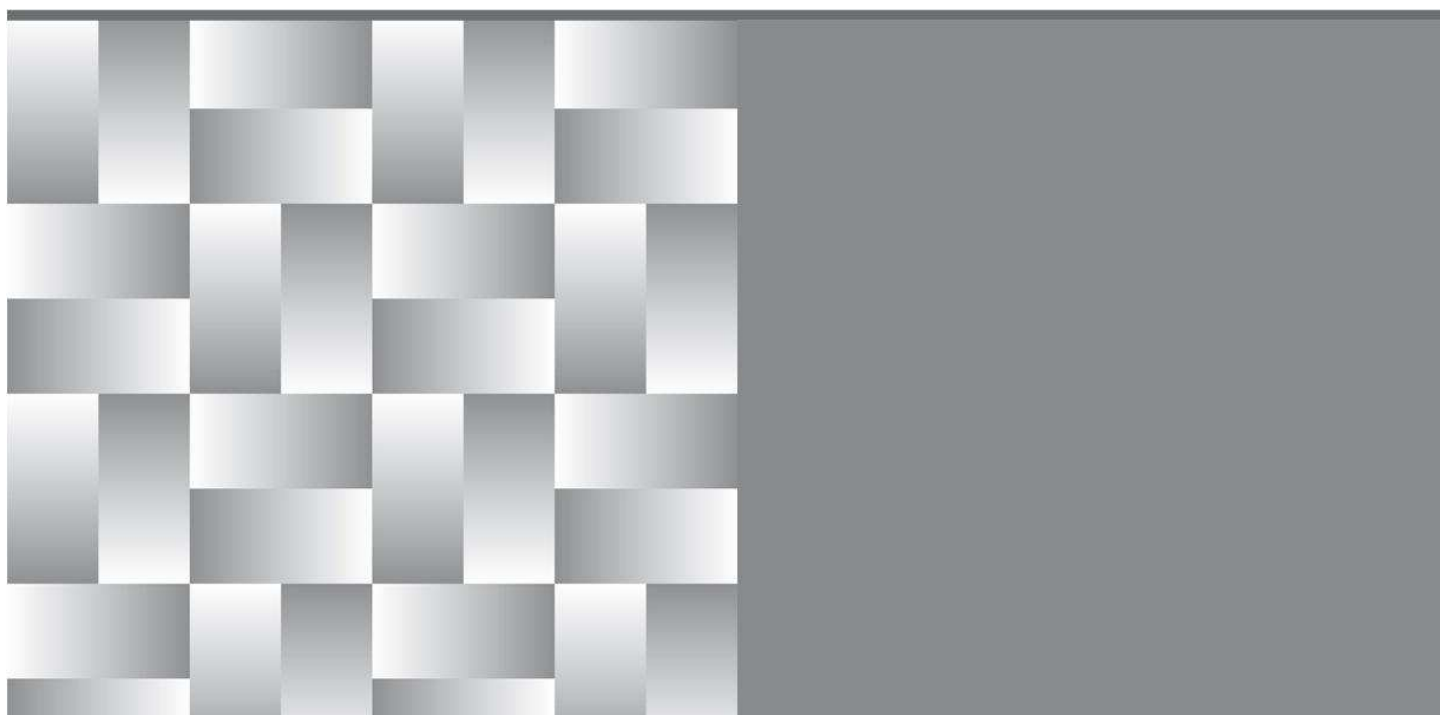


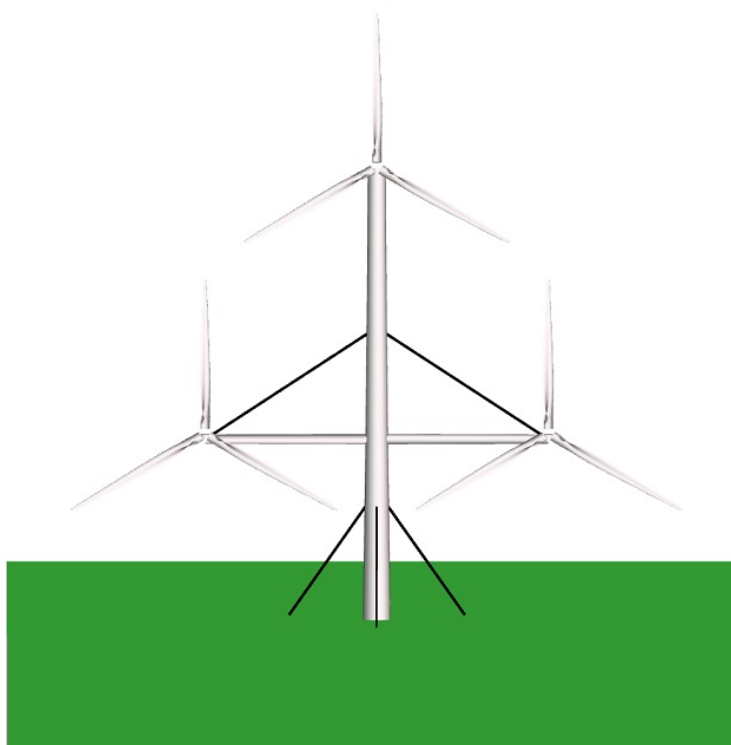
## HAWC2 Model of a Fictitious 30MW Tri-Rotor WT based on DTU 10MW RWT (short description)



