



# SNS COLLEGE OF TECHNOLOGY



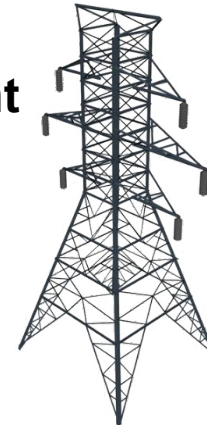
(An Autonomous Institution)

COIMBATORE-35

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## UNIT V: MONITORING AND CONTROL

TOPIC: System Security Assessment





# TOPIC OUTLINE

- **DEFINITION**
- **BLOCK DIAGRAM**
- **PREVENTIVE STATE**
- **EMERGENCY STATE**
- **RESTORATIVE STATE**
- **COMPONENTS OF SECURITY ASSESSMENT**



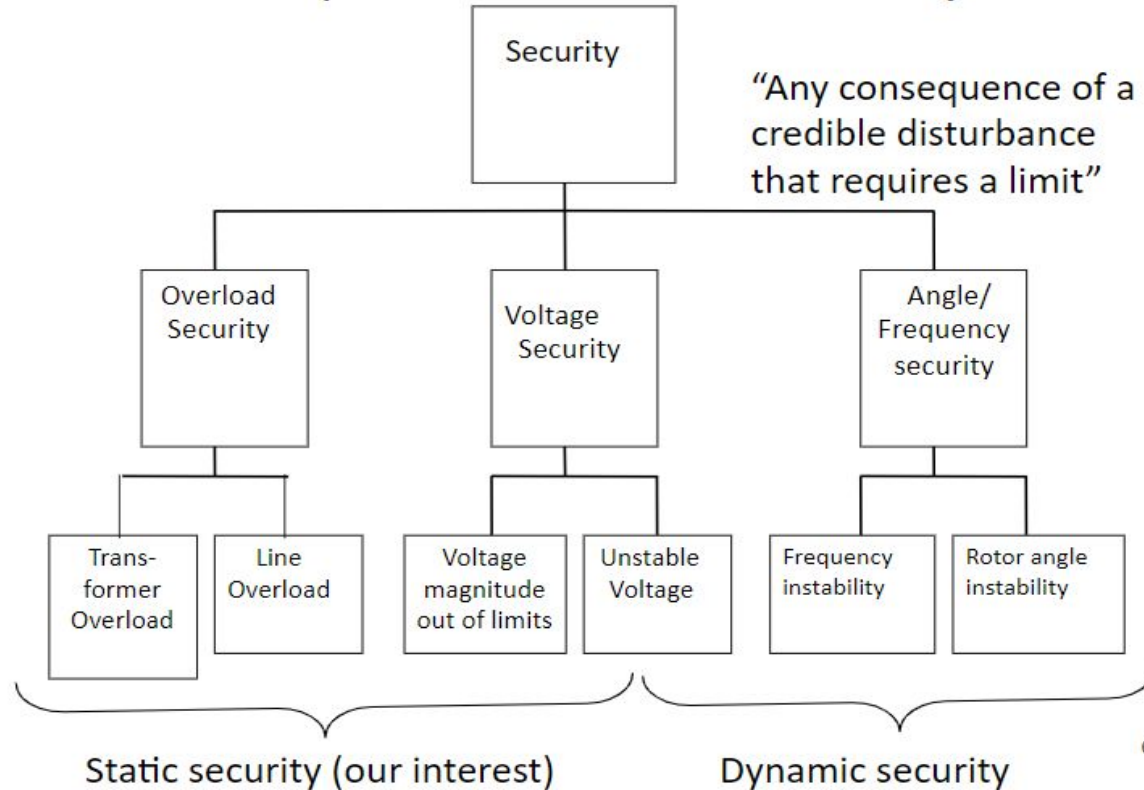
# WHAT IS SYSTEM SECURITY?



- Power system security may be looked upon as the probability of the system's operating point remaining within acceptable ranges, given the probabilities of changes in the system (contingencies) and its environment.
- Dy Liacco first pointed out in 1967 that a power system may be identified to be operating in a number of states.



# BLOCK DIAGRAM





## Preventive state

- The preventive state is actually the normal state. The term 'preventive' was used to stress the 'Security' aspect of the normal operation.
- Normal operating condition usually means that all the apparatus are running within their prescribed limits, and all the system variables are within acceptable ranges.
- The system should also continue to operate 'normally' even in the case of credible contingencies. The operator should 'foresee' such contingencies (disturbances) and take preventive control actions (as economically as possible) such that the system integrity and quality of power supply is maintained.



# Emergency state



- The power system enters an emergency state when some of the components operating limits are violated; some of the states wander outside the acceptable ranges, or when the system frequency starts to decrease.
- The control objective in the emergency state is to relieve system stress by appropriate actions.
- Economic considerations become secondary at this stage.



# Restorative state

- Restorative state is the condition when some parts (or whole) of the system has lost power.
- The control objective in this state is to steer the system to a normal state again by taking appropriate actions.



# Major components of security assessment



- System monitoring
- Contingency analysis
- Preventive and corrective actions





# System monitoring

- The prerequisite for security assessment of a power system is the knowledge of the system states. Monitoring the system is therefore the first step.
- Measurement devices dispersed throughout the system help in getting a picture of the current operating state. The measurements can be in the form of power injections, power flows, voltage, current, status of circuit breakers, switches, transformer taps, generator output etc., which are telemetered to the control centre.
- Usually a state estimator is used in the control centre to process these telemetered data and compute the best estimates of the system states.
- Remote control of the circuit breakers, disconnector switches, transformer taps etc. is generally possible. The entire measurement and control system is commonly known as supervisory control and data acquisition (SCADA) system.

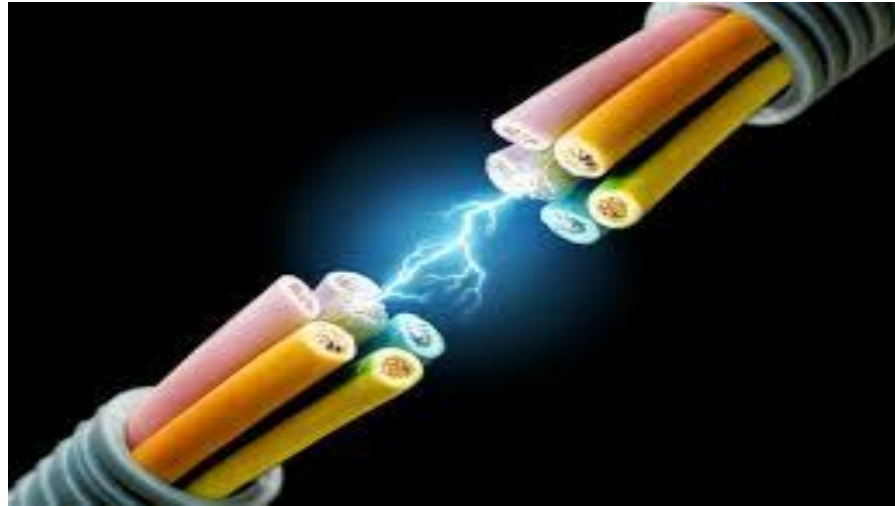


# Contingency analysis

- Contingency definition involves preparing a list of probable contingencies.
- Contingency selection process consists of selecting the set of most probable contingencies in preferred; they need to be evaluated in terms of potential risk to the system. Usually, fast power flow solution techniques such as DC power flow are used to quickly evaluate the risks associated with each contingency.
- Finally, the selected contingencies are ranked in order of their security, till no violation of operating limits is observed.



# RECAP....



# ...THANK YOU