

## **NSF Engine: MOCEAN: Accelerating a Just Energy Transition While Nurturing Healthy Oceans and New Blue Economies Through Innovative Nature-Inclusive Offshore Wind Farms**

### **Overview**

Coastal states have made significant commitments to source increasing portions of their electricity supply from offshore wind energy (OWE) to achieve their climate goals, but development and deployment of OWE farms is hampered by challenges including conflicts with other ocean industries and decision-making processes governed by short time-horizon market forces. The Engine will encourage cooperation among three industries—OWE, Sustainable Seafood, and Blue Technology—through co-creation of Nature-Inclusive Design (*NID*) policies and technologies (e.g. *NID* scour protection, marine sensors, submersibles, and eDNA) and coordinated shepherding of these innovations from the lower Technology Readiness Levels all the way to commercialization. United through the Engine, OWE developers, marine scientists, engineers, fishers, policymakers, entrepreneurs, and historically underserved coastal communities, will be empowered to support the development of cross-state policy supportive of *NID*, high-quality jobs—including to underserved populations—that leverage the skills of the existing local workforce, and to co-create a brighter and more equitable future through a *New Blue Economy*.

### **Intellectual Merit**

This proposed NSF Engine will catalyze significant advancements at the intersections between different science and technology fields and develop system-of-system models in engineering, economics, and education—advancements which otherwise would remain out-of-reach. Advancements in science will range from the micro to the macro scales including marine biology, impacts of stressors on habitats, effects of materials and coating selection on marine growth, and changes in local and regional ecosystems. Advancements in technologies will include new sensing systems (e.g. eDNA, acoustic, & image-based), new inspection equipment & techniques, new coating systems, more durable materials, intelligent nature-inclusive scour protection, productive artificial reefs, and future-proof OWE turbine foundations. Advancements in engineering models will account for important factors insufficiently considered in practice such as impacts of cathodic protection on design life and the environment. Advancements in policy will include the creation of models that quantify the benefits of *NID* in OWE to local labor, the environment, and new jobs in fisheries to be used in the decision-making process for offshore wind development. Advancements in education will include the development of methods of engagement, support, and learning that lead to much greater participation of students and workers from underserved communities in the *New Blue Economy*. The Engine will engage key ecosystem actors in a Use-Inspired Research Design loop that supports the co-creation of new technologies, relevant policies, workforce development systems, cross-industry collaboration, novel products, and interdisciplinary research and thereby ensures that advancements serve all communities in a just and timely way.

### **Broader Impacts**

Broader Impacts include: 1.) Improved ocean health through deployment of *NID* features in OWE farms; 2.) A seafood economy better adapted to the changing ocean through co-created nature-inclusive solutions, including sustainable fishing techniques and restorative aquaculture; 3.) A globally-competitive US OWE industry thanks to new technologies brought to market through collaboration with existing BlueTech communities within the RoS and increased social license of OWE through *NID*; 4.) Inclusive economic growth in underserved coastal communities with historical ties to the existing blue economy and models for catalysis of such growth throughout and outside of the RoS; 5.) STEM workforce entry and retention systems co-created with and serving diverse communities through the *New Blue Economy*.

**Overarching Challenge(s):** A Just Transition to Clean Energy, Sustainable Seafood, Healthy Oceans

**Keywords:** Energy technology, advanced materials, advanced manufacturing, biotechnology, marine biology

**Industry Sectors:** 2211 (Electric Power Generation, Transmission and Distribution), 1141 (Fishing), 3345 (Navigational, Measuring, Electromedical, and Control Instruments Manufacturing)