DFIGs are widely used in grid-connected wind turbines because they support the grid effectively and allow variable-speed operation, which maximizes energy capture under changing wind conditions.

Variable-Speed Operation

Unlike standard squirrel-cage generators, DFIGs provide direct access to the rotor windings. This allows the generator to be magnetized from either the stator or the rotor circuit using a slip power recovery scheme. As a result, the turbine can operate efficiently at both sub-synchronous and super-synchronous speeds, adapting well to fluctuating wind.

Fractional Power Conversion

Only a small part of the total power (slip power) passes through the converter. This reduces converter size, cost, and losses.

Active and Reactive Power Control

The system uses two independently controlled inverters — the rotor-side inverter and the grid-side inverter. Together, they allow precise and decoupled control of both active and reactive power, enabling the turbine to meet grid requirements effectively.

Grid Quality Support

Through advanced control of the grid-side inverter, the system can actively compensate for harmonics on the grid side. This improves the overall quality of power delivered to the utility grid.