1.2 SUMMARY PLANT DESCRIPTION

1.2.1 PLANT SITE

The site for the Calvert Cliffs Nuclear Power Plant (CCNPP) consists of approximately 962 acres on the western shore of the Chesapeake Bay, in Calvert County, about 10-1/2 miles southeast of Prince Frederick, Maryland (Figure 1-1). The site is characterized by a minimum exclusion radius of 1,150 meters, remoteness from population centers, an abundant supply of cooling water, and favorable conditions of hydrology, geology, seismology and meteorology. The nearest population center is Washington, DC, which is approximately 45 miles to the northwest of the site (Figures 1-1 and 2.2-1).

1.2.2 PLANT ARRANGEMENT

The Turbine Building for the CCNPP is oriented parallel and adjacent to the shoreline of the Chesapeake Bay with the twin Containment Structures and the Auxiliary Building located on the west, or landward, side of the Turbine Building. The service building and the intake and discharge structures are on the east, or bay side, of the Turbine Building (Figure 1-2).

Each Containment Structure houses an NSSS, consisting of a reactor, SGs, RCPs, a pressurizer, and some of the reactor auxiliaries which do not normally require access during power operation. Each Containment Structure is served by a polar crane.

The Turbine Building houses the two turbine generators, condensers, feedwater heaters, condensate and feed pumps, turbine auxiliaries, and certain of the switchgear assemblies.

The Auxiliary Building houses the waste treatment facilities, ESF components, heating and ventilating system components, the Fairbanks Morse emergency diesel generators (EDGs), switchgear, laboratories, offices, laundry, Control Room, spent fuel pool, and new fuel storage facilities. Fuel transfer to and from the containment is through a fuel transfer tube.

A safety-related building houses the Societe Alsacienne De Constructions Mecaniques De Mulhouse (SACM) emergency diesel generator. The fuel oil storage tank and auxiliary equipment for this diesel generator are also housed in this building (Figures 1-31 through 1-34). An augmented quality building houses the SACM Station Blackout diesel generator. Auxiliary equipment for this diesel generator is housed in this building (Figures 1-35 through 1-37).

The Independent Spent Fuel Storage Installation, located on Road C-1, is described in its own Updated Safety Analysis Report.

Plant layouts are shown in Figures 1-4 through 1-37.

1.2.3 REACTOR

The reactor of either unit is a pressurized light water cooled and moderated-type fueled by slightly enriched uranium dioxide. The uranium dioxide is in the form of pellets and is contained in Zircaloy, ZIRLO, or M5® tubes fitted with welded end caps. These fuel rods are arranged into fuel assemblies each consisting of 176 fuel rods arranged on a 14-rod square matrix. Space is left in the fuel rod array to allow for the installation of five guide tubes. These guide tubes provide for the smooth motion of CEA fingers. The assembly is fitted with end fittings and spacer grids to maintain fuel rod alignment and to provide structural support. The end fittings are also drilled with flow holes to provide for the flow of cooling water past the fuel tubes.

The reactor is controlled by a combination of chemical shim and solid absorber. The solid absorber is boron carbide in the form of pellets contained in Inconel tubes. Five tubes of absorber form a CEA (i.e., four tubes in a square matrix plus a central tube). The five tubes are connected together at the tops by a yoke which is, in turn, connected to the control element drive mechanism (CEDM) extension shaft. Each CEA is aligned with and is inserted into a guide tube in the fuel assembly.

Chemical shim control is provided by boric acid dissolved in the coolant water. The concentration of boric acid is maintained and controlled as required by the Chemical and Volume Control System (CVCS).

The reactor core rests on the core support plate assembly which is supported by the core support barrel. The core support barrel is a right circular cylinder supported from a machined ledge on the inside surface of the vessel flange forging. The support plate assembly transmits the entire weight of the core to the core support barrel through a structure made of beams and vertical columns. Surrounding the core is a shroud which serves to limit the coolant which bypasses the core. An upper guide structure, consisting of an upper support structure, CEA shrouds, a fuel alignment plate and a spacer ring, serves to support and align the upper ends of the fuel assemblies, prevents lifting of the fuel assemblies in the event of a loss-of-coolant accident (LOCA), and maintains spacing of the CEAs.

