Powerplant Engineering Project Instructions:

The purpose of the Powerplant Engineering course is to provide the student with information on the basic systems, equipment, and technology utilized in the production of electrical energy. This course covers a wide range of subjects. The purpose of the project for this course is to provide the student with the opportunity to learn more about one specific topic in powerplant engineering. The range of projects to select is very broad and not limited by those suggested below.

The format of the project will be a report that shall contain a summary of the purpose of the report, an evaluation of the subject matter, and a conclusion section. This report shall be at least 6 typed pages, double space (and no more than 20 pages in length please). Supporting documentation such as drawings, calculations, are not included in the length limitation requirement. While working in groups is allowed, each student shall submit a report for their research efforts.

Some possible project considerations are listed below. The student is encouraged to select from the list below or from a subject outside the ones listed below. Regardless, the student is to submit a one page abstract of proposed subject to be researched to the instructor by the date listed in the syllabus.

Possible subjects for student project;

1. Research nuclear technology and determine the advantages and disadvantages of the technology. Cover some of the engineering challenges presented by the technology and some of the solutions. Describe some differences in equipment / systems between nuclear power plants and fossil fuel plants, (i.e. generator size, breaker size, emergency power requirements, etc).

2. Research coal powerplants and determine the advantages and disadvantages of the technology. Cover some of the engineering challenges presented by the technology and some of the solutions such as scrubber and NOx emission reduction processes. Describe some differences in equipment / systems between coal power plants and other fossil fuel plants, (coal processing equipment, limestone processing equipment, etc).

3. Research IGCC technology and determine the advantages and disadvantages of the technology. Cover some of the engineering challenges presented by the technology and some of the solutions. Describe some differences in equipment / systems between IGCC power plants and other fossil fuel plants, (Air Plant requirements, Sulfur removal equipment, Gasification process, etc).

4. Research the requirement to make a change to an existing powerplant such as adding an additional condensate pump. Describe what would be the impact to plant thermal heatrate. Develop an electrical package showing proper design and interlocks for equipment.

5. Research protective relay coordination study that will maximize system security and still minimize inadvertent trips. Discuss the methods and assumptions for the study, estimations for equipment type and size, control logic development, and fail safe modes for relay contacts. Determine

limitations presented by motor acceleration, transformer excitation, and other operational limits.

6. Perform the preliminary design for a plant auxiliary power system. List typical loads, develop basic one line diagrams, evaluate auxiliary power system availabilities and estimate ballpark costs for two or three alternative configuration. Identify industry standards that govern the design.

7. Research IEEE technical literature to discover typical reactor coolant pump motor and drive load characteristics and perform motor acceleration calculations for a typical pump. Describe any unique features of a reactor coolant pump due to the environment it must operate in (i.e. radiation, temperature, pressure, etc)

8. Design a belt drive for a 200 hp reciprocating compressor drive based on typical compressor speed and horsepower requirements. Evaluate motor drive end bearing life. Evaluate methods of starting and possible flow control.

9. Predict the level of harmonic distortion on the main plant auxiliary bus for a six-pulse LCI drive for CT starting given typical auxiliary system parameters. Discuss the requirements of IEEE 519 and methods to ensuring compliance (including possible changes to drive system).

10. Perform motor acceleration calculations for large boiler fans. Predict bus voltage performance during the starting period. Discuss mechanical stresses on fan and motor components and effect alternate starting methods may have on both the electrical system and the fan and motor.

11. Given a fan hp, speed and inertia, (centrifugal) select a motor to operate the fan at a higher speed. Research industry motor standards that apply to the design.

12. Perform economic preliminary studies to choose an auxiliary power system voltage for a typical coal fired power plant. Evaluate various methods and equipment (such as generator breaker on high voltage side of GSU transformer verses generator breaker on low side of GSU transformer) for both cost and reliability.

13. Compare the life cycle cost to customers for nuclear, coal and combined cycle plants based on various predicted capital, O&M and fuel costs.

Keep in mind, the above are just suggestions and other topics are welcome. Goal of this project is to provide the opportunity to learn about an area of powerplant engineering that the student has interest in. Please contact the instructor with any questions or needed support in development of your project.