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BOUCHEY,G.D. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards responses to Chemical Engineering Branch questions per 810804 request for addl info.Responses will be incorporated into FSAR Amend 21.

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October 27, 1981
G02-81-424
SS-L-02-CDT-81-083

Docket No. 50-397

Mr. A. Schwencer
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington D.C. 20555

Dear Mr. Schwencer:

Subject: SUPPLY SYSTEM NUCLEAR PROJECT NO. 2
CHEMICAL ENGINEERING BRANCH QUESTIONS

Reference: Letter, R. L. Tedesco to R. L. Ferguson, "WNP-2 FSAR - Request for Additional Information", August 4, 1981

Enclosed are sixty (60) copies of responses to the Chemical Engineering Branch questions transmitted to the Supply System by the referenced letter. These responses will be incorporated into the WNP-2 FSAR in Amendment 21.

Very truly yours,

GW Sherman for

G. D. Bouchey
Deputy Director,
Safety & Security

GDB:CDT:ct

Enclosures

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WNP-2 Files

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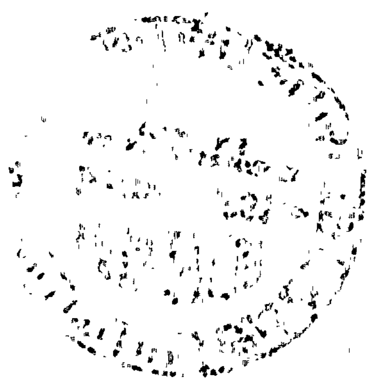

Q. 281.001
(10.4.6)

In accordance with Regulatory Position C.1 of Regulatory Guide 1.56 revision 1, describe the sampling frequency, chemical analyses, and established limits for purified condensate dissolved and suspended solids that will be performed and the basis for these limits.

Response:

Sampling frequency, chemical analyses and established limits for dissolved and suspended solids in purified condensate are included in Table 281.001-1 for feedwater quality.

Bases for purified condensate and feedwater limits are to ensure sustained, safe plant operation by preserving the integrity of Nuclear Steam Supply System components, vessel internals, fuel and transport piping.

The less than 0.1 umho/cm demineralizer effluent conductivity limit ensures that dissolved solids are low and that in conjunction with the Reactor Water Cleanup System, reactor water quality will be maintained. Metallic impurity limits are set to preserve fuel performance by restricting the amount available for desposition on heat transfer and fluid transport surfaces. In addition, restricting corrosion product input minimizes the radiological impact from corrosion product activation, transport and deposition.

Chloride input is controlled to maintain reactor coolant concentrations below the levels where stress corrosion cracking is induced.

The oxygen levels between 20 and 200 ppb in the feedwater fall within the minima portion of the combined generalized and pitting corrosion curve for carbon steel piping. The effect is twofold; piping is preserved and corrosion product activation, transport and deposition are restricted.

WNP-2

TABLE 281.001-1

FEEDWATER QUALITY TO THE REACTOR*

Parameter	Limit	Sampling Frequency
Conductivity	$\leq$0.1 umho at 25°C Measured at demineralizer outlet	Continuous
pH	6.5 to 7.5 at 25oC	Weekly
Metallic Impurity	$\leq$15 ppb with less than 2 ppb copper	Weekly; continuous collected filter sample
Oxygen	$\geq$20 $\leq$ 200 ppb	Continuous
Chlorides	To maintain reactor water quality of $\leq$200 ppb at rated operating pressure	Daily

*Measured after the last feedwater heater unless noted.

Q. 281.002
(10.4.6)

Establish and state the sequential resin replacement frequency in order to maintain adequate capacity margin in the condensate treatment system (Regulatory Position C.2 of Regulatory Guide 1.56, revision 1). Include the basis for the resin replacement frequency.

Response:

Pressure precoat filter/demineralizer media on individual vessels in replaced on a cyclic basis when the pressure drop exceeds 25 psid or the effluent conductivity exceeds 0.1 umho/cm. The conductivity limitation does not apply when condenser vacuum is broken and during the period when condenser vacuum is being restored.

Capacity margin to provide protection for postulated leaks is controlled by maintaining a residual capacity on the most exhaused demineralizer in service. Basis for the calculation will be the maximum allowed throughput volume for a given vessel based on the nominal conductivity which exists related to the installed capacity.

Q. 281.003
(5.4.8)
(10.4.6)

Verify that the initial total capacity of new demineralizer resins (condensate and primary coolant) will be measured and describe the method to be used for this measurement (Regulatory Position C.3 of Regulatory Guide 1.56, revision 1).

Response:

Total capacity of each purchased lot of ion exchange resin will be specified by the manuafacturer/supplier. The resin manufacturer's analysis procedures for capacities will be used until an ASTM or Standards Method procedure for powdered resin capacity is approved. ASTM procedure D-2187-71, referenced in Regulatory Guide 1.56, is not applicable to powdered ion exchange capacity determination.

