

Generators

Omagh College



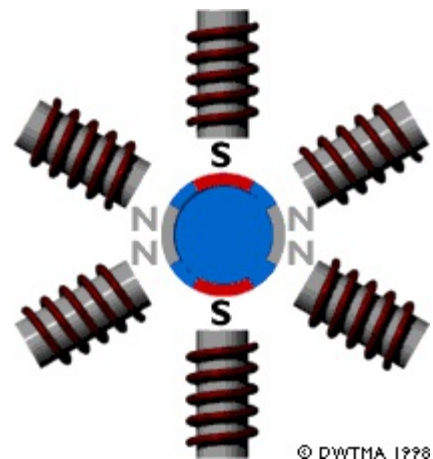
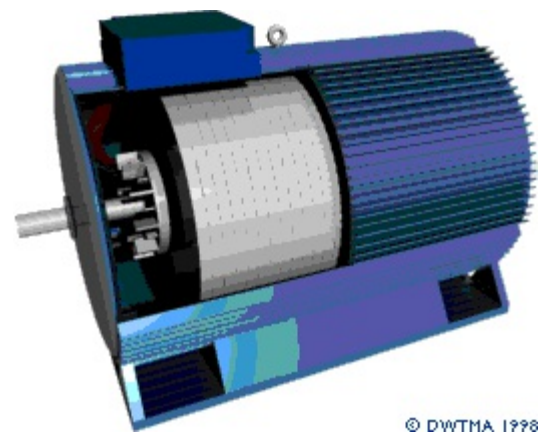
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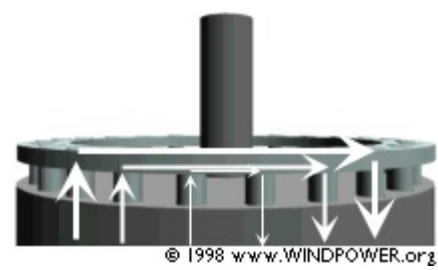
Principles

- All based on induction
- Electro or permanent magnets
- Power = speed x torque
- Direct or indirect grid connection
- Mostly without slip rings (less maintenance)



