Reliability-Based Optimization of Floating Wind Turbine Support Structures

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Introduction

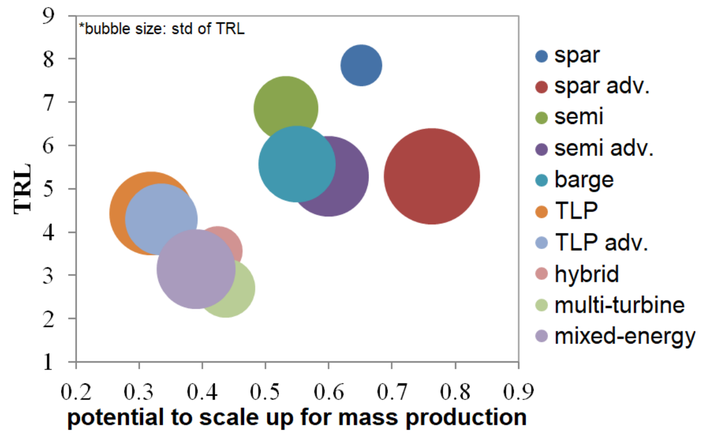
- Floating offshore wind turbines as promising solution for deep water sites;
- Challenging complex system dynamics and harsh offshore environment;
- Reliability-based design optimization for reducing downtimes and economic losses.

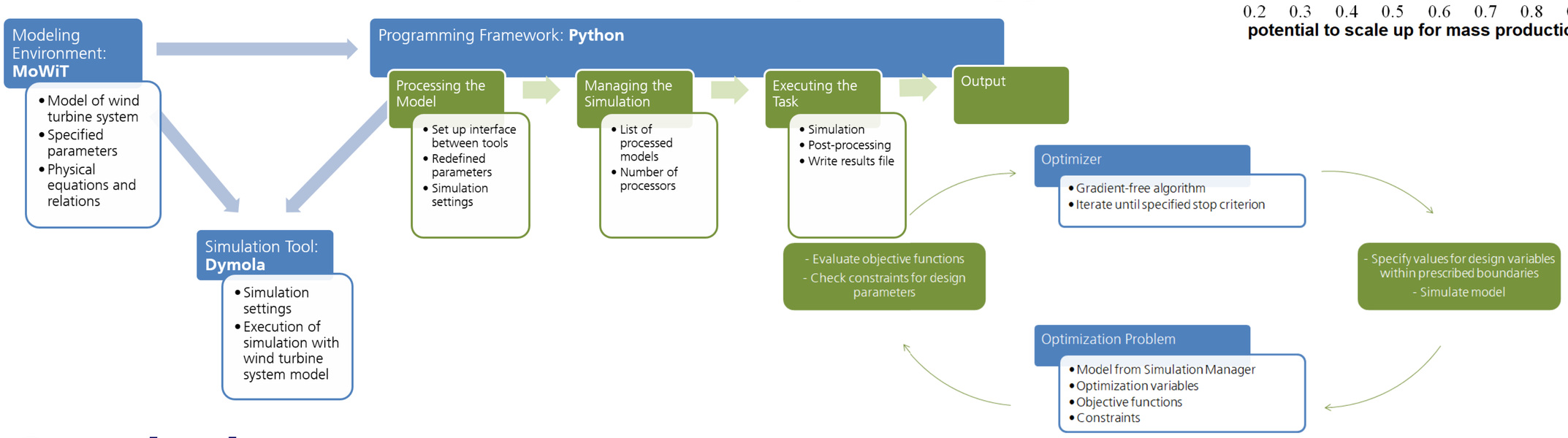
Aims and objectives

- Reliability methods for design optimization of floating wind turbine support structures
- Optimization strategy and design methodology
- Examined design variables, load cases, objectives, and optimization settings

Results and discussion

- Review and classification of reliability methods (qualitative, semi-quantitative, quantitative) [1]
- Review of FOWT support structures for wind farm deployment [2]
- Framework for automated simulation and optimization [3]



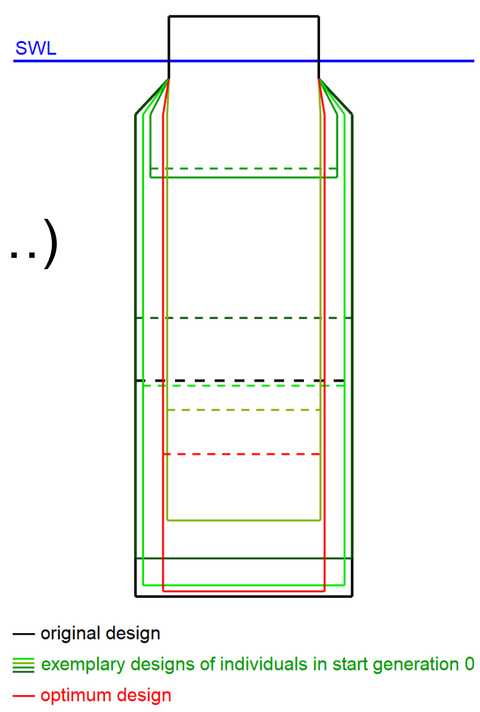


Conclusions

- Successful application of the framework to optimize the OC3 spar-buoy [3]
- High flexibility and broad application range (upscaling [4], controller tuning, …)

Future work

- Application of the framework for optimizing an advanced structure
- Reliability-based design optimization of a spar-type geometry



[1] Leimeister and Kolios (2018). *A review of reliability-based methods for risk analysis and their application in the offshore wind industry*. RSER 91 (2018) 1065-1076.

[2] Leimeister et al (2018). *Critical review of floating support structures for offshore wind farm deployment*. J. Phys.: Conf. Ser. 1104 012007.

[3] Leimeister (2019). *Python-Modelica Framework for Automated Simulation and Optimization*. Proceedings of the 13th International Modelica Conference.

[4] Leimeister et al. (2019). *Larger MW-Class Floater Designs Without Upscaling? – A Direct Optimization Approach*. Proceedings of OMAE 2019.

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