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Comments for 20-EPIC OSW R&D investment needs

Thank you very much for the excellent and informative July 14 OSW Workshop. In addition to what has been discussed, I'd like to offer further insights and comments as below:

-Innovation is needed in the design and manufacturing enabled by materials science and engineering that support the improvement of substructure and foundation components for offshore wind. Research in concrete mechanical and durability performance in marine environments, material and structural innovations and designs for advanced manufacturing methods, material/structure degradation and damage sensing and monitoring are needed to improve service life and safety of the substructure and foundation components and to significantly reduce costs. A number of offshore wind companies are developing concrete floating platforms and anchor components. Concrete offers the potential for 2X to 4X the life of steel structures with demonstrated lifetimes ranging from 30 to 100 years and reduced O&M requirements compared to steel offshore structures that are typically designed for only 20 years. Ultra-high performance concrete that has much higher strength and damage tolerance can further increase the life span, decrease the use of materials and steel, lower the weight for lifting and placement, and reduce costs. Research is needed to further develop, characterize, certify, and design with concrete materials for new offshore floating wind applications.

-New promising manufacturing methods such as modular construction, factory prefabrication or onsite 3D concrete printing need to be explored for offshore applications. Lessons can be learnt from recent developments in the bridge construction industry, such ultra-high performance concrete materials, connection designs, structural designs with ultra-high performance concrete, and construction methods; these lessons need to be tailored to offshore structures to address specific challenges related to offshore loads and harsh environments.

-Life cycle assessments are needed to understand and validate the economic costs, environmental impact and social costs of offshore wind structures or components comparing new vs. existing technologies (materials, manufacturing, structural designs).

-Novel approaches for structural health monitoring of offshore wind structures, such as blades, columns and foundations, are needed considering the potential accelerated deterioration/degradation in offshore environments and difficulties with visual inspections. Multifunctional structural materials can enable both radically improved structural performance with lower costs, and damage/deterioration self-sensing capacity for early warning.

-Before reaching field demonstration and deployment, new offshore wind technologies should be tested first in laboratory settings with a controlled environment and parameters, in order to gain critical understanding for achieving rational designs addressing safety, durability and cost considerations.

-CEC can leverage, and greatly benefit from, the vast innovation capacity of CA universities, who can collaborate with national labs and industry to accelerate offshore wind research and development, accelerate an increase in technology levels and deployments, serve as an incubator for training future workforce/experts/decision makers for offshore wind and renewable energy infrastructure, and make California a national and international leader in this sector.