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 8 – Grid connected WECS and its issues

SUCCESSFUL STUDENT

Positive Attitude

Professionally Groomed

Socially Interactive

Technically Skillful

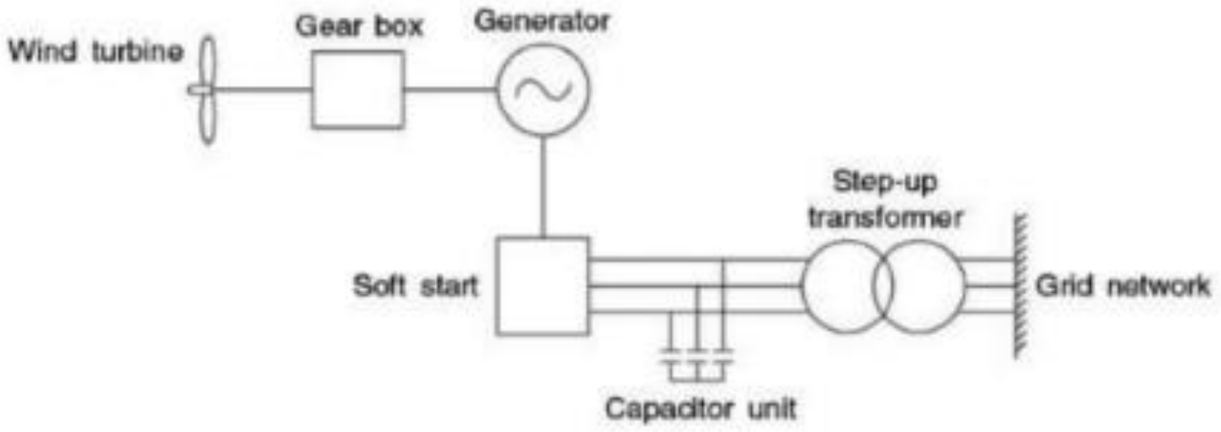


Figure 8.10 Schematic diagram of a fixed speed WEG.

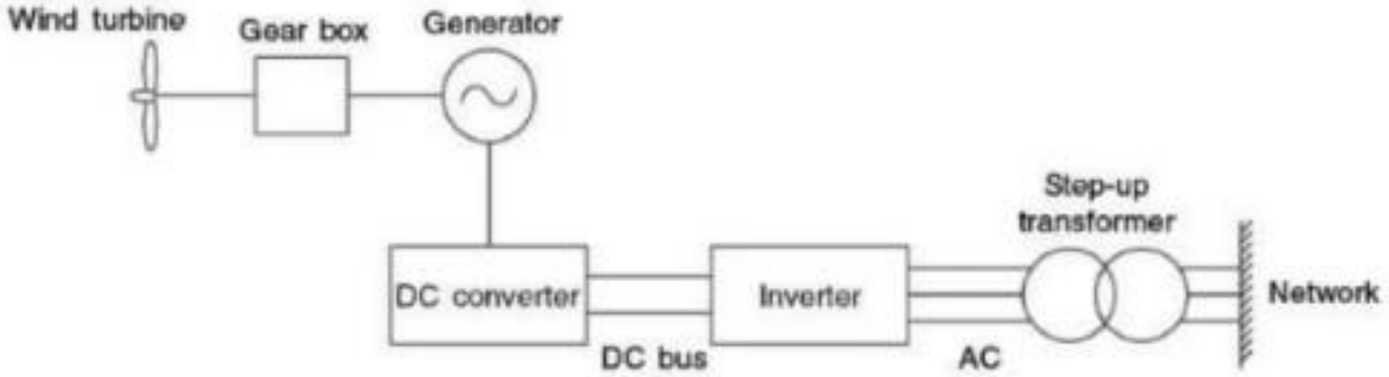


Figure 8.11 Schematic diagram of a variable speed WEG.

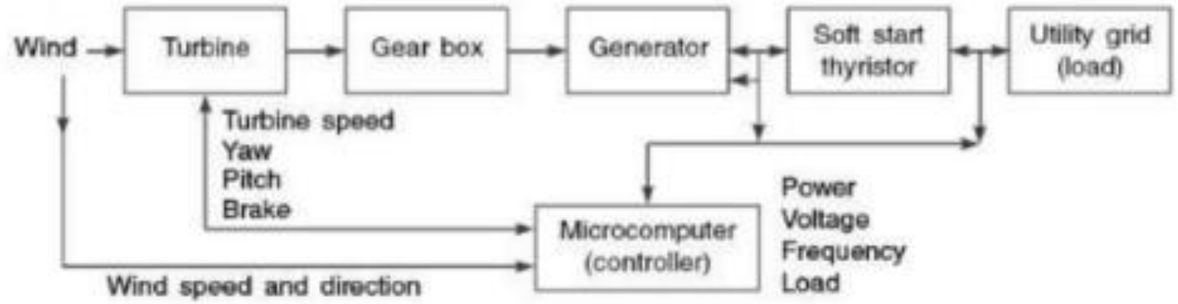


Figure 8.12 Block diagram of a wind farm with microprocessor-based control system.

