

Distinguish, differentiate, compare and explain what is the Difference between synchronous generator and asynchronous generator. Comparison and Differences.

Difference between synchronous generator and asynchronous generator

In simple, synchronous generator supply both active and reactive power but asynchronous generator (induction generator) supply only active power and observe reactive power for magnetizing. This type of generators is used in windmills.

Asynchronous Generator

Squirrel Cage Induction Generator The fixed speed concept is used in this type of wind turbine. In this configuration, the Squirrel Cage Induction Motor is directly connected to the wind through a transformer. A capacitor bank is here for reactive power compensation and a soft starter is used for smooth grid connection. It does not support any speed control is the main disadvantage.

Wound rotor induction generator (WRIG)

The variable speed concept is used in this type. In this type of turbine, Wound Rotor Induction Generator is directly connected to the grid as shown in the figure. The variable rotor resistance is for controlling slip and power output of the generator. The soft starter used here for reducing inrush current and reactive power compensator is used to eliminate the reactive power demand. The speed range is limited, poor control of active and reactive power, the slip power is dissipated in the variable resistance as losses are the disadvantages of this configuration.

Synchronous Generator

Wound Rotor Generator

Turbine with wound rotor connected to the grid. This configuration neither requires soft starter nor a reactive power compensator is its main advantage. The partial scale frequency converter used in the system will perform reactive power compensation as well as a smooth grid connection. The wide range of dynamic speed control depends on the size of frequency converter. The main disadvantage is that in the case of grid fault it requires additional protection and use slip rings, this makes electrical connection to the rotor.

Permanent Magnet Generator

The generator is connected to the grid via full-scale frequency converter. The frequency converter helps to control both the active and reactive power delivered by the generator to the grid.

Doubly Fed Induction Generator

In order to satisfy the modern grid codes, the grid turbine system has the capability of reactive power support. Doubly fed induction generator based wind turbine system has more advantages than others. DFIG wind turbine delivers power through the stator and rotor of the generator the reactive power can provide in two sides. Hence use the term doubly. Reactive power can be supported either through grid side converter or through rotor side converter. The stator part of the turbine is directly connected to the grid and the rotor is interfaced through a crowbar and a power converter. The voltage to the stator part is applied from the grid and the voltage to the rotor is induced by the power converter. The power is delivered from the rotor through the power converter to the grid if the generator is operated above synchronous speed.