

Wind turbine generator voltage

A modern wind turbine is often equipped with a transformer stepping up the ...

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The following figure shows the model of a wind turbine. The mechanical and electrical domains each require their own Solver Configuration block.

This subsystem demonstrates how to model the wind turbine state machine. The turbine state machine defines four wind turbine states.

Park brake mode: This is the entry mode of the wind turbine operation. The wind turbine enters the park brake mode from the pitch brake mode when the turbine rotor speed is under the permissible limits for safe operation. During this mode, the generator is in the tripped state, the hydraulic park brake is engaged, and the wind turbine rotor blades are pitched to the braking angle for the aerodynamic braking. The hydraulic brake is the secondary method for braking the wind turbine.

Startup mode: The wind turbine enters the startup mode from the park brake mode when the wind speed is under the permissible limits for safe operation. The wind turbine enters this mode from the pitch brake mode when the wind speed and the turbine speed are under the permissible limits. During this mode, the generator is in the tripped state, the hydraulic park brake is released, and the wind turbine rotor blades are pitched to the minimum angle for achieving the maximum turbine rotor acceleration.

Generating mode: The wind turbine enters the generating mode from the startup mode when the wind turbine rotor speed goes above the turbine cut in speed. During this mode, the generator is connected to the transformer, the hydraulic park brake is released, and the wind turbine rotor blades are pitched to achieve the optimal electric power generation as per the operating conditions.

Pitch brake mode: The wind turbine enters pitch brake mode from generating mode when the wind speed and turbine rotation speed are not under the permissible limits. The wind turbine enters the pitch brake mode from the startup mode when the wind speed is not under the permissible limits. During this mode, the generator is connected to the transformer to consume the kinetic energy available in the rotor blade, the hydraulic park brake is released, and the wind turbine rotor blades are pitched to the braking angle for the aerodynamic braking. The aerodynamic braking is the primary method for braking the wind turbine.

This subsystem demonstrates how to model the pitch angle controller of the wind turbine.

Park brake and pitch brake mode: The pitch angle is set to 95 degree for the aerodynamic braking during these

modes.

Startup mode: The pitch angle is set to 1 degree for achieving the maximum acceleration during this mode.

Generating mode: The pitch angle is set to achieve the optimal electric power generation as per the operating conditions.

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