Microprocessor-based control system

- ✓ used with the grid-connected wind farms
- ✓ It is equipped with remote control and automatic call facility
- ✓ The controller can communicate with the wind farm through a PC and a modem on a telephone line

- ✓ The microcomputer receives
  - ❖ the input of wind speed and direction
  - ❖ load /grid voltage and frequency
- ✓ It sends signals to the turbine to establish proper yaw (direction control), blade pitch (pitch control) and to activate the brakes in high winds
- ✓ The microcomputer may turn on optimal loads in strong winds and can also adjust the power conditioner to change the load voltage and frequency

GRID INTEGRATION

Wind Electric Generators are designed to operate satisfactorily within the following grid parameters

- ✓ Voltage — 400/440 V ± 13%
- ✓ Frequency — 50 Hz, –3 Hz, +1 Hz
- ✓ Asymmetry current ±12.5%

Grid System and Properties

The short-circuit power level of grid (S_{SC}) at PCC (power control centre) is defined as the product of the rated voltage and the short-circuit current at PCC of the wind farm, i.e.,

$$S_{sc} = \frac{3}{2} V_r I_{sc}$$

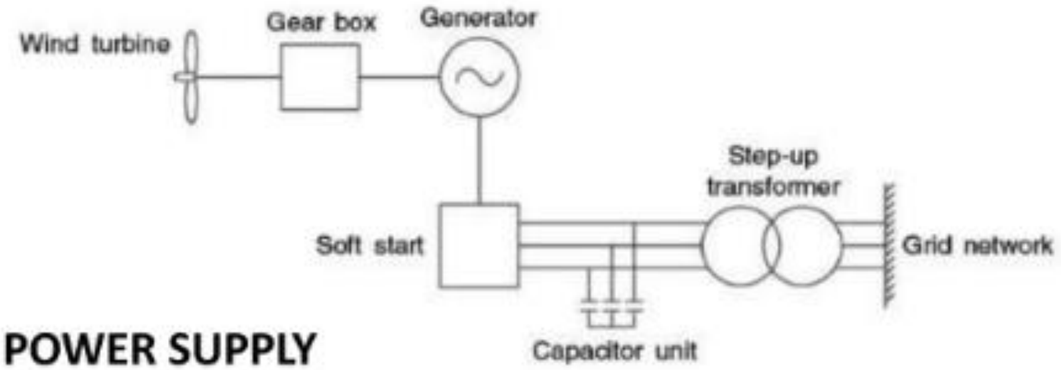
The short-circuit ratio is a basic characteristic measure of the grid which is defined as

$$R_{SC} = \frac{S_{sc}}{S_r}$$

where

S_{SC} = short-circuit power level of the grid

S_r = rated turbine power level.

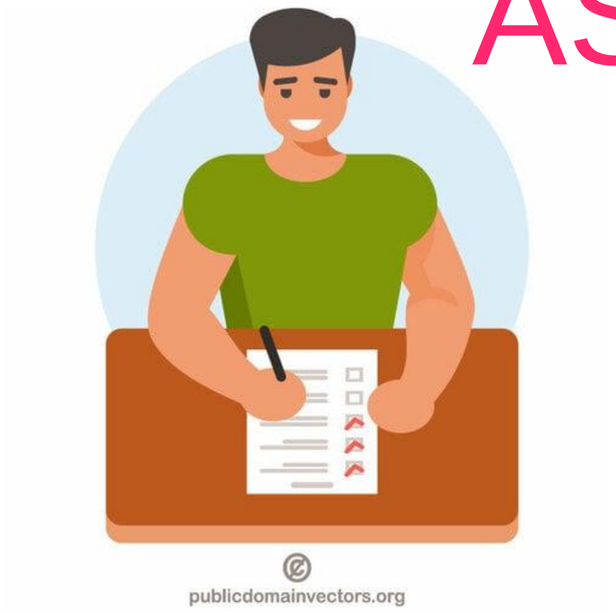


REACTIVE POWER SUPPLY

Figure 8.10 Schematic diagram of a fixed speed WEG.

With conventional energy system, generators besides supplying active power, also supply reactive power required by consumers to operate their electrical equipment But in case of WEGs (induction type), they require reactive power to start power generation. To have availability of reactive power, each WEG is provided shunt capacitors. These capacitors meet reactive power requirement of WEG and maintain power factor at the rated value of 0.95

ASSESSMENT



REFERENCE

Reference Book:

1. S.P. Sukhatme, ‘Solar Energy’, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997. (UNIT II)

2. G.N. Tiwari, ‘Solar Energy – Fundamentals Design, Modelling and applications’, Narosa Publishing House, New Delhi, 2002. (UNIT II)

3. S.M. Muyeen,” Wind Energy Conversion Systems: Technology and Trends”, Springer 2012. [UNIT III]

Text Book:

1. G.D. Rai, ‘Non Conventional Energy Sources’, Khanna Publishers, New Delhi, 2006. (UNIT I - V)

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!!