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Marine Spatial Planning of Offshore Renewable Energy Development

See attached

Additional submitted attachment is included below.

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The Energy Commission is currently soliciting ideas and stakeholder input for the 2018 – 2020 EPIC Triennial Investment Plan. For those that would like to submit an idea for consideration in the 2018-2020 EPIC Triennial Plan, we ask that you complete the form below. Submittals are due by **5:00 p.m. on February 10, 2017.**

Part 1. Initiative Description and Purpose:

1. Please provide a brief description of the proposed initiative:

Conduct marine spatial planning with ecosystem service tradeoff analysis to assess the pros and cons of offshore renewable energy (e.g., wind farm) development in relation to energy production, environmental impacts, fisheries displacement, viewshed impairment, and other ecosystem service values/impacts of biological and socio-economic importance. Utilize tradeoff analysis to engage multiple stakeholder groups with alternative unique ecosystem service objectives (e.g., energy industry, fishermen, conservationists), and inform ocean managers in the marine spatial planning of renewable energy development for minimizing conflicts among ecosystem services and maximizing compatibility in meeting stakeholder objectives. Inclusive of this process would be assessment and enhancement of the ability to create synergy between offshore renewable energy production and operation of desalination facilities for enhancing freshwater security in California. Generate sustainable, high-value, low-impact offshore renewable energy development plans for the U.S. west coast.

2. What technical and/or market barriers would the proposed initiative help overcome? For scientific analysis and tools, what knowledge gaps would the proposed initiative help fill?

At present, there is not a plan for offshore renewable energy development in California that is comprehensive (balancing existing and emerging ocean uses), coordinated (planning multiple emerging uses simultaneously) or strategic (optimized using an analytically-defined objective function). Marine spatial planning with tradeoff analysis would overcome this barrier (in all three factors), thereby engaging stakeholders and informing managers and policy in how to best integrate offshore renewable energy development into California's already-crowded seascape. On the scientific side, this project would catalyze the development of an analytical approach for marine spatial planning to simultaneously coordinate the development of multiple emerging uses (e.g., energy production, desalination) while balancing a suite of unique management objectives. Application of this approach to the offshore renewable energy development would support quantification of the critical interactions between energy facilities and other ocean activities and uses (e.g., fisheries, conservation, shipping, viewshed), and the generation of a transparent, objective approach to mitigating conflicts among these uses, maximizing their compatibility, and promoting valuable, sustainable renewable energy production off the California coast.

Part 2. Benefits and Impacts

3. If this initiative is successful, either fully or partially, what would be the expected impact? Who are the primary users and/or beneficiaries?

The impact would be hugely positive to helping the State of California achieve its renewable energy portfolio goals. The initiative also would benefit nearly all ocean user groups in California by reducing conflicts and impacts expected to be experienced by these groups if California were to pursue conventional planning of offshore renewable energy development that is not comprehensive, coordinated and strategic. Consequently, these user groups will gain in socioeconomic and conservation value. The initiative also would provide a path for sustainable, valuable offshore energy development, generating large positive economic impacts to the energy industry. The initiative also would contribute to cost-effective freshwater security in California. Finally, the initiative will benefit all of Californians, Americans and the global community through reductions in greenhouse gases creating climate change and ocean acidification, which are generating a multitude of knock-on negative effects on the economy, social welfare, environment and world peace.

4. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed initiative:

Impacts of the initiative would be explicitly quantified in relation to plans of energy development and their impacts expected if California were to pursue a "business as usual" conventional approach to planning that does not utilize marine spatial planning with tradeoff analysis. Impacts also would be quantified in terms of stakeholder engagement and successful creation and timely implementation of offshore renewable energy plans for California waters, similar to the assessment of impacts of the California Marine Life Protection Act, which generated a network of marine protected areas along the California coast (in some cases using tradeoff analysis to guide the decision-making process). Finally, impacts would be quantified through monitoring of the value, interactions and impacts of the developed offshore renewable energy facilities, and comparison of these outcomes in relation to those predicted by the marine spatial planning initiative.

5. Please provide a list of peer-reviewed references that support the responses for questions 3 and 4. Proposed initiatives that include peer-reviewed references will be given stronger consideration.