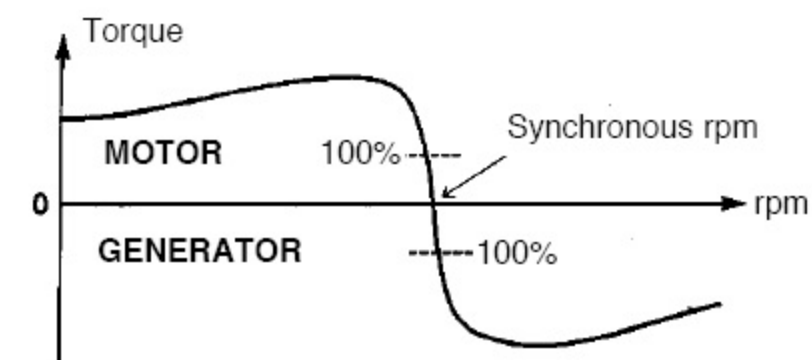
Synchronous machines

Rotating stator field keeps rotor speed constant



Asynchronous machines

Rotating stator field turns the rotor with a certain slip

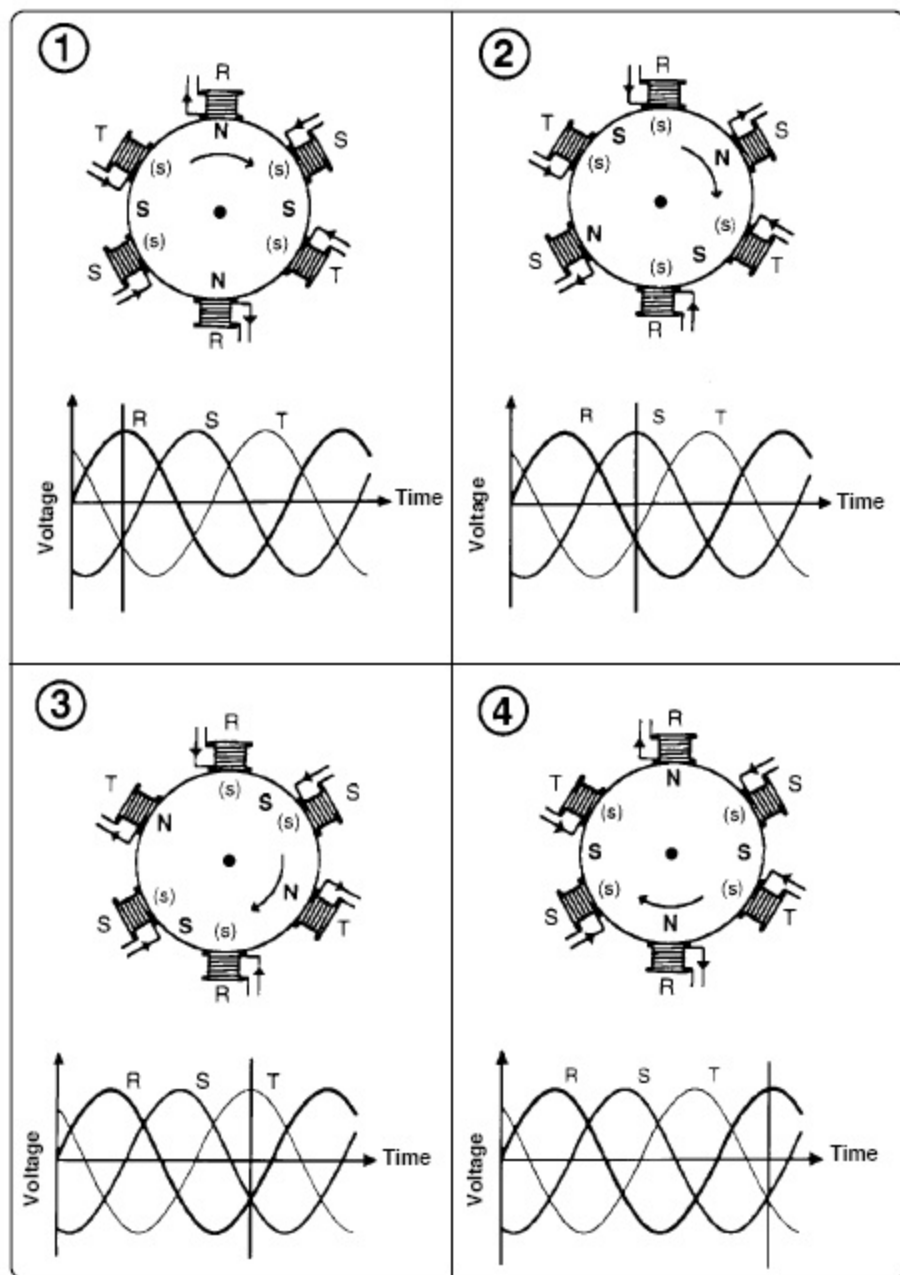


Torque curve

The steep part of the curve explains how an asynchronous generator can keep the rotor speed almost constant Pole number

- 2 = 3000 rpm
- 4 = 1500 rpm
- 8 = 750 rpm etc

- Some machines can change number of poles, and so optimise the rotor speed
- Multipole generators may be connected directly to the propeller



