THE CINCINNATI GAS & ELECTRIC COMPANY

CINCINNATI, OHIO 45201

November 2, 1981
QA-1474

E. A. BORGMANN
SENIOR VICE PRESIDENT

U. S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Attention: Mr. R. C. Knop, Acting Chief
Reactor Construction & Engineering Support Branch

RE: WM. H. ZIMMER NUCLEAR POWER STATION - UNIT 1
10CFR50.55(e) M-28, YUBA HEAT TRANSFER CO.
FUEL POOL HEAT EXCHANGERS, CONSTRUCTION PERMIT CPPR-88,
DOCKET NO. 50-358, W. O. #57300-957, JOB E-5590

Gentlemen:

On April 6, 1981, the NRC Site Senior Resident Inspector was notified by phone of a possible 10CFR50.55(e) condition regarding tube failures in the Fuel Pool Heat Exchangers which appeared to be due to an excessive tube vibration situation.

The fuel pool heat exchangers are not safety related pieces of equipment. Their function is to remove decay heat from the fuel assemblies and maintain fuel pool water temperature. However, as described in the ZPS-1 FSAR, Section 9.1.3, copy attached, the residual heat removal system can readily be used to supplement or replace the fuel pool heat exchangers in the event they become unavailable.

After careful consideration of this item, we have determined that this condition does not constitute a deficiency under 10CFR50.55(e). We do not believe this item to be reportable because the heat exchangers are not safety related and the safety of plant operations would not have been adversely affected had these tube failures occurred during normal plant operations.

We trust that this letter will constitute an acceptable final report on this deficiency in accordance with the requirements of 10CFR50.55(e).

Very truly yours,

THE CINCINNATI GAS & ELECTRIC CO.

By E. A. Borgmann

E. A. BORGMANN
SENIOR VICE-PRESIDENT

EAB/FKP/eic

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cc: NRC Resident Inspector
Attn: W. F. Christianson

NRC Office of Inspection & Enforcement
Washington, D. C. 20555

9.1.2.5 Summary of Radiological Considerations

By adequate design and careful operational procedures, the safety design bases of the spent fuel storage arrangement are satisfied. Thus, the exposure of plant personnel to radiation is maintained well below published guideline values. Further details of radiological considerations for the spent fuel storage arrangement are presented in Chapter 12.0.

9.1.3 Spent Fuel Pool Cooling and Cleanup System

9.1.3.1 Design Bases

The objective of the spent fuel pool cooling and cleanup system is to remove the decay heat released from the spent fuel elements. The system maintains a specified fuel pool water temperature, water purity, water clarity, and water level.

9.1.3.1.1 Safety Design Bases

The spent fuel pool cooling and cleanup system shall be designed to remove the decay heat from the fuel assemblies and maintain fuel pool water temperature to prevent damage to the fuel elements caused by overheating.

9.1.3.1.2 Power Generation Design Bases

The spent fuel pool cooling and cleanup system shall:

a. minimize corrosion product buildup and control water clarity so that the fuel assemblies can be efficiently handled under water,

b. minimize fission product concentration in the water which could be released from the pool to the reactor building environment,

c. monitor fuel pool water level and maintain a water level above the fuel sufficient to provide shielding for normal building occupancy, and

d. maintain the pool water temperature below 120° F under normal operating conditions.

9.1.3.2 System Description

The spent fuel pool cooling and cleanup system is shown in Figure 9.1-3. The system is designed to dissipate the heat of the spent fuel pool fuel load during equilibrium or nonequilibrium fuel cycle conditions. Design parameters for major system components are given in Table 9.1-1. The number of assemblies, and therefore the heat load, of the discharged fuel batches varies somewhat (i.e., from approximately 25% to 29% of a full core). The nominal spent fuel heat load is within the capability of either one of the two redundant pump/heat exchanger combinations provided for each fuel pool cooling system train. This nominal heat load is taken to be 25% of the reactor fuel assemblies 15C hours after reactor shutdown, plus 25% more of the reactor fuel assemblies that have been stored in the pool for about 1 year. The system cools the fuel storage pool water by transferring the spent fuel decay heat through heat exchangers to the reactor building closed cooling water system. Water purity and clarity in the storage pool, reactor well, and dryer-separator storage pit are maintained by filtering and demineralizing the pool water through a filter-demineralizer.

