

Electric Power Distribution System Design Status of PEFP

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1. Introduction

Proton Engineering Frontier Project (PEFP) has been developing a 100 MeV proton linear accelerator. Also, PEFP has been designing the Proton Accelerator Research Center in Gyeongju. In site, we installed GIS (Gas Insulated Switchgear) to receive 154kV electric power and 154kV/3.3kV transformer. We are also designing distribution system according to the electrical load changes. Additionally, we designed emergency diesel generator and UPS for the electric power outage occurs. For the energy saving scheme, we are now designing solar power system of PEFP.

In this paper, we described electrical power system of PEFP.

2. Electrical Power System of PEFP

2.1 154kV Substation Facilities

154kV substation facilities are composed of 154kV incoming line, 170V gas insulated switchgear (GIS), transformer. 154kV power transmission cable (XLPE cable, 1C 400sq, 3 lines) for 154kV substation facilities, which has sufficient capacity to receive electrical power required, will be installed between substation and GIS of PEFP.

154kV substation is outdoor type, 170kV totally enclosed gas insulated switchgear. It includes gas insulated buses (GIB), power circuit breakers, disconnect switches, current transformer, voltage transformers, earthing switches, surge arrestors, compressed air system with local pipes and fittings.

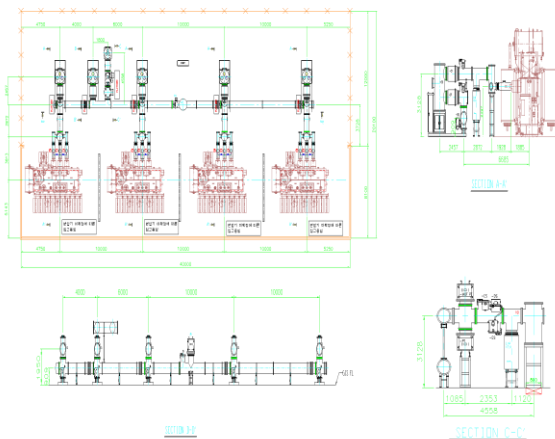


Fig. 1 GIS Configuration of PEFP

154kV switchyard consists of one bus and one breaker. For gas insulated bus, aluminum tubular bus is adopted. It is capable of withstanding the expected maximum short circuit current at rated voltage. Fig. 1 describes the GIS configuration of PEFP.

3.3kV switchgear system consists of RF power supply system (A system) and conventional facilities (B system), which is described in Fig. 2.

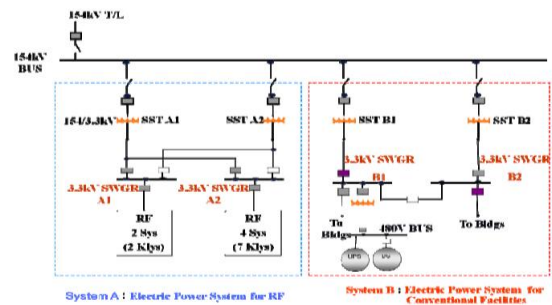


Fig. 2 3.3kV Switchgear System of PEFP

For 154kV/3.3kV transformer, it is based on oil natural air natural cooled/oil natural air forced cooled (ONAN/ONAF) with temperature rise of 65 degrees. Polarity of transformers is subtractive and high voltage winding is connected with delta and low voltage winding is connected with wye. For basic insulation level (BIL), H.V line winding is 650kV and H.V line busing is 750kV, and L.V line winding and bushing is 60kV. The neutral of low voltage winding should be grounded through a resistor to limit ground fault current to relay operation required. Surge arrester is installed in the incoming feeders of each switchgear to absorb the surge caused by transformer transient overvoltage. The distribution class surge arrester is installed in the load side to protect the loads against the surge caused by vacuum breakers. The incoming circuits from each transformer and the circuits connecting between switchgears are equipped with a digital protection relay, which has multi-function of inverse time overcurrent protection and residually grounded overcurrent protection.

According to the energy saving scheme, high-efficient transformer for the distribution system (460V, 220V) is adopted.

If power from the transformer is lost due to any reason, emergency generator supplies power to the critical loads, battery chargers and UPS system to minimize the economical loss and provide the

