Electrical System of AHWR

Main power output system

The Main Power Output System (MPOS) of the Unit Transmits (UT's) the power generated by the 300 MWe generator at 21 kV from generator terminals to the switchyard and then to the grid. The major equipment of MPOS are the following:

1. Isolated Phase Bus Duct (IPBD), suitably rated based on TG output voltage and power output.
2. Generator Circuit Breaker (GCB) of rating based on TG output voltage and power output.
3. Generator Transformer (GT) of 350 MVA output rating, with a bank of three single phase transformers to step up the voltage to 220 kV.
4. 220 kV Gas Insulation Sub-station (GIS) for evacuation of power.

Approximately 50% of the station auxiliary load will be supplied through the unit transformers. The rest of the station auxiliary loads will be supplied from the 220 kV switchyard through the start-up transformer. When the turbo-generator is tripped, the GCB will isolate the generator from the network. However, the unit auxiliaries will continue to receive power through their respective UTs from the switchyard bus through the GT.

Station Auxiliary Power Supply System (SAPSS)

SAPSS covers power supply arrangement for various Station Auxiliary loads required for start-up of unit, normal operation, safe shutdown and maintaining the unit under safe shut down conditions. SAPSS is broadly classified into four categories of power supplies depending upon the reliability, continuity, and availability of the power supply:

1. Class-IV AC supply: Source of supply derived from the main generator and from off-site sources. Power supply to the Class IV buses will be interrupted whenever there is simultaneous power supply failure from the grid and the generator.
2. Class-III AC supply: Normally powered from Class-IV buses but can also be supplied from on-site standby sources (DG Sets). Power Supply to the Class III bus will be automatically restored within one minute after failure of Class-IV source.
3. Class-II AC supply: This is the most reliable AC power supply source and provides uninterrupted power supply to the loads connected to the Class II buses for a specified period, even when Class IV/class III supplies fail.
4. Class-I DC Supply: This is also the most reliable DC power supply source and it provides uninterrupted DC power supply to the loads connected to the Class I buses for a specified period, even when class IV/class III supplies fail.

Cabling system

The cabling system comprises of power cabling required for distribution of electrical power to the plant equipment and control cabling required for control, protection, measurement, alarm and status indication circuits. The electrical system cables are further classified according to the operating voltage of the system on which they are used viz. 6.6 kV AC power cables, 4l5 V AC power cables, 220 V DC power cables, 230V AC/220V DC control cables.

Illumination system

The illumination is mainly divided into normal lighting and emergency lighting. Normal lighting is that provided in all indoor and outdoor areas of the plant. It is designed to provide sufficient illumination at various places for the operating and maintenance personnel to perform their duties efficiently. This lighting is connected to Class-IV station power supply and operates at 240V AC. Emergency lighting to an area is provided from Class I, Class II or Class III depending upon the importance of the functional requirements in that area. Various indoor areas of plant shall require luminaries fed from Class IV power supply and also from emergency power supply.

Earthing system

Earthing systems consist of earthing of electrical systems neutral point and non-current carrying metallic parts from safety considerations. The systems listed below need to be earthed:

Lightning protection system

Lightning protection system against direct stroke is provided for each building. Lightning protection system is designed to prevent damage to equipment and structures due to direct strokes of lightning and to limit its secondary effects on the equipment. Protection against transfer of high voltages into the buildings via underground and ground-based metal structures is provided by connecting them to ground electrode at entry of building. For protection against travelling surges, surge arresters are also provided on all transmission lines, near generator transformers, SUTs, EHV cables and also on the IPBD to protect equipment from lightning/switching over voltages