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RCAM's Comments on the CEC Draft Research Concept on Advance to Next-Generation Offshore Wind Energy Technology

Additional submitted attachment is included below.

Comments on the CEC Draft Research Concept on Advance to Next-Generation Offshore Wind Energy Technology

Research Idea Exchange, Docket Number 19-ERDD-01

Prepared by:
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RCAM Technologies, Inc. (RCAM), a small wind energy technology company with operations Irvine, California, offers the following public comments regarding CEC's research concept for potential applied research, development, and deployment projects that facilitate the deployment of floating offshore wind energy.

General Comment: **RCAM strongly supports the CEC's research concept for potential applied research, development, and deployment projects** that facilitate the acceleration of floating offshore wind energy (FOSW) in California. The CEC research concept is critical to facilitating the deployment of floating offshore wind energy and increasing the cost competitiveness, performance, reliability, and knowledge of the environmental and wildlife impacts of FOSW in California.

However, RCAM Technologies suggests three changes to the potential project that will further increase the range of technologies eligible and the breadth of stakeholders, industry members, and research institutions eligible and the collaborations between them. The suggested changes are:

1) Reduce the minimum match share requirement from 25% to approximately 10% or less.

Rational: Only large for-profit companies can provide cost-matching contributions on the order of 25%. Most small companies and research organizations will not be able to provide these levels of cost match, especially for large awards. Reducing the minimum cost match will help ensure that California receives a broader array of ideas from a more diverse group of researchers and industry partners.

2) Decrease the smallest project award size to approximately $3M (eligible projects from $3M to $5M).

Rational: There are wide range of impactful FOSW technologies, some of which may need less than minimum award size listed by CEC ($4M) to reach the TRL levels CEC is targeting at the end of projects. In addition, as described in our response to the previous question, most small companies and research organizations will be challenged to provide the required cost matching contributions for a large award. For example, a $4M award would require at least $1M of cost match at the minimum 25% cost match requirement. Most small companies and research organizations do not have the resources to provide $1M of cost match and would unlikely be able to raise these funds from large developers or investors for early to mid-stage, high risk FOSW technologies—none of which have been installed in the US yet. As a result, only the largest organizations, namely oil and gas companies or a small number of larger established OSW companies, such as foundation suppliers or turbine manufactures, will be able to compete in the solicitation. In addition, high cost matching requirements discourage collaboration because non-profit research organizations such as California's Universities and National Laboratories, and engineering consulting firms will not be able to provide sufficient cost match to join a collaboration. Usually collaborative projects require that each participating organization provide cost match in proportion to the funding they request which is often referred to as each organizations "carrying its own cost match".

3) Reduce the eligible beginning Technology Readiness level to TRL 4-5, and end of project TRL to 6-8.

Rational: As the first California solicitation for offshore wind technology development, it's challenging to predict what sort of responses and technologies will be proposed. Reducing the TRL will help ensure a wider range of potentially impactful technologies can be developed.

RCAM in consultation with Dr. Mo Li of the University of California, Irvine, offer the following responses to the specific questions asked by the CEC:

Question # 2: What type of innovation is needed in design and material science that support the improvement of substructure and foundation components?

Concrete mechanical and durability performance in marine environment, material and structural designs for advanced manufacturing methods, degradation and damage sensing and monitoring, are needed to improve substructure and foundation components. Numerous offshore wind companies such as Ideol, Saitec, Olav Olsen, and Equinor are developing concrete floating platforms. RCAM is development 3D concrete printed anchor components. Concrete offers potential for 2X to 4X the life of steel structures with demonstrated lifetimes ranging from 30 to 80 years and reduced O&M requirements compared to steel offshore structures that are typically designed for only 20 years. Research is needed to further develop, characterize, and certify concrete materials for new offshore floating (and fixed bottom) wind applications. In addition, new promising manufacturing methods such as 3D concrete printing have been developed for onshore applications, but have only begun to be explored for offshore applications by companies such as RCAM.

Question # 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?

RCAM strongly supports the specific objectives listed in the *CEC Draft Research Concept on Advance to Next-Generation Offshore Wind Energy Technology.* RCAM especially supports the objective to "Innovate manufacturing/assembly processes and materials for FOSW component(s) (e.g. substructure, foundation and support substructure) and demonstrate at a pilot scale to validate the expected benefits, such as LCOE reduction." **RCAM believes the examples for FOSW components should also explicitly list mooring and anchoring systems as an example project for clarity.**

In addition, RCAM believes project funding should be permitted to be used to support the objectives listed above including 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.
- Test facilities, demonstrating commitment of the testing site manager to collaborate with the project.
- Geotechnical surveys or data gathering needed for demonstrating and testing innovative mooring solutions.

Question #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 you identify as a critical to facilitate the deployment of alternative transmission paths in California?

RCAM supports development of long term (days to weeks of storage capacity) energy storage technologies such as ocean pumped hydro storage (which is also referred to stored energy at sea

https://en.wikipedia.org/wiki/Stored_Energy_at_Sea) as a demonstrated means of mitigating costly transmission upgrades by increasing capacity factors of offshore wind plants and reducing the need for new transmission lines. However, RCAM believes that **if offshore wind is not demonstrated and deployed in California, long term energy storage of offshore wind electricity will not be necessary.** There are initial opportunities and offshore wind resources today to obtain the benefits of offshore wind without energy storage. **The costs and environmental challenges of offshore wind must be addressed sufficiently before or in parallel to long term energy storage solutions.**

In addition, long term energy storage technologies such as pumped hydro storage, green hydrogen, compressed air energy storage will benefit many renewable energy technologies especially solar electric, onshore wind, and offshore wind. **The cost to develop these long term energy storage technologies such as green hydrogen, ocean pumped hydro, ocean CAES should be shared by multiple renewable energy technologies, ideally with a dedicated, cross-cutting energy storage program funded with SUPPLEMENTAL EPIC funding.**

Thank you for your consideration of these comments.

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