

NUCLEAR SWITCHYARDS

Computer Based Training Module Available on NANTeL



ABSTRACT

This CBT is a self-paced, detailed, comprehensive, nuclear industry generic overview of the layout and purpose of switchyards. This includes a variety of switchyard types, their design (grading and drainage, structures), equipment (ring buss, double ring buss), protection (grounding, lightning, relays) and operation (communication, monitoring, security) and regulatory environment (NRC, NERC, FERC). The module has undergone one round of revision to address ownership issues and feedback via NANTeL and other sources to make it more effective and seamless for the learners. The final exam was revised to add the open book resource documents link and reformat selected questions to improve clarity based on exam analysis and feedback.



INTENDED AUDIENCE

1. Experienced nuclear plant electrical engineers who are developing expertise in the switchyard
2. Site engineering Managers or Supervisors



DURATION

- 3.5 hours
- An additional 8-12 hours for reading materials provided within the CBT

TERMINAL LEARNING OBJECTIVES

1. Describe the switchyard design requirements and considerations.
2. State the characteristics of various switchyard bus configurations.
3. State the regulatory (NRC and NERC) requirements for the switchyard design.
4. Identify the relationship between FERC and NERC and the responsibilities of NERC.
5. Identify the major equipment in the switchyard and their function.
6. Explain the desirable features of the protective relaying schemes and their functions.
7. Explain the purpose of the switchyard ground grid and the high voltage insulators.
8. Identify the key actions to cope with and recover from a station blackout.
9. Describe the tagging program at switchyards.
10. Explain the work coordination process at switchyards.
11. Describe the requirements of an onsite and offsite power system in a nuclear power plant.
12. Identify when and how to conduct a power flow analysis.
13. Describe the preparations involved in various weather readiness programs.

KEY INDUSTRY DOCUMENTS

1. EPRI 1026664 Nuclear Maintenance Applications Center: Switchyard Equipment Application and Maintenance Guide
2. IEEE 765 Standard for Preferred Power Supply (PPS) for Nuclear Power Generating Stations (NPGS)
3. NRC Generic Letter 2006-02, Grid Reliability and The Impact On Plant Risk and The Operability of Offsite Power
4. 10CFR50 Appendix A General Design Criteria
5. NUREG-0800 SRP BTP 8-3, Rev. 3, Stability of Offsite Power Systems
6. NRC Bulletin 2012-01, Design Vulnerability In Electric Power System
7. NRC Order EA-12-049, Issuance of Order To Modify Licenses With Regard To Requirements For Mitigation Strategies For Beyond-Design-Basis External Events
8. NUMARC 87-00 Rev. 1, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors
9. OSHA 29CFR1910.269, Electric Power Generation, Transmission and Distribution
10. IEEE 308, Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations
11. NERC Standard NUC-001, Nuclear Plant Interface Coordination