

Overview

NSF Engines: Type-2: MOCEAN: Accelerating a Just Energy Transition While Nurturing Healthy Oceans and New Blue Economies Through Innovative Nature-Inclusive Offshore Wind Farms
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Purpose and Vision

The U.S. offshore wind energy resource is enormous, and the cost to generate electricity from offshore wind energy farms is now very affordable. Coastal states have made significant commitments to have increasing portions of their electricity supply come from offshore wind energy to help them achieve their climate goals. Unfortunately, however, the development and deployment of offshore wind farms is hampered by many challenges. These include conflicts in the shared-use of the ocean with fisheries, the lack of a regional industrial development strategy, and unprepared workforces for the breadth of excellent employment opportunities. In addition, current dispersed policies and decision-making processes will not deliver a just energy transition. The MOCEAN Innovation Engine will serve the coastal region from Massachusetts to Virginia by bringing together communities, policy makers, offshore wind developers, marine scientists, engineers, and entrepreneurs to co-create innovative ways not only to deploy nature-inclusive designs that protect and enhance existing marine ecosystems and reduce conflicts, but also to ideate and incubate new technologies and new employment opportunities that specifically target low-income and historically disadvantaged communities.

Intellectual Merit

This proposed NSF Engine will make significant advancements in science and technology, as well as improve engineering, economic, and educational models. The advancements in science will range from the micro-to-macro scale, and these will include the formation of marine organisms; marine biology; impact of stressors on habitats; the effect of different materials and coatings on marine growths; local ecosystems, as well as regional ecosystems that includes habitat migration due to the changing ocean environment. The advancements in technologies will also be broad and will include new sensing systems (e.g. eDNA, acoustic, image-based), new types of inspection equipment, coating systems, more durable materials, intelligent nature-inclusive scour protection, productive artificial reefs, and future-proof foundations. The advancements in engineering models will account for important factors that are presently ignored or insufficiently considered in practice, including the effects of soil-foundation structure interactions on design, and the impact of cathodic protection on design life and the environment. For economics, the advancements will quantify the benefit of local labor, environmental impact, and new jobs in fisheries to create models that can be used in the decision-making process for the design and operation of offshore wind farms. In education, advancements will create new methods of engagement, support, and learning that lead to much greater participation of students and workers from marginalized communities in the New Blue Economy. The composition of the MOCEAN team was designed to make intellectual progress at the intersections between different fields, and to create system-of-system models.

Broader Impacts:

The MOCEAN team is committed to bringing together currently disconnected researchers, economic development efforts, innovation, community groups, and others to co-create an offshore wind energy deployment strategy that foster new blue tech industries and enables underserved coastal communities to grow and thrive beyond their traditional economies. This strategy will also establish the nation as the global leader in sustainable offshore wind farm development. The broader impacts of this include: (i) Ensuring a just energy transition; (ii) Creating a continuously learning and innovating ecosystem that advances technologies for economic and ecological benefit; (iii) Integrating diverse fields to achieve community-centered research and policy objectives; (iv) Creating a better-informed citizenry and empowered decision makers; (v) Fostering collaboration across institutions, governments, and financial investment institutions, and (vi) Mobilizing deep outreach programs to motivate young people to enter STEM fields and to create entry points for broad stakeholder participation in the energy transition. All MOCEAN activities and programs integrate diversity, inclusion, equity, accessibility and justice principles with intentionality, including within the leadership team, STEM education and training, and communities across the region to enhance economic development.

Keywords: Climate, Offshore, Wind, Ecojustice, Fisheries

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