Q. 281.004
(5.4.8)
(10.4.6)

Describe the method of determining the condition of the demineralizer units so that the ion exchange resin can be replaced before an unacceptable level of depletion is reached (Regulatory Position C.4 of Regulatory Guide 1.56, revision 1). Describe the method by which (a) the conductivity meter readings for the condensate cleanup system will be calibrated, (b) the flow rates through each demineralizer will be measured, (c) the quantity of the principal ions likely to cause demineralizer breakthrough will be calculated, and (d) the accuracy of the calculation of resin capacity will be checked.

Response:

Deminerlizer condition during normal power operation is related to inlet conductivity and vessel volume throughput. Inlet conductivity is related to concentration through the equivalent conductance of the primary constituents in the process fluid.

(a) Conductivity instrumentation for condensate and cleanup systems is calibrated against laboratory flow cells in accordance with ASTM-D1125.

(b) Flow rates are measured and totalized for the individual condensate demineralizers and recorded for the reactor water cleanup demineralizers.

(c)(d) The condensate and cleanup filter demineralizer systems are designed to be operated at a 0.1 umho/cm conductivity end point versus the calculated breakthrough discussed in position 4.C of Regulatory Guide 1.56.

Q. 281.005
(5.4.8)
(10.4.6)

Indicate the control room alarm set points of the conductivity meters at the inlet and outlet demineralizers in the condensate and reactor water cleanup systems when either (Regulatory Position C.5 of Regulatory Guide 1.56, revision 1):

a. The conductivity indicates marginal performance of of the camineralizer system;

b. The conductivity indicates noticeable breakthrough of one or more demineralizers.

Response:

The alarm ser points for the conductivity meters at the inlet and outlet of the demineralizers in the condensate and reactor water cleanup systems are provided below. These conductivity levels indicate marginal performance of the demineralizer system.

	Influent	Effluent
Condensate	0.17 umho/cm	0.1 umho/cm
Reactor Water Cleanup	1.0 umho/cm	0.1 umho/cm

Q. 281.006
(5.4.8)
(10.4.6)

The reactor coolant limits and corrective action to be taken if the conductivity, pH, or chloride content is exceeded will be established in the Technical Specifications. Describe the chemical analysis methods to be used for their determination (Regulatory Position C.6 of Regulatory Guide 1.56, Revision 1).

Response:

The chemical analysis methods used for the determination of conductivity, pH and chloride content of the primary coolant are as follows:

Conductivity	-	measured in accordance to ASTM-D1135
pH	-	measured in accordance to ASTM-D1293
Chloride	-	determined by specific ion electrode in accordance with General Electric BWR Chemistry Training Manual or by Ion Chromatography as described in the vendor's operating manual.

Q. 281.007
(10.4.6)

Describe the water chemistry control program to assure maintenance of condensate demineralizer influent and effluent conductivity within the limits of Table 2 of Regulatory Guide 1.56, Revision 1. Include conductivity meter alarm setpoints and the corrective action to be taken if the limits of Table 2 are exceeded.

Response:

Condensate influent and effluent levels are maintained within the limits of Table 2 of Regulatory Guide 1.56, Revision 1, in the following manner:

1. Individual demineralizer vessel outlet conductivity is continuously monitored and the vessel is removed from service when the 0.1 umho alarm setpoint is reached. Exception is taken when the condenser is vented or condenser vacuum is being restored.

2. Combined demineralizer outlet conductivity is continuously monitored and is alarmed at 0.1 umho/cm. Corrective action is initiated in accordance with plant procedures and plant technical specifications whenever the 0.1 umho/cm limit is exceeded.

3. Condensate inlet conductivity is continuously monitored and alarmed at 0.17 umho/cm at which point a condenser leak is indicated. Corrective action is initiated in accordance with plant procedures once the 0.17 umho/cm is exceeded.

Q. 281.008
(9.1.3)

Regarding the Spent Fuel Pool Cleanup System, provide the following information.

Describe the samples and instrumentation and their frequency of measurement that will be performed to monitor the Spent Fuel Pool water purity and need for ion exchanger resin and filter replacement. State the chemical and radiochemical limits to be used in monitoring the spent fuel pool water and for initiating corrective action. Provide the basis for establishing these limits. Your response should consider variables such as: gross gamma and iodine activity, demineralizer and/or filter differential pressure, demineralizer decontamination factor, pH and crud level.

Response:

Section 9.1.3.2 has been changed.*

*Draft FSAR page change attached.

A high rate of leakage through the refueling bellows assembly, drywell to reactor seal, or the fuel pool gates is indicated by lights on the operating floor instrument racks and is alarmed in the control room.