1.2.4 REACTOR COOLANT SYSTEM

The Reactor Coolant System (RCS) of each unit consists of two closed heat transfer loops in parallel with the reactor vessel. Each loop contains one SG and two pumps to circulate coolant. An electrically heated pressurizer is connected to one loop hot leg. The coolant system is licensed to operate at a power level of 2,737 MWt to produce steam at a pressure of 888 psia with no plugged SG tubes.

The reactor vessel, loop piping, and SG plenums are fabricated of low alloy steel, clad internally with stainless steel. The pressurizer surge line and RCPs are fabricated from stainless steel and the SG tubes are fabricated from Inconel.

Overpressure protection is provided by power-operated relief valves (PORVs) and spring-loaded safety valves connected to the pressurizer. Safety and relief valve discharge is released under water in the quench tank where the steam discharge is condensed.

The two SGs are vertical shell and U-tube SGs each of which produces approximately $6x10^6$ lb/hr of steam. Steam is generated in the shell side of the SG and flows upward through moisture separators. Steam outlet moisture content is less than 0.05%.

The reactor coolant is circulated by four electric motor-driven, single-suction, centrifugal pumps. Each pump motor is equipped with a nonreverse mechanism to prevent reverse rotation of the pump.

1.2.5 CONTAINMENT

The Containment Structure uses a pre-stressed concrete design. The structure is in the form of a vertical right cylinder with a dome and a flat base. The interior of the structure is lined with carbon steel plate for leak tightness. Inside the structure, the reactor and other NSSS components are shielded with concrete. An unlined steel ventilation stack is attached to the outside of the Containment Structure and extends to an elevation about 10' above the top of the containment dome. Access to portions of the Containment Structure during power operation is permissible.

The Containment Structure, in conjunction with ESFs, is designed to withstand the internal pressure and coincident temperature resulting from the energy released in the event of the LOCA associated with operation at rated thermal power plus uncertainty. The design conditions for the structure are an internal pressure of 50 psig, a coincident concrete surface temperature of 276°F and a leak rate of 0.16% by weight per day at design temperature and pressure.

1.2.6 ENGINEERED SAFETY FEATURES SYSTEMS

Separate ESF systems for each unit in conjunction with separate containment systems protect the public and plant personnel from accidental release of radioactive fission products, particularly in the unlikely event of a LOCA. These safety features function to localize, control, mitigate, and terminate such incidents to hold exposure levels below applicable guidelines.

The ESF systems are:

The safety injection systems [including High Pressure Safety Injection (HPSI), Low Pressure Safety Injection (LPSI), and the Safety Injection Tanks (SITs)];

The containment cooling systems, consisting of the Containment Spray System (CSS), and the Containment Air Recirculation and Cooling System;

The Containment Penetration Room Ventilation System;

The Containment Iodine Removal System.

The Control Room Emergency Ventilation System.

For each unit, four SITs are provided, each connected to one of the four reactor inlet lines. Each tank has a volume of 2,000 ft^3 containing 1,000 ft^3 of borated water at refueling concentration and 1,000 ft^3 of nitrogen at 200 psig. In the event of a LOCA, the borated water is forced into the RCS by the expansion of the nitrogen. The water from three tanks adequately cools the entire core. In addition, borated water is injected into the same nozzles by two LPSI and two (three pumps are available) HPSI pumps taking suction from the refueling water tank (RWT). For maximum reliability, the design capacity from the combined operation of one HPSI and one LPSI pump provides adequate injection flow for any LOCA; in the event of a Design Basis Event (DBE), at least one HPSI and one LPSI pump will receive power from the emergency power sources if normal power is lost and one of the EDGs is assumed to fail. Upon depletion of the RWT supply, the HPSI pump suctions automatically transfer to the containment sump and the LPSI pumps are shutdown. One HPSI pump has sufficient capacity to cool the core adequately at the start of recirculation. During recirculation, heat in the recirculating water is removed in the shutdown cooling heat exchangers by the operation of the CSS (see below). Further, the suction of the HPSI pumps may be manually aligned so as to inject sub-cooled water from the shutdown cooling heat exchangers directly in the RCS for core cooling.

