



# **SNS COLLEGE OF ENGINEERING**

Kurumbapalayam (Po), Coimbatore – 641 107

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## **DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**COURSE NAME : 19EE605 PROTECTION AND SWITCHGEAR**

III YEAR /VI SEMESTER

Unit 1- PROTECTION SCHEMES

Topic: Need for Protective Systems



# NEED FOR PROTECTIVE SYSTEMS



Power system consists of generators, transformers, transmission and distribution lines, etc.

- Short circuits and other abnormal conditions often occur on a power system.
- The heavy current associated with short circuits is likely to cause damage to equipment if suitable protective relays and circuit breakers are not provided for the protection of each section of the power system.
- Short circuits are usually called faults by power engineers. Strictly speaking, the term 'fault' simply means a 'defect'.
- Some defects, other than short circuits, are also termed as faults. For example, the failure of conducting path due to a break in a conductor is a type of fault.



# NEED FOR PROTECTIVE SYSTEMS



- If a fault occurs in an element of a power system, an automatic protective device is needed to isolate the faulty element as quickly as possible to keep the healthy section of the system in normal operation.
- The fault must be cleared within a fraction of a second.
- If a short circuit persists on a system for a longer, it may cause damage to some important sections of the system.
- A heavy short circuit current may cause a fire. It may spread in the system and damage a part of it.
- The system voltage may reduce to a low level and individual generators in a power station or groups of generators in different power stations may lose synchronism.
- Thus, an uncleared heavy short circuit may cause the total failure of the system.



# NEED FOR PROTECTIVE SYSTEMS



- A protective system includes circuit breakers, transducers (CTs and VTs), and protective relays to isolate the faulty section of the power system from the healthy sections.
- A circuit breaker can disconnect the faulty element of the system when it is called upon to do so by the protective relay.
- Transducers (CTs and VTs) are used to reduce currents and voltages to lower values and to isolate protective relays from the high voltages of the power system.
- The function of a protective relay is to detect and locate a fault and issue a command to the circuit breaker to disconnect the faulty element.



# NEED FOR PROTECTIVE SYSTEMS



- The basic electrical quantities which are likely to change during abnormal conditions are current, voltage, phase-angle (direction) and frequency.
- Protective relays utilize one or more of these quantities to detect abnormal conditions on a power system.
- Protection is needed not only against short circuits but also against any other abnormal conditions which may arise on a power system.
- A few examples of other abnormal conditions are over speed of generators and motors, overvoltage, under frequency, loss of excitation, overheating of stator and rotor of an alternator etc.
- Protective relays are also provided to detect such abnormal conditions and issue alarm signals to alert operators or trip circuit breaker.





# NEED FOR PROTECTIVE SYSTEMS



- A protective relay does not anticipate or prevent the occurrence of a fault, rather it takes action only after a fault has occurred.
- However, one exception to this is the Buchholz relay, a gas actuated relay, which is used for the protection of power transformers.
- The cost of the protective equipment generally works out to be about 5% of the total cost of the system.



# Assessment



1. What is switchgear?

- a) An apparatus used for switching, controlling and protecting the electrical circuits and equipment's.
- b) It detects the faults only
- c) It corrects the faults only
- d) All of the above.





# References



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2. Paithankar Y G, Bhide S R, “Fundamentals of Power System Protection”, Prentice Hall of India Pvt Ltd., New Delhi, 2<sup>nd</sup> Edition, 2014.
3. Badriram, Vishwakarma B.H, “Power System Protection and Switchgear”, New Age International Pvt Ltd Publishers, 2<sup>nd</sup> Edition 2017.

**Thank You**