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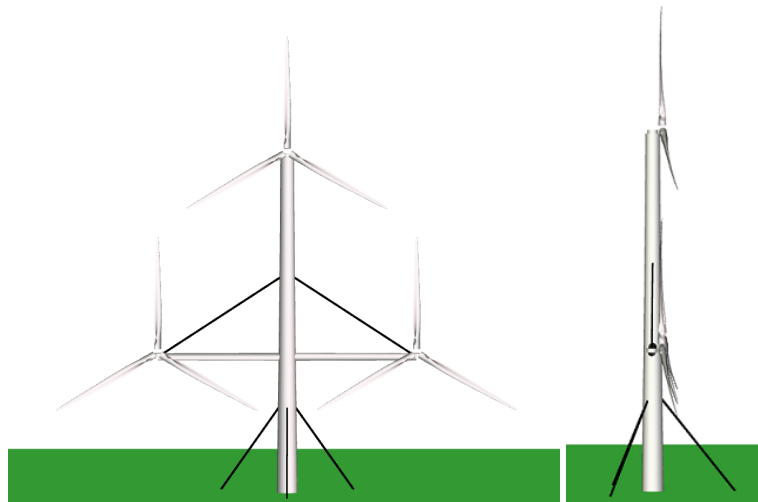
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# 1 Introduction

Short description of a multi-rotor (tri-rotor) horizontal axis wind turbine (MR-HAWT) HAWC2 model. Each rotor nacelle assembly (RNA) is based on the DTU 10MW reference wind turbine RNA. ( Bak et al., 2013). The tower is modified and the model includes 2 arms for the support of the lower two rotors. In addition 3 guy-wires provide extra support to the tower as well as 2 wires connect the arm ends to the tower. Each rotor is controlled with the basic DTU WE controller ( DTU Wind Energy, 2018). The aim of this fictitious model is to demonstrate the MR-HAWT design-analyses capabilities of HAWC2 code ( Larsen and Hansen, 2007). It is a fictitious WT model and no detailed aeroelastic design has been performed.

## 1.1 Wind Turbine Model

Each rotor has a diameter of 178 m and the blade length is 86.3 m. The hub-height for the centre upper rotor is located at 264 m above ground level and for the lower left and right rotors at 108 m above ground level. The combined electrical power output can reach 30 MW. A sketch of the MR-HAWT is shown at Figure 1. A summary of the basic WT characteristics is given at Table 1.



*Figure 1: Front and side view of the tri-rotor WT.*

Table 1: Main properties of the WT.

Property	Unit	Value
Number of rotors	[-]	3
Rotor diameter	[m]	178.332
Rotor rated electrical power	[kW]	10000
Total WT rated electrical power	[kW]	30000
Number of blades	[-]	9
Hub-height upper rotor	[m]	264
Hub-height lower rotors	[m]	108
Blade length	[m] 84	
Number of generators	[-]	3
Generator efficiency	[-]	0.95
Minimum rotor speed	[rad/s]	0.628
	[rpm]	5.997
	[Hz]	0.100
Rated rotor speed	[rad/s]	1.005
	[rpm]	9.597
	[Hz]	0.160
Cut-in wind speed	[m/s]	3
Cut-out wind speed	[m/s]	25
Maximum blade pitch angle rate	[deg/s]	4
Number of controllers	[-]	3
Controller name	[-]	DTU-WE-controller
Above rated control	[-]	Constant power

## 2 References

Bak, C. M., Zahle, F., Bitsche, R., T., K., and Yde, A. (2013). Description of the DTU 10 MW Reference Wind Turbine. Technical Report DTU Wind Energy-I-0092(en), Wind Energy Department - Technical University of Denmark.

Larsen, T. J. and Hansen, A. M. (2007). How to HAWC2, the users manual. Technical Report Risø-R-1597(en), Risoe National Laboratory - Technical University of Denmark.

DTU Wind Energy (2018). <https://github.com/DTUWindEnergy/BasicDTUController>. Wind Energy Department - Technical University of Denmark.