Alexander, K. A. et al. Interactive marine spatial planning: siting tidal energy arrays around the mull of Kintyre. PloS one 7, e30031 (2012).
Arkema, K. K. et al. Embedding ecosystem services in coastal planning leads to better outcomes for people and nature. Proceedings of the National Academy of Sciences 112, 7390-7395 (2015
Beverley, P., Ehler, C., Battershill, C., Hikuroa, D. & Boven, R. Hauraki Gulf Marine Spatial Plan Independent Review Panel Second Review Report. Report No. 2, (2015).
Collie, J. S. et al. Marine spatial planning in practice. Estuarine Coastal and Shelf Science 117, 1-11, doi:10.1016/j.ecss.2012.11.010 (2013).
Douvere, F. The importance of marine spatial planning in advancing ecosystem-based sea use management. Mar. Policy 32, 762-771, doi:10.1016/j.marpol.2008.03.021 (2008).
Foley, M. M. et al. Guiding ecological principles for marine spatial planning. Marine Policy 34, 955-966 (2010).
Halpern, B. S. et al. Near-term priorities for the science, policy and practice of Coastal and Marine Spatial Planning (CMSP). Marine Policy 36, 198-205 (2012).
Lester, S. E. et al. Evaluating tradeoffs among ecosystem services to inform marine spatial planning. Marine Policy 38, 80-89 (2013).
Lester , S.E. et al. Marine spatial planning makes room for offshore aquaculture in crowded coastal waters. Nature Comm. (In Review).
Marra, J. When will we tame the oceans? Nature 436, 175-176, doi:10.1038/436175a (2005).
Rassweiler, A., Costello, C. & Siegel, D. A. Marine protected areas and the value of spatially optimized fishery management. Proceedings of the National Academy of Sciences 109, 11884-11889 (2012).
Rassweiler, A., Costello, C., Hilborn, R. & Siegel, D. A. Integrating scientific guidance into marine spatial planning. Proceedings of the Royal Society B: Biological Sciences 281, 20132252 (2014).
Wever, L., Krause, G. & Buck, B. H. Lessons from stakeholder dialogues on marine aquaculture in offshore wind farms: Perceived potentials, constraints and research gaps. Marine Policy 51, 251-259, doi:10.1016/j.marpol.2014.08.015 (2015).
White, C., Halpern, B. S. & Kappel, C. V. Ecosystem service tradeoff analysis reveals the value of marine spatial planning for multiple ocean uses. Proceedings of the National Academy of Sciences 109, 4696-4701 (2012).
Yates, K. L., Schoeman, D. S. & Klein, C. J. Ocean zoning for conservation, fisheries and marine renewable energy: Assessing trade-offs and co-location opportunities. Journal of environmental management 152, 201-209 (2015).

6. (For technologies only) What competitive advantages does the proposed technology solution have over current benchmark technologies? If the technology is beyond the prototype stage, what strategies do you suggest to bring to scale?

Science is just now developing an analytical framework to marine spatial planning with tradeoff analysis that is comprehensive (balancing existing and emerging ocean uses), coordinated (planning multiple emerging uses simultaneously), and strategic (optimized using an analytically-defined objective function). This technology solution is the benchmark for spatial planning of the oceans and it is being applied to offshore aquaculture in southern California (Lester et al. In Review - see above section for full reference). The proposed initiative would scale marine spatial planning with tradeoff analysis to the State level, and apply it to the field of offshore renewable energy development., which is rapidly growing and in urgent need of permitting guidance (e.g., by the US Bureau of Ocean Energy Management).

Part 3. Connection to Energy Commission's EPIC Framework

Energy Commission staff have developed a draft strategic framework to guide the CEC's planning and implementation of EPIC across triennial investment cycles. One of the objectives of the draft strategic framework is to communicate a consistent set of priorities for organizing current and future EPIC investments.

7. Please indicate which of the following strategic framework themes you feel the proposed initiative best fits within:
    - Advance Technology Solutions for Deep Energy Savings in Building and Facilities
    - Accelerate Widespread Customer Adoption of Distributed Energy Resources
    - Increase System Flexibility from Low-Carbon Resources
    - Increase the Cost-Competiveness of Renewable Generation
    - Create a Statewide Ecosystem for Incubating New Energy Innovations
    - Maximize Synergies in the Water-Energy-Food Nexus
    - Develop Tools and Analysis to Inform Energy Policy and Planning Decisions
    - Catalyze Clean Energy Investments in California's Underrepresented and Disadvantaged Communities

If Other, Please Specify

Also: Increase System Flexibility from Low-Carbon Resources, Increase the Cost-Competiveness of Renewable Generation Create a Statewide Ecosystem for Incubating New Energy Innovations, and Maximize Synergies in the Water-Energy-Food Nexus