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ROBUST AND EFFICIENT FSI-METHODS FOR WIND TURBINES

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Improved power output and reduction of installation and maintainence costs are critical factors in order for wind energy to be competitive to other sources of energy like oil, gas and water power. The design of efficient and reliable wind turbines is a challenging task which requires a thorough understanding of both the aerodynamic forces induced by the wind field and the structural response of the rotor and the tower.

Coupled fluid-structure interaction (FSI) simulations are needed for accurate modeling of wind turbines, and also to verify and improve parametrized models. Detailed FSI analysis will be even more important in the design of offshore wind turbines because of the extreme wind conditions at sea. Recently published FSI studies of the NREL 5MW offshore wind turbine [1] show that blade deflections can be significant, and also the presence of high frequency oscillations in the blade twist angle which could be important for fatigue analysis.

The resulting strong coupling and high resolution requirements require the development of more computationally efficient parallel FSI algorithms. Recent progress in suitable partitioned FSI schemes is presented, based on an isogeometric discretization for both the fluid and structure subsystems.

REFERENCES

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