All LPSI and HPSI pumps are located outside the Containment Structure to permit access for periodic testing during normal operation. The pumps discharge into separate headers which lead to the containment. Test lines are provided to permit running the pumps for test purposes during plant operation.

The CSS supplies cool, borated water which reduces the temperature and pressure of the containment atmosphere. The pumps take suction initially from the RWT. Long-term cooling is based on suction from the containment sump through the recirculation lines. In the recirculation mode of operation, heat is transferred from the recirculating borated water via the shutdown cooling heat exchangers to the Component Cooling System and ultimately to the Chesapeake Bay water via the component cooling heat exchangers.

The Containment Air Recirculation and Cooling System is also designed to provide capability for reducing the temperature and pressure of the containment atmosphere. The cooling coils and fans are sized to provide adequate containment cooling at DBE conditions without assistance from other containment heat removal systems. The heat is transferred to the Service Water System.

Operation of the penetration room exhaust system ensures that radioactive materials discharging from the containment atmosphere following a LOCA are filtered prior to reaching the environment. The penetration room may be maintained at a negative pressure relative to the Containment following a LOCA. The penetration room ventilation system is equipped with particulate filters and charcoal adsorbers.

The containment iodine removal system recirculates containment air through charcoal adsorbers to remove iodine from the containment atmosphere.

The Control Room Emergency Ventilation System has two separate air conditioning units. Each of these units has two particulate, an absolute, and a charcoal filter unit assembly with dampers and fans, and an airborne radioactivity detector in the return line. Filter unit dampers and fans automatically align to recirculation mode, direct a portion of the Control Room air through the filter unit assemblies upon sensing a high airborne radioactivity level or in response to a SIAS initiation from either unit. The filter unit dampers and fans can also be remotely actuated from the Control Room.

1.2.7 REACTOR PLANT PROTECTION, CONTROL, AND INSTRUMENTATION SYSTEMS

1.2.7.1 Reactor Protection

Reactor parameters are maintained within acceptable limits by the inherent self-controlling characteristics of the reactor, by CEA positioning, by boron content of the reactor coolant and by operating procedures. The function of the Reactor Protective System (RPS) is to provide reactor operators with audible and visual alarms when any reactor parameter approaches the preset limits for safe operation. Should pre-selected limits be reached, the RPS initiates reactor shutdown to prevent unsafe conditions for plant personnel and equipment and to the general public.

The RPS is divided into four channels, each receiving trip signals from separate sensors when the relevant parameter reaches a preset level. If any two of these four channels receives coincident signals, the power supply to the magnetic jack CEDM is interrupted allowing the control elements to drop into the core to shut down the reactor. The protective system is completely independent of, and separate from, the control system.

1.2.7.2 Reactor Control

The RCS provides for start-up and shutdown of the reactor and for adjustment of the reactor power in response to turbine load demand. The NSSS is capable of following a ramp change from 15% to 100% power at a rate of 5% per minute and at greater rates over smaller load change increments up to a step change of 10%. The control is accomplished by manual control. The temperature control program provides a demand temperature which is a function of power. This temperature is compared with the coolant average temperature; if the temperatures are different, the CEAs are adjusted until the difference is within the prescribed control band. Regulation of the reactor coolant temperature in accordance with this program

maintains the secondary steam pressure within operating limits and matches reactor power to load demand.

The reactor is controlled by a combination of CEAs and dissolved boric acid in the reactor coolant. Boric acid is used for reactivity changes associated with large but gradual changes in water temperature, xenon effects and fuel burnup. Additions of boric acid also provide an increased shutdown margin during the initial loading and subsequent refuelings.

Control Element Assembly movement provides changes in reactivity for shutdown or power changes. The CEAs are actuated by CEDMs mounted on the reactor vessel head. The CEDMs are designed to permit rapid insertion of the CEAs into the reactor core by gravity. Control Element Assembly motion is initiated manually.

