

Transmission & Distribution Course

Simulation Assignment

As part of the course work you are to complete a power system design using any software available to you (various types available at the power system laboratory). The requirement is to design a power system to supply a large industrial operation that is to be located some 450 kilometres away from the power station.

The requirements of the model are as follows:

- A. The power station is to be located in a coastal town and must have a capacity of no less than 100 MW (expandable in future) on an n+1 arrangement. Natural gas is the only energy source as such, although the area is well known for having extensive wind and sun facilities.

The power station design must include a relevant switchyard that will interconnect this with the transmission line and operations load (step-up switchyard and auxiliary services).

- B. Power is to be transferred to the industrial operation via a transmission line – a distance of some 450 kilometres. The transmission line can make use of towers or poles (depending on your design) and must be capable of carrying up to 200 MW with minimal losses.

While transformer sizes and types have been selected for you as part of the distribution system those associated with the power station and transmission switchyards have not. These you must select and establish the reason for your selection.

- C. The industrial area will require a switchyard to receive the transmission line and drop down voltage to the industrial area distribution system. This HV distribution voltage will be 22 kV as per the drawings.

The HV cables used to interface the various MCC's will be between 100 meters and 800 meters. You must select the cable type and sizes you see appropriate to meet the expected loads. All HV Cables would be laid in cable trays (nothing to be buried). LV cabling would follow the same principle. Assume that all LV cables from transformers to MCC's would be no longer than 40 meters and would also be laid in cable trays.

- D. At the industrial site you must provide an emergency power station (diesel based) that can provide at least 10 MW capacity on an n+1 basis.
- E. Renewable systems can be used, but you need to make sure you understand why your selection and location. The industrial area does not have much wind, but has good sun periods. These would have to be modelled accordingly.
- F. The computer model will be a load flow model and I would also like to see fault calculations for all busbars. These should be produced by the load flow model anyways.

You will have questions and/or concerns about this modelling. I will act as your adviser at all times and you must make decisions as part of the design process. You must justify your reasons for all decisions of the equipment selection.

In the end all I expect from you is a report with the reasons for equipment selection and design justification as well as a copy of the computer model.