4 situations of the rotation magnetic field

3-phase generators
are used in almost all
wind turbines

Tornado-Tuff
Designed, Built, and Proven
in America's Tornado Alley

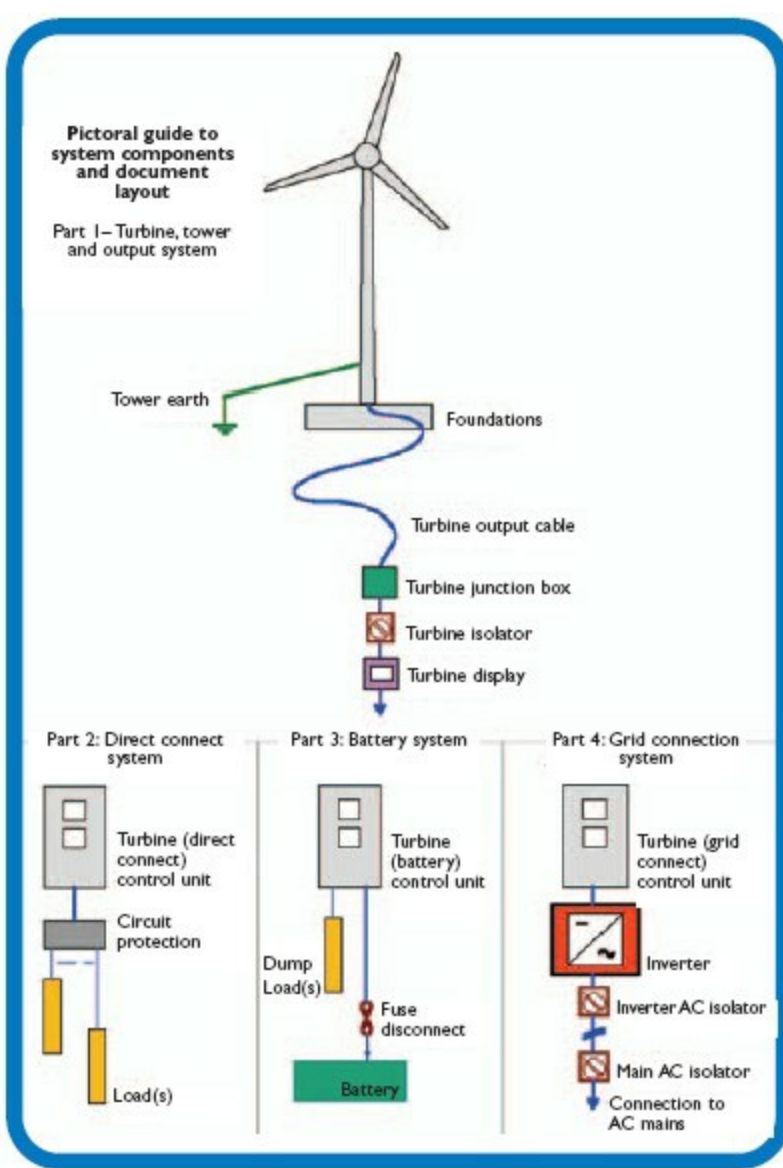


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10KW CLASS WIND TURBINE

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- AMERICA'S BEST SELLING RESIDENTIAL SYSTEM
- CERTIFIED BY CALIFORNIA ENERGY COMMISSION
- SIMPLE DESIGN - 3 MOVING PARTS
- PATENTED POWERFLEX® ROTOR SYSTEM
- AUTOFURL® AUTOMATIC STORM PROTECTION
- DIRECT-DRIVE PM ALTERNATOR
- NO SCHEDULED MAINTENANCE REQUIRED
- HEAVY-DUTY CONSTRUCTION
- DESIGNED FOR 30+ YEARS
- POLYURETHANE AIRCRAFT-QUALITY PAINT
- PROVEN, OVER 50 MILLION OPERATIONAL HOURS

- Permanent Magnet Generators directly coupled to the main shaft are common on small wind turbines.
- Produces "wild" AC current (variable frequency)
- A few manufacturers use brushless DC generators



Direct grid
connection with
asynchronous
generator (larger
machines)

Indirect grid
connection with
synchronous or
asynchronous
generator (smaller

machines)

Power quality issues (Grid)

- Voltage surges (if cut-in is not soft enough)
- Increased voltage level in weak grids
- Reactive power consumption
- Noise from electronic controls
- Same impact as corresponding motor load