SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A+ Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 19EEO305 /Renewable Energy Generation Technology

IV YEAR / VII SEMESTER

UNIT 3- WIND ENERGY

Topic 7 – Grid connected WECS

SUCCESSFUL STUDENT

Positive Attitude

Professionally Groomed

Socially Interactive

Technically Skillful

STANDALONE MODE

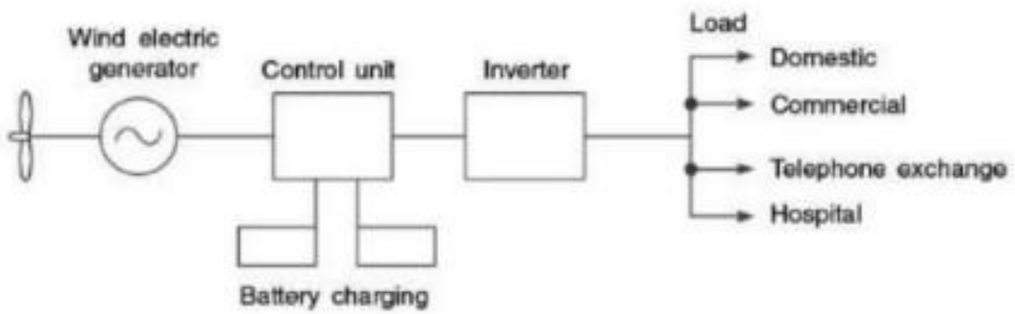


Figure 7.24 A standalone 5 kW wind electric generator.

- ✓ represents decentralized application of wind energy
- ✓ is characterized by the situation where an individual energy consumer or a group of consumers install their own wind turbine
- ✓ A WEG with a capacity of 2.5 kW to 5 kW is useful for domestic power supply
- ✓ The two most promising applications of the wind energy conversion system are:
  - ❖ Power supply for domestic use and battery charging
  - ❖ Windmill water pump for irrigation and drinking purposes
- ✓ It operates independently with a battery and its charging equipment
- ✓ Such installations are useful for remote mountainous regions where the extension of grid or supply of oil is a remote possibility.
- ✓ As the wind changes speed, the pitch of the blades is adjusted to control the frequency of turbine rotation

Backup Mode Like Wind–Diesel Power Supply

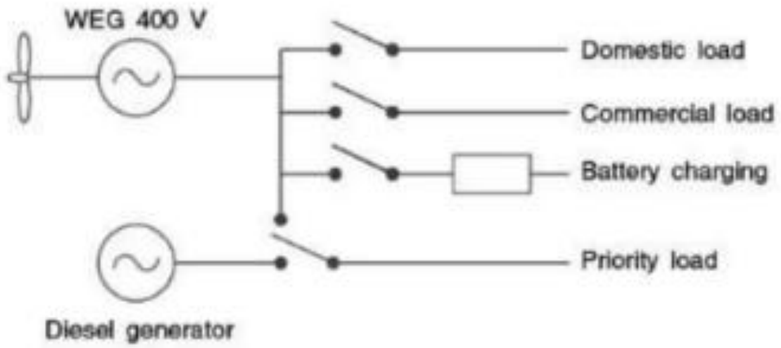


Figure 7.27 Wind–diesel power supply.

- ✓ Wind energy, being intermittent, requires a backup of diesel generator to maintain a 24-hour power supply.
- ✓ In areas inaccessible to grid power, the emergency loads of hospitals, defense installations and communication services are met with a wind–diesel hybrid system, while the general loads of domestic and commercial establishments are fed by WTG
- ✓ As the wind speed drops, low tariff loads are automatically switched off to reduce the demand.
- ✓ During the period of no wind, priority loads are fed by the diesel generator.

Grid Connected Wind Turbine Generators

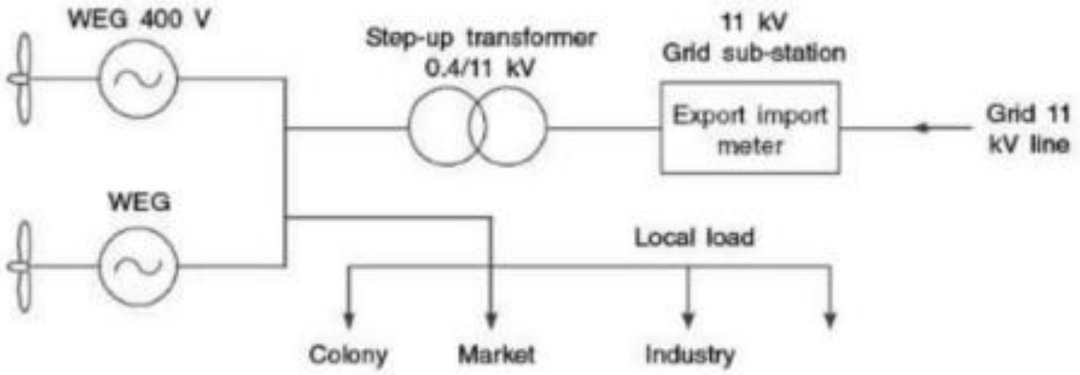


Figure 7.28 Grid-connected wind turbine generators.