The spent fuel pool cooling and cleanup system consists of two full-sized circulating pumps, two full-sized heat exchangers, two filter-demineralizers, two skimmer surge tanks, and the required piping, valves and instrumentation. The pump circulates the pool water in a closed loop, taking suction from the surge tanks, circulating the water through the heat exchangers and filters, and discharging it through diffusers at the bottom of the spent fuel pool and reactor well. The water flows from the pool surface through scuppers and adjustable skimmer weirs to the surge tanks. Makeup water for the system is transferred from the cycled condensate storage tank to the skimmer surge tanks to make up evaporative and leakage losses. The fuel pool pumps and heat exchangers are located in the reactor building below the bottom of t'. fuel pool. The fuel pool filter-demineralizers, which collect rad.oactive corrosion products, are also located in the reactor building.

The spent fuel pool water is continually recirculated except when draining the reactor well and dryer-separator pit. Each of the two pump/heat exchanger trains is designed to remove the nominal heat load. The operating temperature of 120° F is permitted to rise somewhat when the circulating flow is interrupted for draining the reactor well and dryer-separator pit, or when larger than normal batches of fuel are stored. Both pump/heat exchanger trains may be run in parallel when a larger than normal heat load is produced in the pool.

The spent fuel pool cooling and cleanup system is normally connected to the offsite a-c power source. Upon loss of offsite a-c power, manual transfers can be made to power this system from the standby a-c power systems. However, since this system is considered to be a nonessential load, no automatic transfer to the emergency buses is provided.

To establish a circulating pattern of flow in the reactor well and storage pool, the diffusers and skimmer drains are placed to sweep particles dislodged during refueling operations away from the work area and out of the pool. To control particles dislodged from parts transferred to the dryer-separator storage pit the normal circulating flow pattern can be altered by taking suction from the bottom of the dryer-separator storage pit. A portable underwater vacuum cleaner is provided to remove crud and miscellaneous objects from the pool walls and floor.

Fuel pool water clarity and purity is maintained by a combination of filtering and ion exchange. The filter-demineralizer maintains a total heavy element concentration (Fe, Cu, Hg, Ni, etc.) to 0.1 ppm or less with a pH range of 6.0 to 7.5. Particulate material is removed from the cooling water by the pressure precoat filter-demineralizer units in which a finely divided disposable filter medium is supported on filter elements. The filter medium is replaced when the pressure drop is excessive or the ion exchange resin is depleted. The spent filter medium is backwashed to radwaste for processing of radioactive wastes. New filter medium is mixed in a precoat tank and is transferred as a slurry by a precoat pump to the filter where the solids deposit on the filter elements. The holding pump connected to each filter-demineralizer maintains circulation through the filter in the interval between the precoating operation and the return to normal system operation. A strainer is provided in the effluent stream of the filter-demineralizers to limit the migration of the filter material.

The two filter-demineralizer units for ZPS-1 are located separately in shielded rooms. Sufficient clearance is provided in the rooms to permit removal of the filter elements from the vessels. Each room contains only the filter-demineralizer and piping. All valves are located on the outside of one shielding wall of the room, together with necessary piping and headers, instrument elements, and controls. Penetrations through shielding walls are located so as not to violate radiation shielding requirements.

Instrumentation is provided for both automatic and remote manual operation of the filter-demineralizer units. Indication is provided in the radwaste building control room and the fuel pool pump area. Surge tank high- and low-water level switches are provided. A level indicator is provided to monitor reactor well water level during refueling and is mounted at the pump room instrument rack. Control of flow to or from the reactor well is accomplished during refueling. A pool high-low water level switch operates a local indicator light and sounds an alarm in the main control room whenever the level is either too high or too low. The trip point is adjustable over the range of the skimmer weir adjustment.

The pumps are controlled from the pump room area. Pump low suction pressure automatically turns off the pumps. A pump low discharge pressure alarm indicates in the main control room and in the pump area instrument rack. The controls for the remotely controlled valve which allows discharge of the refueling water volume to the cycled condensate storage tank are located on a rack in the pump area. The open or closed condition of this valve is indicated by a light in the pump area.

The flow rate through each of the filter-demineralizers is indicated and recorded on the filter-demineralizer control panel.

A high rate of leakage through the refueling bellows assembly, or the fuel pool gates, is indicated by lights on the pump area instrument rack and is alarmed in the main control room.

The filter-demineralizers are controlled from a local panel in the reactor building. Differential pressure and conductivity instrumentation is provided for each unit to indicate when backwash is required.

Suitable alarms, differential pressure indicators, and flow indicators are provided to monitor the condition of the filter-demineralizers.

9.1.3.3 Safety Evaluation

The system is designed to maintain a maximum spent fuel storage pool temperature of 120° F with a spent fuel load consisting of 25% (140 fuel assemblies) of the reactor fuel assemblies having decayed 150 hours and 25% of the reactor fuel assemblies (140 fuel assemblies) having been in the pool for 1 year.