The pressure in the RCS is controlled by regulating the temperature of the coolant in the pressurizer, where steam and water are held in thermal equilibrium. Steam is formed by the pressurizer heaters or condensed by the pressurizer spray to reduce pressure variations caused by expansion and contraction of the reactor coolant due to reactor system temperature changes.

1.2.7.3 Instrumentation

The nuclear instrumentation includes out-of-core and incore neutron flux detectors. Ten channels of excore instrumentation monitor the neutron flux and provide reactor protection and control signals during start-up and power operation. Four of the channels monitor the neutron flux from the start-up range through the full power range, and six channels monitor the neutron flux from within the start-up range through the full power range. Of the latter, four are used for reactor protection and two for reactor control.

The incore monitors consist of self-powered rhodium neutron detectors and thermocouples to provide information on neutron flux distribution and temperature in the core. The Unit 1 and Unit 2 instrumentation consists of 35 incore detector assemblies.

The process instrumentation monitoring includes those critical channels which are used for protective action. Additional temperature, pressure, flow and liquid level monitoring is provided, as required, to keep the operating personnel informed of plant conditions, and to provide information from which plant processes can be evaluated and/or regulated.

Instrument signals penetrating the containment are electronic. Instrument signals for the remaining plant instruments are either electronic or pneumatic depending on the function to be served.

The plant gaseous and liquid effluents are monitored for radioactivity. Activity levels are displayed and off-normal values are annunciated. Area monitoring stations are provided to measure radioactivity at selected locations in the plant.

1.2.8 ELECTRICAL SYSTEMS

The CCNPP includes two generating units, the ratings of which are 1,020,000 kVa, 0.9 PF, 25 kV, for Unit 1 and 1,036,000 kVa, 0.9 PF, 22 kV, for Unit 2. Each generator delivers power to the 500 kV switchyard through two 810,000 kVa main step-up power transformers. Three 500 kV transmission lines connect to the switchyard and transmit the plant output to the network.

The plant distribution system utilizes voltage levels of 13.8 kV, 4.16 kV, 480 Volt, and 120/208 Volt. The system is designed to provide reliable power for normal operation and safe shutdown of the plant. Auxiliary and start-up power will be supplied by three service transformers rated at 500/14 kV and 60/80/100 MVa. Each transformer is capable of supplying the total auxiliary load of both units simultaneously. One service transformer is connected to each 500 kV bus in the switchyard.

Four 125 Volt DC systems provide continuous emergency power for control, vital instrumentation, emergency lighting, vital 120 Volt AC loads, and computers. Both units share a 250 Volt DC system which supplies power to the emergency lube and seal oil pumps. Separate battery systems are provided for substation control, relaying, microwave, telemetering, and communications.

A total of four EDGs, two dedicated to each unit, are provided to supply power to the ESF loads. Three of these EDGs are Fairbanks Morse diesels with generators rated at 0.8 PF and 4160 Volts and continuous ratings of 3000 kW. The fourth is an SACM diesel generator (Diesel Generator 1A) with a continuous rating of 5400 kW, 0.8 PF, and 4160 Volts. Although the Fairbanks Morse and SACM diesels have different continuous ratings, either of the two EDGs dedicated to a unit is capable of supplying all of the ESF loads for the associated bus. In addition, an augmented-quality Station Blackout SACM diesel generator with a continuous rating of 5400 kW, 0.8 PF, and 4160 Volts is installed. This generator can be aligned to any of the four 4160 Volt emergency buses to support, SBO, or ESF loads, if necessary.

1.2.9 AUXILIARY SYSTEMS

1.2.9.1 Chemical and Volume Control System

The purity level in the RCS is controlled by continuous purification of a bypass stream of reactor coolant. Water removed from the RCS is cooled in the regenerative heat exchanger. From there, the coolant flows to the letdown heat exchanger and then through a filter and demineralizer where corrosion and fission products are removed. It is then sprayed into the volume control tank (VCT), and returned to the RCS by the charging pumps through the regenerative heat exchanger.