The filter demineralizers are controlled from a local panel. 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.

Insert "attached"

9.1.3.3 Safety Evaluation

The maximum possible heat load will be the decay heat of one full core load of the fuel due to an emergency dump into the pool plus the remaining decay heat of previously discharged batches of fuel. The residual heat removal system (RHR) can be operated in parallel with the fuel pool cooling and clean-up system during this condition when the pool has a greater than normal load and when its temperature exceeds 125°F. The RHR system can be used in parallel with the fuel pool cooling system to remove abnormal heat loads, as well as during the normal refueling mode. The RHR system will not be initiated unless the reactor is in a cold shutdown condition. The operator must insert spool pieces in supply and discharge piping and open normally closed valves to permit the use of this system for supplementary cooling.

The fuel pool heat exchangers are cooled by the reactor building closed cooling water system to prevent contamination outside the reactor building in the event of a fuel pool heat exchanger tube failure. The system can maintain the fuel pool water temperature below 125°F when removing the nominal heat load from the pool with the reactor building closed cooling water temperature at its maximum of 95°F. The fuel pool water temperature is permitted to rise to approximately 150°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.

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 turbulance as possible. Diffusers are placed to minimize stratification of

Insert to Page 9.1-26:

There are two sampling points: SP-25A&B, at the effluent from the fuel pool filter demineralizers, and FPC-DM-1A&B. There are also sample points: SP-69, at the common effluent line, and SP-24, at inlet header to the demineralizers. All four sample points are piped to the sample room. All four sample points continuously transmit conductivity measurements to a 4-point recorder and also provided grab samples at the nearby associated fume hood. The conductivity cells are L&N Model 4905. The recorder, S-CR-25, is L&N Speed-O-Max Type W.

There are also instruments for measuring and recording differential pressure across the filter demineralizers to alarm on plugging of the filters. Transmitters dPT-13A&B and recorder dPIR-13 (Range 0 to 40 psid lin.), are furnished to monitor the plugging tendency of the filter demineralizers.

Weekly fuel pool analyses will be performed to assure that the General Electric water quality specifications for the fuel pool are maintained. The water quality parameters are as follows:

Conductivity	< 3 umho/cm at 25°C
Chloride	< 0.5 ppm
pH	5.3-7.5 at 25°C
Total Insolubles	< 1 ppm
Heavy Metals	< 0.1 ppm

Weekly gross gamma analyses following fuel load or when active fuel is stored in the pool. Special tests on iodine or other significant radionuclide removal by the fuel pool filter demineralizers will be performed when gross gamma activity levels in the fuel pool exceed 10^{-3} uCi/cc during normal power operation.

Continuous influent and effluent conductivity for the fuel pool demineralizers are monitored and recorded. A high conductivity effluent alarm setpoint of 1.5 umho/cm is chosen to reflect marginal performance of the demineralizer since they will eventually saturate with air saturated water at an equalibrium level of about 1.1 umho/cm. Differential pressure drop in continuously monitored across the filter demineralizers and at pressure alarm setpoint of 25 psid, the units are removed from service and re-precoated with a combined filteration/ion exchange media.

In addition, the fuel pool water shall be kept of sufficient clarity at all times by the spent fuel pool cleanup system to permit reading letters 0.25 inches high, 25 feet below the surface, using a surface breaking viewing aid and binoculars.

Q. 281.9
(6.1.2)

Regarding the Spent Fuel Pool Cleanup System, provide the following information:

a. Indicate the total amount of paint or protective coatings (area and film thickness) used inside containment that do not meet the requirements of ANSI N101.2 (1972) and Regulatory Guide 1.54. We will use the above information to estimate the rate of combustible gas generation vs. time and the amount (volume) of solid debris that can be formed from these unqualified organic materials under DBA conditions that can potentially reach the containment sump. A G value of 5 will be used unless a lower G value is justified technically.

b. In order for the staff to estimate the rate of combustible gas generation vs. time due to exposure of organic cable insulation to DBA conditions inside containment, provide the following information:

   1) The approximate total quantity (weight and volume) of organic cable insulation material used inside containment, including uncovered cable and cable in closed metal conduit or closed cable trays. We will give credit for beta radiation shielding for cable in closed conduit or trays if information is provided as to the respective quantities of cable in closed conduits or trays vs. uncovered cable.

   2) The approximate breakdown of cable diameters and conductor or cross section associated or an equivalent cable diameter and conductor cross section which is representative of the total cable surface area consistent with the quantity of cable surface area consistent with the quantity of cable identified in 1) above.

   3) The major organic polymer or plastic material associated with the cable in 1) above. If this information is not provided, we will assume the cable insulation to be polyethylene and a G value of 3.