- ✓ A common arrangement for connecting medium capacity WTGs (250 kW) to 'state grid' is shown in Figure 7.28.
- ✓ WTGs generate electric power at 400 V; it is then stepped up to make this voltage compatible to the grid (11 kV).
- ✓ In India, grid-connected WEGs constitute wind farms where the generated power is distributed among the nearby consumers and the excess power is exported to the grid.
- ✓ Electrical energy is purchased (imported) from the grid during periods of no wind.

WIND ENERGY CONVERSION SYSTEMS

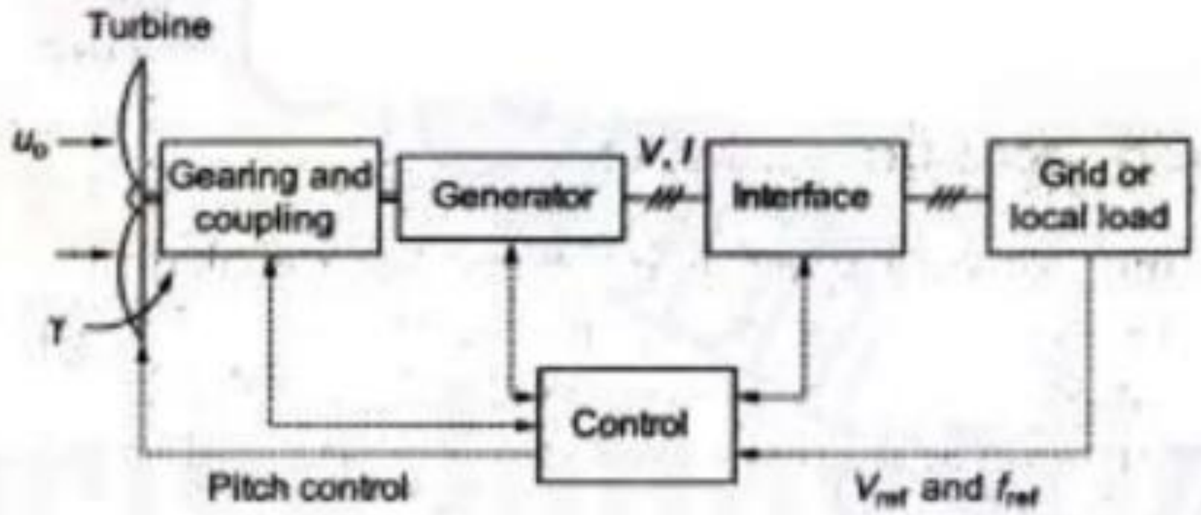
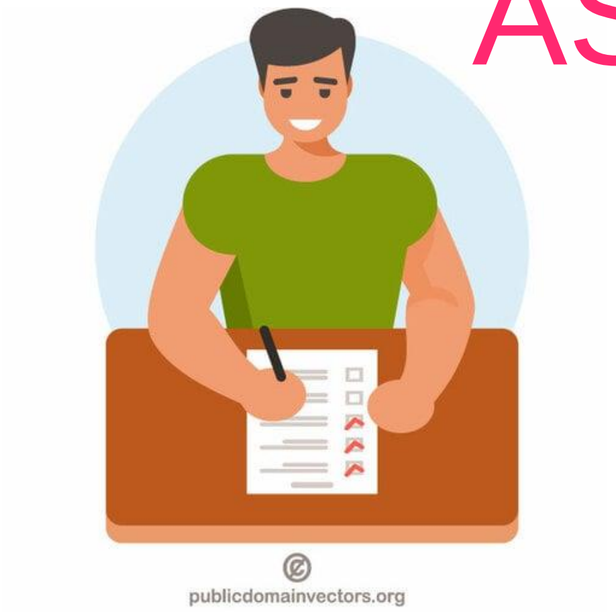


Fig. 7.23 *General block diagram of a WECS*

- ✓ General block diagram WECS is as shown in Figure
- ✓ **Turbine shaft speed is stepped up** with the help of gear system to suit generator speed
- ✓ Fixed gear ratio is preferred than variable gear ratio

- ✓ Generator 3 types
  - ❖ large WTGs, - induction generators
  - ❖ Medium capacity WTGs - synchronous generators
  - ❖ Small capacity WTGs - permanent magnet dc generators
- ✓ Interface
  - ❖ power electronic converters, transformers (high frequency), filters
- ✓ Control unit
  - ❖ monitors and controls the interaction among various blocks

ASSESSMENT



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2. D.P.Kothari, K.C.Singal and Rakesh Ranjan,”Renewable energy sources and Emerging Technologies”, PHI Pvt. Ltd., 2009. (UNIT I-V)

THANK YOU!!