

REE 453 Power System Analysis

Course Project

This project requires you to design a power distribution system for a combined-cycle power plant, and then perform analyses using a commercial power system software program. The preliminary one-line diagrams and line and equipment electrical data from an actual power plant have been provided in Blackboard in .dwg and pdf formats.

The plant consists of a combustion turbine generator and a steam turbine generator (with associated parasitic loads) that are grid-connected, and an emergency diesel generator that will start and power 480 V loads upon loss of the other power sources.

Design Scope of Work:

30% phase:

- Size all of the power conductors for the 480 V loads expected – use XHHW for all conductor insulation, and use a minimum of 12 AWG for all current-carrying conductors
- Size PVC conduits for all conductors
- Update the one-line diagrams with line lengths, conductor sizes, etc.

60% phase:

- Finish sizing all other power conductors – use XHHW for all conductor insulation, and use a minimum of 12 AWG for all current-carrying conductors
- Size PVC conduits for all conductors
- Create a configured one-line diagram in Easy Power using the sizes calculated and the line length and equipment data provided in Blackboard.
- Perform a power flow study using Easy Power software for the electrical system in the one-line diagrams. Verify the voltages at each bus are within +/- 5% of nominal.

90% phase:

- Perform a short-circuit study using Easy Power software for the electrical system in the one-line diagrams. Verify that the switchgear bus ratings are acceptable for the symmetrical fault current values that may be seen for each piece of switchgear.

100% phase:

- Final documents and simulations
- Produce a cost for engineering services that includes engineering and design hours. Assign one member of the group as a lead Professional Engineer (PE, \$125/hour) and the other members as engineering interns (EITs, \$75/hour) for the design phase.

Design Deliverables (These will be Rev. A, Issued for Review):

- 30% review deliverables:
 - Calculation sheets that show the formulas used and the calculation results for any calculations
 - One-line drawings
 - Check prints for all design documentation
- 60% review deliverables:
 - An Easy Power simulation file
 - A power flow analysis from Easy Power
- 90% review deliverables:
 - A short circuit analysis from Easy Power (due at 90% review)
- Final deliverables:
 - Finalized versions of everything above
 - The cost of the design engineering services using a work breakdown structure (100% deliverable)