

Water Systems of AHWR

Advanced Heavy Water Reactor (AHWR) plant has many water systems for heat removal, domestic use, plant and other services. The main systems are described as under.

Active Process Water (APW) system

The active process water system supplies cooling water to various equipment and heat exchangers in the reactor building, service building and turbine building. This system is named active process water system because any leakage from the tubes of the heat exchangers to shell side will make the system active due to radioactivity. The system has two independent loops with its own set of Heat Exchangers (HXs) and pumps to remove heat from the various loads. In each loop, two pumps and two HXs will operate in normal operation mode to remove the total heat from the reactor. During normal operation, both the loops will be operating to remove the total heat. It is designed for both OBE & SSE conditions.

Non-active process water system

The system is classified as non-active, because any leakage from the heat exchangers, which the system cools, will not render the system active. It caters to cooling of safety and non-safety related equipment which does not handle radioactive substance. The system removes heat from safety related equipment namely diesel generator coolers and air compressors both of which require cooling even under Class IV failure, and also from non-safety related equipment associated with turbine auxiliaries. The system has two independent closed loops and the cooling medium is DM water. It has centrifugal pumps and plate type heat exchangers. The system is provided with an expansion tank mainly to take care of volume changes of the loop due to temperature change and to feed make up water to cater the leakage.

Service water system

For transfer of heat from reactor process water heat exchangers to ultimate heat sink (sea), cooling scheme consisting of three cooling circuits is provided. The system water circuit forms the primary cooling circuit; the APW circuit & NAPW circuit forms the secondary cooling circuit and the Service Water System (SWS) the tertiary circuit. Closed cooling circuit is provided for system water as well as for APW & NAPW. SW system is of once through type and it transfers heat from APW and NAPWHX's to the sea. SW system consists of four vertical turbine pumps per loop. During normal operation two pumps will be in operation with one under maintenance and one under standby. Each pump will be provided with individual suction chamber along with facilities for isolation by stop logs, trash rack to prevent large size particles entering the chamber, coarse screens for trapping jelly fish and travelling water screens for

arresting any floating and other debris. Facility for chlorination on both upstream and downstream side of travelling water screen will be provided to prevent marine growth.

Condenser cooling water system

Sea water will be used for cooling the condenser in open recirculation mode. Condenser cooling water system supplies the required amount of seawater to the main condenser. The flow is selected in such a way that the temperature rise for the seawater will be limited to the prescribed value. Intake convey the seawater to condenser cooling water system pump house from where the sea water is pumped to the condenser water boxes located in the turbine building. The discharged water is conveyed back to sea through the outfall structure.

Fire water system

This system caters to water requirements for firefighting and backup supply for cooling various safety related equipment under failure of process water system and under Station Black Out (SBO) condition. It will remain in poised condition so as to be available under any operational condition namely normal operation, shut down condition and emergency/accident condition of the plant. Adequate redundancy is provided by way of introducing standby equipment namely pumps, separate headers etc. System is provided with Class III back up power supply and also standalone diesel engine driven pumps. The system for firefighting water requirements is designed to comply with the AERB guidelines.

The fire water system comprises of constantly pressurized hydrant system connected to the firefighting equipment namely fire hydrants and sprinklers and is also interfaced with process water cooling system for moderator HXs and end shield HXs. The firefighting water system caters to the automatic sprinklers provided for oil filled main transformers and non-automatic sprinklers provided for oil systems, cable vaults & cable tunnels.