

MODULE : TB6

GENERATOR AND GENERATOR PROTECTION

COURSE DESCRIPTION:

- Operation of Generator
 - Capability curve, efficient real and reactive power loading, feasible operating regions
 - Fundamental concepts in {P(kW) – F(Speed)} and {Q(kVAR) – V(Voltage)} loop controls
 - Recommended Governor control modes and AVR control modes for isolated operation and parallel operation with grid
- Generator protection elements
 - Over load protection, RTD, insulation class, loss of insulation life
 - Stator earth fault, core damage curve, effect of neutral grounding, voltage based and current based schemes
 - Differential protection
 - Over fluxing protection: generator withstand curve
 - Field over heating
 - Rotor earth fault: effects, Stage 1(Alarm) and Stage 2(Trip), special remarks - monitoring through slip rings in brushless excitation system,
 - Loss of excitation: unit behavior, off set mho relay with and without under voltage, complementary to pole slipping relay

- Reverse power: unit behavior, influence of prime mover (Steam, Hydro, Gas, Diesel), application of low forward power, measuring CT requirement, testing relay operation on line
 - Unbalanced current (Negative Sequence) protection: source of unbalance, effect on rotor, I_2^2t relation, influence of machine cooling, Negative sequence loading on captive units in presence of non-linear loads when operating in parallel with grid and in isolation.
 - Voltage controlled and voltage restrained over current protections: where useful and where not useful, DMT and IDMT characteristics
 - Under frequency protection : Steam, Hydro, Gas and Diesel
 - Pole slipping: Critical Clearing Time and loss of synchronism, mho relay with blinders
 - Inadvertent energizing : scheme and precautions
 - PT fuse failure schemes : with one PT, with three PTs
 - Recommended protections for small, medium and large generating units
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- Load and no load dynamics and testing of following protection schemes at site:
 - Differential : Stability and sensitivity checks
 - Stator earth fault
 - Negative sequence
 - Case study : Typical calculation procedure for setting Generator numerical protection relay (e.g. REM 543)
 - Case studies / discussions on reported abnormal occurrences: Reverse power, Differential, Over Frequency.