

## Detection of aeroelastic instabilities for floating offshore wind turbines

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Floating wind turbines may sound impossible at first but is actually a very promising concept that already has established itself on the renewable energy market. They have the advantage of being deployed at deeper waters, where traditional bottom-fixed offshore wind turbines are no longer economically feasible. At these deeper waters, the winds are stronger and more consistent. This allows for a more even electricity production, which is exactly what wind energy is lacking today.

To ensure that the turbines remain operational and intact for their expected lifetime, this study aims to improve the detection process of vibrations in the rotor blades and the turbine tower, allowing operators to deal with them before the structure breaks down. Specifically, it assesses the risk of vortex-induced vibrations (VIV).

The results were reassuring and indicated that floating turbines are not more prone to VIV in the rotor blades than bottom-fixed ones, and they are actually less prone to vibrations in the turbine tower. This is attributed to the higher natural frequency of the towers on floating platforms, meaning that the wind speeds required for VIV to occur in the tower are far higher than for the same turbine on a bottom-fixed foundation.

In the past decade, bottom-fixed turbines have grown to colossal sizes, and researchers believe that this trend will hold true for floating turbines as well. To prepare for this, this study scales the findings to larger floating turbines of the future. The conclusions show that the blades of large-rotor floating turbines will likely not see more vibrations than their bottom-fixed counterparts, but the risk of tower vibrations is harder to predict. If larger turbines behave similarly to the ones analysed in this study, the risk will remain low. However, scaling up also means dealing with much heavier components on an unstable sea, a challenge that will require the wind industry to develop larger, more stable service and installation vessels in the decades to come.

