Novel Approaches for Physical Model Testing of Floating Wind Turbine Platforms

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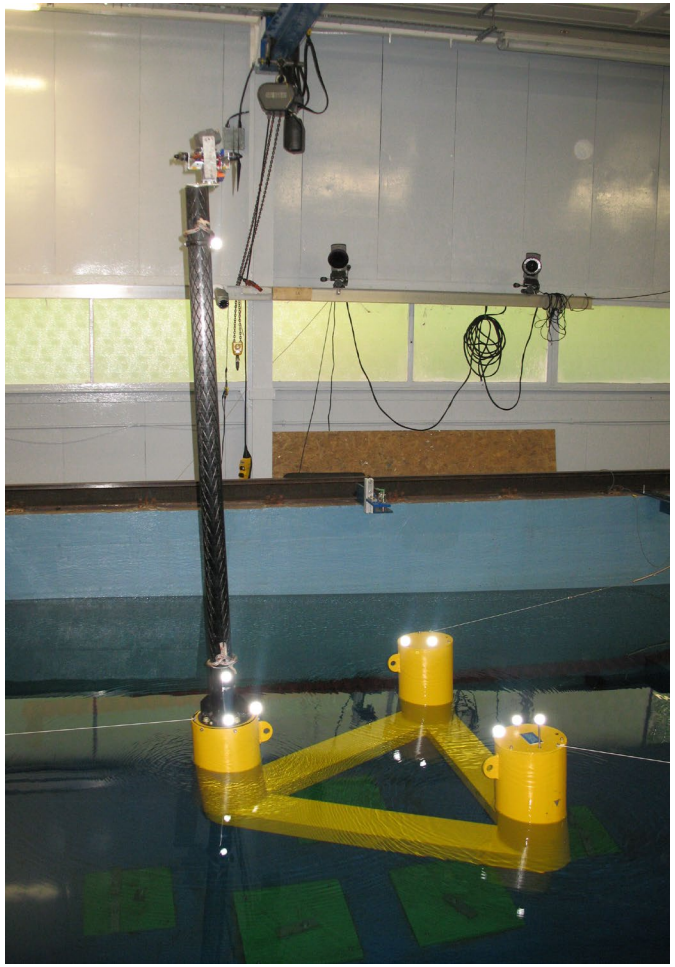
Background:

- *Growth in use of "Hybrid model testing" in recent years for floating wind turbines.*
- *Simulation of effects of wind loading with actuators (e.g. fan) software-controlled in real time*
- *In particular "Software in the loop" (SIL) systems used to simulate wind loading in place of direct physical generation*
- *Advantages include issues related to cost & size of models and equipment, scaling issues, and flexibility of test cases*



Challenges:

- *Complex approach due to coupling between aero and hydro effects – easy to make errors*
- *Lack of standard procedures for validation & uncertainty estimation*
- *Lack of understanding of level of complexity required for different TRL model tests*
- *Requirements for customised version of standard codes (e.g. FAST) for full SIL approach*
- *Real-time computing issues may lead to control lag with uncertain impact on results*

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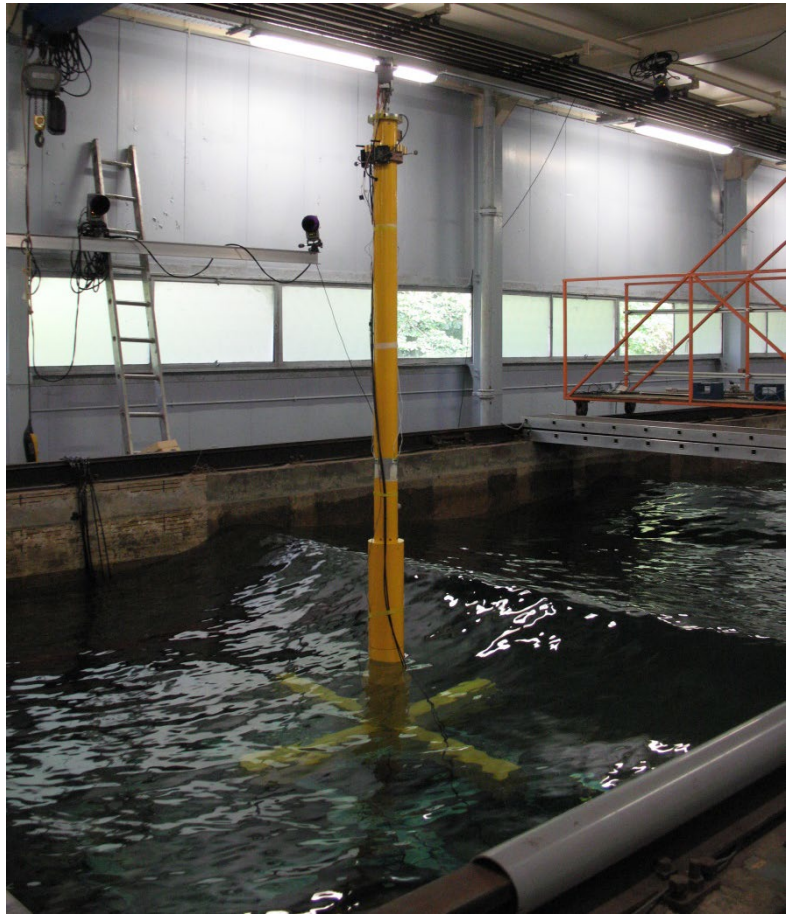
Aims:

- *Quantify benefits of using SIL and other hybrid testing approaches in testing of FOWT platforms*
- *Develop methodology and associated hardware for benchmarking performance of hybrid testing approaches*
- *Determine impact of system performance on simulation fidelity and uncertainty*
- *Develop metamodels for wind load simulation and test performance against "full" SIL approach*



Tasks :

- *Refine Hybrid system hardware*
- *Develop metamodels for wind load simulation (surge only)*
- *Develop benchmarking system hardware (1-DOF)*
- *Verify system and quantify uncertainty for metamodels v SIL*
- *Implemement and demonstrate working metamodel-based system in small-scale model tests*
- *Compare with constant load and full SIL cases.*