Response:

a. All of the organic top coat materials used within the containment have been subjected to the test requirements stipulated in ANSI 101.2 and ANSI N512 and to an accumulative dose of 1×10^9 rads, at the Oak Ridge National Laboratory. Test results show the coatings were intact with no defects. Further information regarding the decomposition of organic and inorganic paint and protective coatings inside containment, including mass and surface area, is provided in the response to Q. 22.048.

b. The Supply System has committed to inert the WNP-2 containment (reference letter G02-81-181, G.D. Bouchey to D.G. Eisenhut, "Inerting of the WNP-2 Primary Containment", dated July 16, 1981) and, therefore, it is necessary to re-evaluate the potential for post-LOCA combustible gas combinations based on oxygen generation rather than hydrogen generation. This evaluation will consider the exposure of organic cable insulation to DBA conditions inside containment in an inerted atmosphere. FSAR revisions reflecting the results of this analysis are scheduled for submittal to the NRC by January 1, 1982.

Q. 281.011
(9.3.2)

Acceptance Criterion 2.g in Standard Review Plan Section 9.3.2 states that passive flow restrictions to limit reactor coolant loss from a rupture of the sample line should be provided. You do not address this criterion in the FSAR. Describe how the requirement of maintaining radiation exposures to as low as is reasonably achievable will be met in the event of a rupture of the sample line containing contaminated primary coolant, in accordance with Regulatory Position C.2.i(6) of Regulatory Guide 8.8, Revision 3 (June 1978).

Response:

Passive flow restrictions, as such, have not been used in the design of the WNP-2 process sampling lines.

The following design features, however, will maintain radiation exposures as low as reasonably achievable and satisfy the intent of Acceptance Criterion 2.g in Standard Review Plan Section 9.3.2.

a) Sample lines which carry radioactive or potentially radioactive fluid, are 3/8" O.D x .049" wall stainless steel tubing. The small size tubing is in essence a passive flow restriction.

b) Sample lines are made of continuous seamless tubing with a minimum of joints and all joints are welded.

c) All sample lines can be isolated at the source by either air-operated valves, solenoid valves or manual valves.

d) Flow indication for each sample line is provided in the sample station racks. Loss of flow would alert the operator to a potential line rupture and action would be taken to isolate the line.

Regulatory Position C.2.i(6) of Regulatory Guide 8.8, Revision 3 (June 1978) addresses means of reducing leakage of contaminated coolant from valves, rather than leakage resulting from a ruptured sample line. In particular, the position is likely directed toward leakage from large valves since leakage from valves of the size associated with the sampling lines is typically insignificant.

Q. 281.010
(9.3.2)

Verify that sample line purge flows and duration times are sufficient to flush out stagnant lines to assure that a representative sample is obtained.

Response:

Sampling procedures at WNP-2 specify a sample line purge flow of not less than 500 ml/min. The procedures additionally specify a purge volume of seven (7) times the volume of the sample lines, which is sufficient to insure a representative sample is obtained. Sample line volume will be identified for each sample line when "as-built" line lengths have been determined. Based on sample line volume and the minimum purge flow, the correct purge duration time will be determined.

Q. 281.012
(9.3.2)

Acceptance criterion 1.a in Standard Review Plan Section 9.3.2 indicates that sumps inside containment and the standby liquid control storage tank should be sampled. Describe provisions to sample sump water inside the containment in accordance with the requirements of General Design Criterion 04 in Appendix A to 10 CFR Part 50.

Response:

The WNP-2 drywell sumps are provided with gravity flow connections to the reactor building sumps. During normal operation, samples may be obtained directly from the sumps. For operation during accidents, the design of the Post Accident Sampling (PAS) system includes the capability of obtaining samples from the four floor drain sumps and the equipment drain sump in the reactor building. A sample from each sump may be pumped to the PAS station where a grab sample is taken for laboratory analysis.

The Standby Liquid Control System (SLCS) tank samples are obtained periodically. (Frequency will be specified in the appropriate Technical Specification.) These samples are withdrawn from the SLCS tank via a 30" manhole in the top of the tank and taken to the laboratory for analysis. This method eliminates the clogging problems which could occur in long runs of sample line tubing to a remote sample area (due to transporting such fluids as pentaborate).

Q. 281.013
(5.4.8)

Verify that provisions have been made for draining and venting reactor water cleanup system components through a closed system in accordance with GDC 60 and 61.

Response:

Provisions have been made for draining and venting Reactor Water Cleanup system components in accordance with GDC 60 and 61. The system pumps, heat exchangers, and filter/demineralizers are vented and drained to the radioactive equipment and floor drainage systems. Wastes are collected in the reactor building radioactive sumps and are transferred to the radwaste system for treatment, sampling, and disposal or reuse within the plant.

Q. 281.014
(TMI II.B.3)

Provide information that satisfies the attached proposed license conditions for post-accident sampling.

Response:

See Item II.B.3, Appendix B to the FSAR.