The CVCS automatically controls the rate of coolant removed from the RCS to maintain the pressurizer level within the prescribed control band, thereby compensating for changes in volume due to coolant temperature changes. The VCT is sized to accommodate coolant inventory changes resulting from load changes from hot standby to full power. Using the VCT as a surge tank decreases the quantity of liquid and gaseous waste which otherwise would be generated.

Reactor Coolant System make-up water is taken from the demineralized water storage system and from the two concentrated boric acid tanks. The boric acid solution in these tanks is maintained at a temperature which prevents crystallization. The make-up water is pumped through the regenerative heat exchanger into the reactor coolant loop by the charging pumps.

Boron concentration in the RCS can be reduced by diverting the letdown flow away from the VCT to the Reactor Coolant Waste Processing System and using demineralized water for coolant make-up (feed and bleed).

When the boron concentration in the RCS is low, the feed and bleed procedure described above would generate excessive volumes of waste to be processed; therefore, the CVCS is equipped with an ion exchanger which is loaded with deborating resin to reduce boron concentration late in cycle life.

1.2.9.2 Shutdown Cooling System

The Shutdown Cooling System is used to reduce the temperature of the reactor coolant at a controlled rate from 300°F to a refueling temperature of ≤ 140°F and to maintain the proper reactor coolant temperature during refueling.

The Shutdown Cooling System utilizes the LPSI pumps to circulate the reactor coolant through two shutdown cooling heat exchangers, returning it to the RCS through the LPSI header. Component cooling water is used to cool the shutdown cooling heat exchangers.

1.2.9.3 Component Cooling System

The Component Cooling System consists of three pumps, two saltwater-cooled heat exchangers, interconnecting piping, valving and controls. The corrosion-inhibited, demineralized water of this closed system is circulated through the component cooling heat exchangers where it is cooled to a design temperature of 95°F by saltwater with a maximum design inlet temperature of 90°F. Component cooling water temperature may reach as high as 120°F during a LOCA and during plant cooldown.

Typical items cooled by component cooling water are:

- Shutdown cooling heat exchangers
- Letdown heat exchanger
- RCP seals and lube oil cooler
- HPSI pump seals
- LPSI pump seals
- Waste gas compressors aftercooler
- Waste evaporators (Retired in place)

All ESF equipment connected to this system and requiring cooling water are fed by flow paths arranged in parallel to each other.

A component cooling water head tank floats on the system and absorbs the volumetric changes due to temperature changes to which the water in the closed system is subjected.

A chemical additive tank is piped and valved to the system in such a way that the corrosion inhibitor concentration can be increased during normal operation as required.

During normal plant operation, only one of the three pumps and one of the two heat exchangers are required for cooling service.

During normal shutdown, two of the three pumps and both of the heat exchangers are utilized for cooling.

For a LOCA one of the three pumps and both of the heat exchangers can provide the necessary cooling.

1.2.9.4 Fuel Handling and Storage Systems

The fuel handling systems provide for the safe handling of fuel assemblies and CEAs and for the required assembly, disassembly, and storage of the reactor vessel head and internals. These systems include a polar crane and a refueling machine located inside containment above the refueling pool, the fuel transfer carriage, the upenders, the fuel transfer tube, a fuel handling machine in the spent fuel storage room, and various other devices used for handling the reactor vessel head and internals.

The spent fuel pool, located in the Auxiliary Building, consists of two halves. Both new fuel and spent fuel may be stored in either half of the pool. Dry storage fornew fuel is provided near the spent fuel pool in the new fuel storage racks. A spent fuel handling machine is provided for manipulation of the spent fuel.

Spent fuel may be stored at the Independent Spent Fuel Storage Installation. The NUHOMS dry storage system is used for the transfer and storage of spent fuel. The system includes storage canisters, a transfer cask, lifting yoke and transfer trailer. A detailed description of the components and transfer operations is discussed in the Independent Spent Fuel Storage Installation Safety Analysis Report.

1.2.9.5 Sampling System

The sampling system consists of three subsystems: reactor coolant sampling, radioactive waste systems sampling, and turbine plant sampling. These subsystems provide the means for determining chemical and radiochemical conditions of the process fluids used in the plant.

