REFERENCE PLANT DESCRIPTION

INTRODUCTION

The Nuclear Plant is located adjacent to the Columbia River, 42 miles East of Portland, Oregon. The general plant description is contained in chapter 1 of the Trojan Nuclear Plant FSAR.

The Nuclear Steam Supply System (NSSS) is a Westinghouse (W) design. It is a pressurized water reactor (PWR) rated for 3423 MWt. The licensed reactor output is a total reactor core heat transfer rate to the reactor coolant of 3411 MWt. The equivalent warranted gross and approximate net electrical outputs of the plant are 1178 MWe and 1130 MWe, respectively.

The NSSS is similar to other W four-loop nuclear plants using a chemical shim and control rods for reactivity control and generates dry steam in vertical U-tube steam generators. The NSSS is located within a prestressed post-tensioned reinforced concrete Containment.

GENERAL DESCRIPTION OF THE PLANT SITE

The Nuclear Plant site consists of approximately 623 acres located in Columbia County in NW Oregon on the Columbia River. Major structures on the site include the Containment, Turbine Building, Auxiliary Building, Fuel Building, Control Building, and a single natural draft cooling tower.

The town of St. Helens, Oregon, the county seat of Columbia County, is located approximately 12 miles S-SE of the site. The town of Rainer, Oregon is located approximately 4 miles N-NW and the town of Kalama, Washington, is approximately 3 miles SE of the site.

PLANT DESIGN CRITERIA

The principal design criteria for the Nuclear Plant are the fundamental architectural and engineering design objectives established for the plant. The basis for development and selection of the design criteria used in this plant are to provide: protection of public health and safety; reliable and economic plant performance; and an attractive appearance.

The essential systems and components of the plant are designed to enable the facility to withstand, without loss of the capability to protect the public, the additional forces that might be imposed by natural phenomena. The designs are based on the most severe of the natural phenomena recorded for the vicinity of the site, with margin to account for uncertainties in the historical data.

NUCLEAR STEAM SUPPLY SYSTEM

The NSSS consists of a PWR, RCS, and associated auxiliary fluid systems. The RCS is arranged as four closed reactor coolant loops connected in parallel to the reactor vessel; each loop contains a reactor coolant pump (RCP) and steam generator. An electrically heated pressurizer is connected to the hot leg of one reactor coolant loop.

The reactor core is composed of uranium dioxide pellets enclosed in zircaloy tubes. The tubes are supported in assemblies by a spring clip grid structure. Mechanical control rods consisting of rod control cluster assemblies are located within selected fuel assemblies. New fuel is introduced during refueling outages to replace some of the previously burned fuel.

The reactor vessel and reactor internals contain and support the fuel and control rods. The reactor vessel is cylindrical with hemispherical heads clad with stainless steel.

The pressurizer is a vertical cylindrical pressure vessel with hemispherical heads and is equipped with electrical heaters and spray nozzles for system pressure control.

The steam generators are vertical U-tube type heat exchangers utilizing inconel tubes. Integral separating equipment reduces the moisture content of the steam at the turbine throttle valves.

The RCPs are vertical, single-stage, centrifugal pumps equipped with controlled leakage shaft seals.

Auxiliary systems are provided to let down and inject water into the RCS, to add makeup water, purify reactor coolant water, provide chemicals for corrosion inhibition and reactor control, cool system components, remove residual heat when the reactor is shut down, and cool the spent fuel storage pool.

ENGINEERED SAFETY FEATURES (ESF)

The ESF systems provided have sufficient redundancy of components and power sources that under conditions of the design basis Loss-of-Coolant Accident (LOCA), the system can maintain integrity of the containment and keep exposure of the public below the limits set forth in 10 CFR 100.

