Simulating a 10-turbine wind farm connected to a power grid

Keywords: Renewable Energy, Doubly Fed Induction Generator, Wind Turbine Generation System

In this example, ten, fully detailed, doubly fed induction generator (DFIG) based wind turbine generation system (WTGS) models, were connected to a three-section transmission system through a transformer. All turbines were modeled with individual power electronics components. Each WTGS had its own distribution transformer, connected to the sub-collector bus (cBx).

In order to form a high-resolution benchmark for the design of a protective device and power electronic controller, we investigated fault responses of the wind farm, when running at a time step of 50µs. During the 100 second simulation, three kinds of grid faults were introduced: single-line-to-ground, two-phase-to-ground, and three-phase.

The simulation performed on a quad-core, dual-CPU Xeon 2.2 GHz PC running 6-CPUs and the RT-LAB simulation platform.

The results demonstrated that using a high-fidelity simulation of all doubly fed generators and power electronics IGBT switching, this complete model was able to execute with a step size of **28 microseconds**.

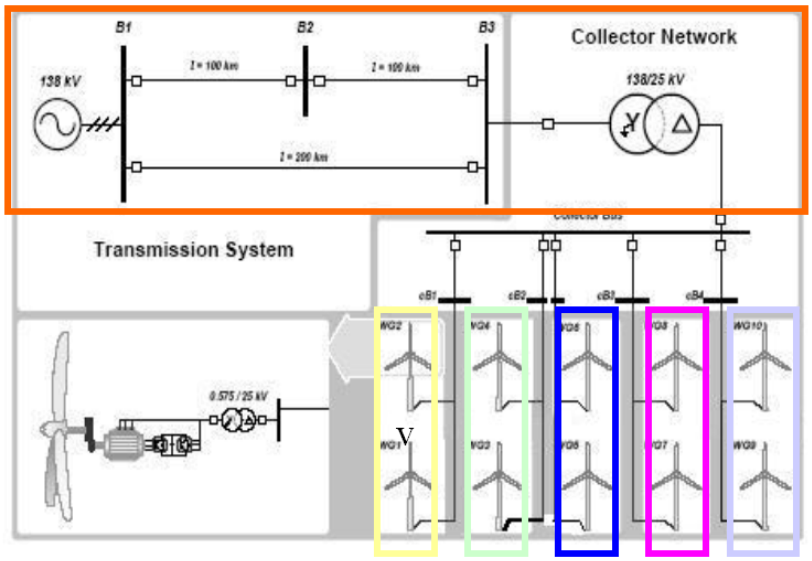

Figure 1. 10-turbine wind farm in a 6-CPU configuration

System configuration	
Hardware used	8-CPU HILBox outfitted with a dual quad-core Xeon PC running at 2.2 GHz
Software included	RT-LAB, RT-Events, ARTEMIS
Solution package	eMEGAsim