/notice-scoping-workshop to download the research concept

- Final report of study “Research and Development Opportunities for offshore Wind in California” https://ww2.energy.ca.gov/2020publications/CEC-500-2020-053/CEC-500-2020-053.pdf

- Final report of research roadmap “Utility-Scale Renewable Energy Generation Technology Roadmap”

https://ww2.energy.ca.gov/2020publications/CEC-500-2020-062/CEC-500-2020-062.pdf

Thank You!

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