The spent fuel pool for ZPS-1 can accommodate the spent fuel when larger than normal batches of fuel are discharged. Such a condition would exist, for example, when a full reactor fuel core must be removed from the reactor vessel for inspection purposes. The residual heat removal system can be operated in parallel with the fuel pool cooling and cleanup system to remove decay heat in this situation. The heat exchangers are cooled by the reactor building closed cooling water system to prevent contamination outside the reactor building in the event of heat exchanger tube failure.

The system can maintain the fuel pool water temperature below 120° F when removing the nominal heat load from the pool with the reactor building closed cooling water temperature at its maximum. The fuel pool water temperature is permitted to rise to approximately 140° F while the system water flow is diverted from the pool to drain the reactor well and dryer-separator pit, or when larger than normal batches of spent fuel are stored in the pool. The largest heat load requirement for this system occurs during the early fuel cycles. With the presently anticipated fuel residence schedule, this amounts to about 20% of a full core. The present fuel residence schedule does not indicate fuel reinsertion. In addition, sufficient storage racks and heat removal capability are provided to remove all remaining fuel assemblies in the reactor core at this same time if required for inspection purposes.

The spent fuel pool cooling and cleanup system consists of two 100% trains, each capable of maintaining the pool temperature at or below 120° F while removing the decay heat associated with a nominal heat load. Both trains of the system may be operated in parallel when a larger than nominal heat load is produced in the pool. In this situation, the fuel pool temperature may be allowed to rise to 140° F.

The RHR system shall be connected to the spent fuel pool cooling and cleanup system only in the event that a full core load of fuel, recently discharged from the reactor, is present in the spent fuel pool and the pool temperature exceeds 140° F.

The spent fuel pool cooling piping portion of the system is designed for SSE loading. The spent fuel pool cooling pumps and heat exchanger supports are also designed for SSE loading. Valves 1FC010 and 1FC023 provide isolation from the Seismic Category I cooling piping and the non-seismic filter demineralizer piping. A Seismic Category I intertie is provided from heat exchanger 1FC02AA to the Seismic Category I por- 16 tion of the RBCCW system. The intertie connection is made wth 3-foot removable spool pieces on the supply and return lines upon removal of the blind flanges. Isolation valves are provided on the RBCCW branch to allow making the intertie with the RBCCW system operating. All electrical and control and instrumentation for the system is non-safety-related and is non-Seismic Category I. In addition, spent fuel pool makeup can be provided from the Seismic Category I portion of the service water system. This source of makeup water shall be employed upon failure of the normal makeup system in a time interval sufficient to prevent uncovering of the stored fuel. Two locked closed hose gate valves which are part of the service water system are located 16 on elevation 627 feet 9 inches in the reactor building. Makeup water can be provided to the spent fuel pool through hoses connected to one or both of these valves. The service water system is capable of supplying enough water to prevent uncovering of the fuel. There is no permanent connection between the service water system and the spent fuel pool cooling and cleanup system.

There are no connections to the fuel storage pool which could allow the fuel pool to be drained below the pool gate between the reactor well and the fuel pool. Two diffusers are placed in both the reactor well and the fuel pool to distribute the return water as efficiently and with as little turbulence as possible. Diffusers are placed to minimize stratification of either temperature or contamination. A check valve is connected to each diffuser pipe outside the fuel storage pool to prevent the pool water from being siphoned out of the pool and uncovering the spent fuel. Flow control valves at the operating floor enable the operator to achieve optimum recirculation patterns in the fuel pool to control and maintain the specified water quality and operational conditions.

9.1.3.4 Testing and Inspection

No special tests are required because at least one pump, heat exchanger, and filter-demineralizer is continuously in operation while fuel is stored in the pool. Duplicate components are operated periodically to handle abnormal heat loads or to replace a unit for servicing. Routine visual inspection of the system components, instrumentation, and trouble alarms are adequate to verify system operability.

9.1.3.5 Radiological Considerations

The water level in the spent fuel storage pool is maintained at a height which is sufficient to provide shielding for required building occupancy. Radioactive particulates removed from the fuel pool are collected in filter-demineralizer units which are located in shielded cells. For these reasons, the exposure of station personnel to radiation from the spent fuel pool cooling and cleanup system is minimal. Further details of radiological considerations for this and other systems are described in Chapter 12.0.

9.1.4 Fuel Handling System

9.1.4.1 Design Bases

9.1.4.1.1 Power Generation Design Bases

The fuel handling system provides a safe and effective means for transporting and handling fuel from the time it reaches the plant until it leaves the plant after postirradiation cooling.