The turbine plant sample station is located in the Turbine Building. This station contains pressure reducing valves, cooling equipment, pressure, temperature and flow control regulators, valves, piping, grab sample sink, and continuous pH, oxygen, and conductivity monitors, and indicators. An annunciator is located in the Control Room to alarm on abnormal conditions at the sampling station.

The reactor coolant and radioactive waste subsystems sample stations are located in the Auxiliary Building. The radioactive waste sampling station which is common to both units is located in the Unit 1 sample room. Each sample room contains the piping, valves, and cooling equipment necessary to reduce the pressure and temperature of the sample fluid or gas to acceptable levels for grab sampling or collection in a sample bomb. The sample streams are radioactive or potentially radioactive and may contain boric acid. All grab samples and bomb samples are taken to the chemistry laboratory for analysis.

1.2.9.6 Cooling Water Systems

The exhaust steam of the main turbine and SG feed pump turbines is condensed by circulating water. Six circulating water pumps per unit, having a combined volumetric capacity of 1,200,000 gpm take suction from and discharge to the Chesapeake Bay through a three-shell condenser (Figures 1-3A and 1-3B). The circulating water system is designed to maintain condenser back pressure at 2" Hg absolute with a 70°F injection temperature.

Centrifugal displacement-type vacuum pumps maintain a siphon on the condenser circulating water system and permit the circulating water pumps to operate at minimum total dynamic head based on friction drop through the system.

The saltwater cooling system provides bay water to the component cooling heat exchangers, the service water heat exchangers, and the Emergency Core Cooling System (ECCS) pump room air coolers. There are three vertical centrifugal pumps per unit, only two of which are to be on-line during normal plant operation. These pumps take suction from the circulating water intake structure and discharge through the heat exchangers to the Chesapeake Bay.

The Saltwater Chemical Addition System serves both the Unit 1 and Unit 2 Saltwater Systems to minimize the marine fouling of piping and heat exchanger surfaces. This system has the ability to inject approved chemicals into each saltwater header, as necessary.

In the Circulating Water System, a mechanical condenser tube cleaning system is used instead of chemical addition to minimize fouling on the heat exchange surfaces.

1.2.9.7 Plant Ventilation Systems

All areas are heated, cooled, and ventilated in different ways depending upon the peculiarities of each.

Normally the containment atmosphere is cooled using water in fan-coil heat exchangers. After a LOCA these coolers, plus a containment filtering system, will reduce the radioactivity concentration, temperature, and pressure of the containment atmosphere to a safe level. A forced outside air purging system, whose discharge is filtered to eliminate contaminants, is provided to protect personnel entering the containment.

Separate (forced) supply and exhaust ventilating systems are provided in the Auxiliary Building. The exhaust air is forced through high efficiency particulate air (HEPA) filters, then mixed with outside air before it is discharged into the atmosphere. Hot water unit heaters are used for standby and auxiliary heating. The access control areas in this building have a combination heating, cooling, and ventilating system which makes use of a direct expansion-type water chiller with an air-cooled condenser.

The Control Room and the cable spreading room are incorporated into a single air conditioning system, serving Units 1 and 2. The air handling and refrigeration equipment is redundant, but the ductwork is not. During the post-LOCA period, upon a high radiation signal from the Control Room air monitor or a safety injection actuation signal initiation from either Unit, a portion of the recirculated air is shunted through HEPA and charcoal filters to provide for a reduction in the Control Room airborne radioactivity concentration. A chiller is also provided which can supply chilled water to a second set of cooling coils in the air handling equipment. For fire events, this chiller can also be used in conjunction with fan coil units to provide an alternate source of cooling to the Control Room and cable spreading room. The battery rooms are ventilated using air from the access control area.

In the Turbine Building, supply and exhaust fans provide year-round ventilation plus cooling in summertime. Heat is provided by hot water unit heaters.

The office and conference rooms of the service buildings have year-round cooling, heating, and ventilating systems. Floor mounted fan-coil units and suspended air handling units work in conjunction with a direct expansion type water chiller and air cooled condenser. Summer-winter ventilation is provided for the balance of these buildings. Heat is provided through use of hot water coils and in some cases

electric heating elements, except in office spaces where only electric heaters are installed.

