

Grid Code Requirements for Grid Integration of WECS

Introduction

A Grid Code specifies technical requirements for connecting Wind Energy Conversion Systems (WECS) to the power grid. It ensures safe, reliable, and stable operation.

1. Fault Ride-Through (FRT/LVRT)

WECS must remain connected during temporary voltage dips caused by faults and support voltage recovery by injecting reactive power.

2. Active Power Control

Wind turbines regulate real power using pitch control, torque control, and curtailment to balance supply and demand.

3. Reactive Power Control

WECS supply or absorb reactive power to maintain grid voltage and improve power factor.

4. Frequency Regulation

Modern turbines provide synthetic inertia and frequency response to help maintain 50 Hz system frequency.

5. Voltage Regulation

Voltage is maintained using reactive power control, OLTC transformers, capacitor banks, and FACTS devices.

6. Power Quality

Grid codes limit harmonics, flicker, and require acceptable power factor.

7. System Protection

Includes overcurrent, over/undervoltage, earth fault, frequency, anti-islanding, and communication protection.

8. Grid Synchronization

Voltage, frequency, phase sequence, and phase angle must match before connection.

9. Communication and Monitoring

SCADA systems monitor turbine status, power, voltage, frequency, and faults.

10. Forecasting

Wind farms provide day-ahead and real-time generation forecasts for reliable grid operation.

Conclusion

Compliance with grid codes enables secure integration of wind energy while maintaining grid stability, reliability, and power quality.