The ESF systems provided by the plant include: high pressure safety injection that prevents uncovering of the core for small break LOCAs where the RCS remains at high pressure and delays uncovering of the core for intermediate sized breaks; safety injection accumulators that automatically flood the core when RCS pressure reaches approximately 600 psig; low pressure safety injection that cools the core when reactor coolant pressure reaches 200 psig after a LOCA; Containment Spray System (CSS) that sprays borated water into the containment atmosphere to remove iodine and provide a redundant system for containment cooling; containment air coolers that act as a heat sink to cool the containment building atmosphere under the conditions of a LOCA; Auxiliary Feedwater (AFW) to add secondary water to steam generators to provide a heat sink for the primary system; containment isolation valves to provide automatic isolation of all containment penetrations for systems not required to remain in service after assumed accidents in order to limit the consequences of such accidents; a steel-lined, domed, reinforced post-stressed concrete containment vessel is anchored to a reinforced concrete foundation slab. The containment is designed to remain virtually leak-tight during the pressure transient following a LOCA. Diesel generators units provide backup power for a loss of all off-site power. The generators are capable of operating sufficient core cooling and containment cooling equipment to ensure acceptable pressure transients following a LOCA and safe shutdown even if one generator fails to operate.

REACTOR AND PLANT CONTROL

The reactor is controlled by a coordinated combination of soluble neutron absorber and mechanical control rods. The control system allows the plant to accept step-load changes of 10 percent and ramp-load changes of 5 percent/min over the load range of 15- to 100-percent power under normal operating conditions.

PLANT ELECTRICAL SYSTEMS

The main generator is an 1800-rpm, three-phase, 60-cycle generator which produces a.c. power at 22 KV, which is stepped up to 230 KV by the main transformer bank for delivery to the high voltage transmission lines. There is a step-down auxiliary transformer to provide normal power at 12.5 KV to all of the station auxiliaries during operating conditions.

Two step-down startup transformers provide preferred power to all necessary plant loads during startup and loss of normal power conditions. The startup transformers are supplied from the 230-KV offsite transmission network.

Two diesel generators units are provided as standby sources of emergency power at 4.16 KV in the event of a loss of normal and preferred a.c. power. Each generator unit has sufficient capacity to operate all equipment necessary to prevent undue risk to public health and safety should a LOCA occur. Each generator unit is comprised of two engines mounted to drive a common generator shaft. The engines attach to the generator shaft from opposite directions. Consequently, each engine rotates in a different direction. In addition, storage batteries are provided as on-site sources of power in the event of a loss of normal d.c. power.

POWER CONVERSION SYSTEMS

The generator turbine is a tandem-compound, four-element, 1800-rpm unit, which has one high-pressure and three low-pressure elements. Combination moisture separator-reheaters are employed to dry and superheat the steam between the high- and low-pressure turbines. The auxiliaries include deaerating surface condensers, steam jet air ejectors, turbine-driven main feed pumps, motor-driven condensate pumps, full-flow condensate demineralizer, and seven stages of feedwater heating. The steam and turbine systems are designed to receive the heat energy produced in the reactor during normal operation, as well as a 50-percent load rejection of the turbine generator. Heat dissipation under a load rejection is accomplished by operation of steam dumps to the condenser. The steam dumps permit the plant to accept loss of 50-percent external load without reactor or turbine trip. No credit is given to the steam generator atmospheric steam dump from a safety analysis standpoint.

FUEL HANDLING SYSTEMS

The reactor is refueled with equipment designed to handle spent fuel under water from the time it leaves the reactor vessel until it is placed in a cask for shipment from the site. Underwater transfer of spent fuel provides an optically transparent radiation shield, as well as a reliable source of coolant for removal of decay heat. This system also provides the capability to receive, handle, and store new fuel.

RADIOACTIVE WASTE TREATMENT SYSTEMS

The radioactive waste treatment systems provide all equipment necessary to collect, process, monitor, and discharge radioactive liquid, gaseous, and solid wastes that are produced during reactor operation.

Liquid wastes potentially containing radioactive material are collected and monitored. Prior to discharge, equipment is provided for filtering and demineralizing the liquid as required. The treated water from the filters or demineralizers may be recycled for use in the plant or may be discharged to the Columbia River. The miscellaneous dry waste, spent demineralizer resins and spent filters are shipped from the site for ultimate disposal in an authorized location. A steam generator blowdown treatment system is provided to permit continued plant operation with limited fuel clad defects concurrent with steam generator tube leaks to help maintain steam generator chemistry.

Gaseous wastes are collected and held for radioactive decay. Discharge to the environment after filtration is controlled to keep the off-site dose within prescribed limits.