Due to the high output of heat from plant equipment, the intake structure pump room is cooled during both summer and winter using natural and forced air circulation. Hot water unit heaters are used for shutdown periods.

The Heating, Ventilation, and Air Conditioning (HVAC) System for the safety-related Diesel Generator Building is divided into safety-related and non-safety-related portions. While the emergency diesel generator is not in operation, the non-safety-related ventilation provides cooling to the Diesel Generator Building Control Room, Battery Room, 1E Switchgear Room, and non-1E Electrical Panel Room using a constant volume, direct-expansion cooling air handling unit (1A-AHU-1). During diesel generator operation, the safety-related ventilation system provides cooling to the Diesel Generator Room using only outdoor ambient air. The areas serviced by the safety-related HVAC system are heated by safety-related electrical duct heaters. Both the non-safety-related AHU (1A-AHU-1) and the safety-related supply and exhaust fans share a section of common ductwork to supply and exhaust these rooms. Interlocks are provided to ensure that both the non-safety-related AHU (1A-AHU-1) and the safety-related fans do not operate at the same time. Another non-safety-related AHU (1A-AHU-2) also serves the Maintenance Shop, hallway, Fuel Oil Storage Tank Room, and Future Expansion Room.

The HVAC System for the Station Blackout (SBO) Diesel Generator Building includes four augmented-quality fans, each thermostatically controlled, which are provided to exhaust air from the Diesel Generator Room. The SBO Diesel Generator Building HVAC System also includes an augmented-quality AHU (0C-AHU-1) to provide conditioned air to the Control Room. The augmented-quality AHU (0C-AHU-2) provides supply and exhaust ventilation to the Switchgear Room and only supply ventilation to the Battery Room, Cable Spreading Area, and Fuel Tank Room. The Cable Spreading Area, Fuel Tank Room, and Diesel Generator Room are exhausted by the Basement and Tank Room Exhaust Fan (0C-F-6). A separate fan (0C-F-5) provides exhaust ventilation for the Battery Room.

1.2.9.8 Plant Fire Protection System

The plant Fire Protection System is supplied with well water pumped from ground wells into storage tanks. Two fire pumps take suction from these tanks and supply fire protection systems, including sprinkler systems, deluge systems, hose stations and hydrants. In addition to water systems, gaseous and foam systems are provided to accommodate special requirements for various classes of hazards.

These systems were provided to fulfill requirements of the NRC, the Insurer, and corporate policy. The fire protection systems are designed following the guidance of the applicable National Fire Protection Association.

One electric motor-driven and one diesel engine-driven fire pump, take suction from the two 500,000-gallon capacity pretreated water storage tanks and discharge to the 12" fire main header. Each tank reserves 300,000 gallons explicitly for fire protection which cannot be withdrawn for other non-emergency plant uses. A jockey pump maintains the fire system to make-up for minor losses. A make-up pump takes suction from plant service water mains and discharges to the fire system to meet intermittent usage of water for purposes other than fire protection.

Consideration is given to the use of noncombustible and fire-resistant materials throughout the facility, particularly in areas containing critical portions of the plant such as the Containment Structure, Control Room, and components of the ESF systems. Fire walls and stair towers are provided to segregate portions of the plant for safe ingress and egress.

Hydrants and hose stations are strategically located to provide primary and back-up protection. Automatic fire suppression systems consisting of water spray sprinklers, pre-action sprinklers, deluge systems, Halon 1301 total flooding systems, and manually-actuated foam systems are provided for primary fire protection. In addition, automatic fire and smoke detection systems are installed to provide surveillance in safety-related and unattended locations. A sufficient number of portable extinguishers, placed at key locations, can be used for extinguishing limited magnitude fires.

1.2.9.9 Auxiliary Steam System

Normally, the plant heating steam is extracted from Unit 1 or 2 hot reheat. In case both units are not operating, heating steam is supplied to the plant hot water generators by one of two auxiliary boilers. Each oil-fired auxiliary boiler has a steam generating capability of 125,000 lbs/hr at a pressure of 180 psig when supplied with 180°F feedwater and approximately 10,000 lbs/hr of fuel oil.

