FLOWMAS: Floating Offshore Wind Modeling and Simulation

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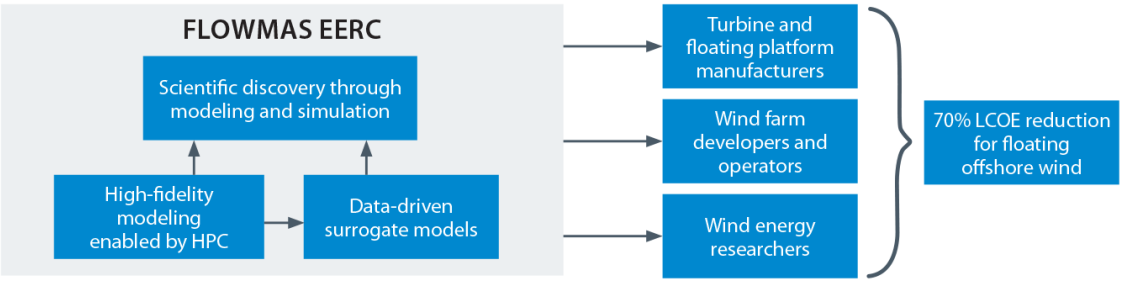
As part of a larger effort to decarbonize the electric grid, the U.S. Department of Energy's (DOE's) Floating Offshore Wind Shot seeks to reduce the levelized cost of energy (LCOE) of floating offshore wind energy 70% by 2035. The FLOWMAS Energy Earthshot Research Center (EERC) will deliver the fundamental research necessary to enable breakthroughs on this aggressive timeline. Knowledge of, and models for, the conditions, loads, and dynamics of floating offshore wind turbines in the meteorological-ocean environment are sorely lacking, especially in extreme conditions. One cannot fully optimize a system that is poorly understood and for which adequate models do not exist. FLOWMAS integrates researchers from mathematical-, computational-, and atmospheric-science backgrounds to better model and better understand the dynamics ranging from climate scales to wind turbine floating platforms and blades that are needed to achieve the Wind Shot. Building on DOE investments in high-fidelity models for climate and land-based wind energy that can exploit exascale-class computing, FLOWMAS researchers will create a suite of high-fidelity codes for floating offshore wind energy that incorporates the microscale (i.e., wind turbines, floating platforms, and mooring systems), mesoscale (i.e., regional weather dynamics), and global/climate scales. Researchers will use results from high-fidelity simulations and ongoing DOE-supported field campaigns to create data-driven surrogate models that are computationally efficient and can explore many system conditions and for long time durations not accessible with computationally expensive high-fidelity models. Finally, the developed models will leverage exascale-computing power to create a new understanding of the floating offshore wind energy system, including how climate change will impact offshore wind energy resources, the physics of floating wind farm and turbine wake dynamics, and the loads and dynamics of floating wind turbines during operational and extreme events.



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