The hot water generators are connected to the plant heating system. Each generator has a capacity of 25,050,000 Btu/hr when supplied with 27,067 lbs/hr of hot reheat steam or pressure reduced auxiliary boiler steam of 65 psig.

For a unit start-up, one of the auxiliary boilers also supplies steam for the unit pre-operational deaeration of the condenser hotwell condensate. The deaeration takes place by direct contact. The excess condensate generated by adding the auxiliary boiler steam to the main unit condensate is circulated to the auxiliary steam system deaerator. The auxiliary boiler feed pumps take suction from the storage portion of the deaerator and discharge the condensate back to the respective operating auxiliary boiler.

1.2.10 STEAM AND POWER CONVERSION SYSTEM

The turbine generator for Unit 1 is furnished by the General Electric Company and the Unit 2 turbine generator is furnished by the Westinghouse Electric Corporation. Each turbine is an 1,800 RPM tandem compound, six-flow exhaust, indoor unit.

Under nominal steam conditions of approximately 865 psia and 528°F at the stop-valves inlet, and with the turbines exhausting condenser pressure of 2" Hg absolute, the Unit 1 generator produces approximately 956,804 kW and the Unit 2 generator produces approximately 950,285 kW at the generator terminals. Turbine output corresponds to an NSSS thermal power level of approximately 2,750,000 kW (Unit 1) and 2,750,000 kW (Reactor Power plus RCP Heat Load – Unit 2).

The condensate and feedwater system of each unit consists of three condensate pumps, one gland steam condenser, five demineralize columns, six precoat filter columns, three external heater drain coolers, three first and second stage feedwater heaters, three condensate booster pumps, two third, fourth and fifth stage feedwater heaters, two turbine-driven feed pumps and two sixth stage feedwater heaters.

Normally, the feed pump turbines are driven by steam from the hot reheat. At low turbine generator loads, main steam or auxiliary steam is used to drive the feed pump turbines. All turbines exhaust into their respective unit condenser.

1.2.11 WASTE PROCESSING SYSTEMS

The Waste Processing Systems, which are shared by Units 1 and 2, provide controlled handling and disposal of liquid, gaseous and solid wastes. Gaseous and liquid waste discharges to the environment are controlled to comply with the limits set by 10 CFR Part 20.

a. Reactor Coolant Waste Processing System

Reactor coolant from the CVCS and from the reactor coolant drain tanks is processed by the Reactor Coolant Waste Processing System, which is comprised of filters, degasifiers, ion exchangers, evaporators, receiver tanks, and monitor tanks. The coolant is purified by the filters, degasifiers, liquid waste processing skid, and ion exchangers.

b. Miscellaneous Waste Processing System

Miscellaneous liquid wastes from the Auxiliary Building are filtered and stored in the miscellaneous waste receiver tank. The miscellaneous waste ion exchanger is used to purify the miscellaneous waste before it enters the monitor tank. If the radioactivity level of the liquid in the monitor tank is found to be high, the waste can be recycled through the ion exchanger or sent to the Reactor Coolant Waste Processing System.

The liquid in the monitor tank is sampled to ensure proper radioactivity limits are not exceeded prior to discharge to the circulating water system.

c. Waste Gas Processing System

Waste gases are collected in the vent header and the waste gas surge tank. One of the two waste gas compressors is used to compress the gas for storage in one of the three waste gas decay tanks. After decay, the gas in the waste gas decay tanks is sampled to ensure proper radioactivity limits are not exceeded, and then is released to the plant vent at a controlled rate.

d. Solid Waste Treatment

Spent demineralizer resins, and filters, which are not to be recycled, are transported to the waste disposal bay. These resins are dewatered in accordance with the CCNPP Process Control Program and stored, onsite, or shipped in an appropriately shielded container to an offsite disposal facility, or offsite vendor for processing.

Low activity wastes (dry active waste) such as contaminated laundry, rags, and paper may be shredded or compacted and/or packaged for removal from the plant for burial or shipment to an offsite processor.