UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 141 TO FACILITY OPERATING LICENSE NO. NPF-21

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

NUCLEAR PROJECT NO. 2

DOCKET NO. 50-397

1.0 INTRODUCTION

By letter dated January 14, 1992, and as supplemented by letters dated February 10, 1995, and August 16, 1995, the Washington Public Power Supply System (WPPSS or the licensee) proposed that Appendix A of Facility Operating License NPF-21 be amended to revise the WPPSS Nuclear Project No. 2 Technical Specifications (TS). The proposed changes would revise TS surveillance requirements regarding demonstration of jet pump operability (TS 4.4.1.2.1 and 4.4.1.2.2). The licensee also requested several administrative changes to correct discrepancies in the TS.

The August 16, 1995, supplemental letter provided additional clarifying information and did not change the original no significant hazards consideration determination published in the Federal Register on May 27, 1992 (57 FR 22272) and March 29, 1995 (60 FR 16204).

2.0 BACKGROUND

The jet pumps are part of the reactor coolant recirculation system and are designed to provide forced circulation through the core to remove heat from the fuel. The jet pumps are located in the annular region between the core shroud and the vessel inner wall. Because the jet pump suction elevation is at two-thirds core height, the vessel can be reflooded and coolant level maintained at two-thirds core height even with the complete break of the recirculation loop pipe which is located below the jet pump suction elevation. Jet pump operability is an explicit assumption in the design basis loss-of-coolant accident (LOCA) analysis evaluated in the WNP-2 Final Safety Analysis Report (FSAR).

The capability of reflooding the core to two-thirds core height is dependent upon the structural integrity of the jet pumps. If the structural system (including the beam holding a jet pump in place) fails, jet pump displacement and performance degradation could occur, resulting in an increased flow area through the jet pump diffuser. This could adversely affect the assumed blowdown flow during a LOCA as well as the water level in the core during the reflood phase (References 1 and 2).

In response to jet pump hold-down beam failures and crack indications found at several operating plants in 1980, the NRC issued Bulletin 80-07 (IEB 80-07, Reference 3). The bulletin included a requirement to initiate daily surveillance testing to ensure timely detection of potential or actual jet pump beam failures and provided an acceptable set of surveillance testing criteria to verify jet pump operability. General Electric (GE) issued a Service Information Letter (GE SIL No. 330) (Reference 4) which described the jet pump beam failures and provided an alternative set of surveillance criteria for monitoring jet pump performance. NUREG/CR-3052 (Reference 5) documented the closeout of IEB 80-07 and provided approval for use of either the IEB 80-07 or GE SIL 330 surveillance requirements for verifying jet pump operability. Jet pump surveillance requirements similar to those contained in IEB 80-07 were incorporated into the standard TS for BWRs, NUREG-0123.

The current WNP-2 surveillance requirements for verification of jet pump operability are consistent with NUREG-0123. The surveillance requirements address both single and two loop recirculation system operation. The jet pumps in an operating recirculation loop are considered operable if no two of the following conditions exist:

a. The indicated recirculation loop flow differs by more than 10 percent from the established flow control valve position-loop flow characteristics.

b The indicated total core flow differs by more than 10 percent from the established total core flow value derived from established recirculation loop flow measurements.

c. The indicated diffuser-to-lower plenum differential pressure of any individual jet pump differs from established recirculation loop patterns by more than 10 percent.

These surveillances are required to be performed for the operating recirculation loop(s) prior to exceeding 25 percent of rated thermal power and at least once per 24 hours when in Operational Condition 1 or 2.

3.0 EVALUATION

The licensee proposed to revise the surveillance requirements of TS 4.4.1.2 to add a note to exempt idle recirculation loops from the testing requirements, to delete testing of the jet pumps at less than 25 percent of rated thermal power, and to revise the acceptance criteria for allowable jet pump diffuser-to-lower plenum differential pressure from 10 percent to 20 percent. The licensee also proposed several administrative changes. The proposed changes are evaluated below.

Idle Loop Testing Exception

The licensee proposed to revise the specification to add a note stating that the surveillance requirements are "[n]ot required to be performed until 4 hours after associated recirculation loop is in operation." The licensee

stated that valid data can only be obtained during jet pump operation. The likelihood of an event requiring jet pump operability occurring during the short time period between startup of an idle reactor recirculation loop and performance of the surveillance testing is remote. The staff finds that 4 hours is an acceptable time period to establish appropriate operating conditions for performance of jet pump testing.

Deletion of Testing at Less Than 25 Percent Rated Thermal Power

The licensee has proposed to revise the specification to delete the requirement to test the jet pumps "prior to THERMAL POWER exceeding 25 percent of RATED THERMAL POWER" and add a note stating that the surveillance requirements are "[n]ot required to be performed until 24 hours after >25 percent of RATED THERMAL POWER."

This proposed change would allow performance of jet pump testing to be delayed until the reactor power level has exceeded 25 percent of rated thermal power. The licensee stated that performance of the surveillance at lower power levels does not provide reliable data due to the operational characteristics of the flow instrumentation at low flow conditions. Due to the turbulence in the jet pump diffuser where the flow measurement pressure tap is located, the differential pressure signal is extremely "noisy." When power and flow conditions are too low, this process noise results in large fluctuations in measured versus actual differential pressure. At power levels above 25 percent rated thermal power, the flow noise is a smaller component of the total signal, so that meaningful data can be gathered and comparisons to baseline flow patterns can be made.

The GE SIL acknowledged that significant scatter exists in jet pump differential pressure (dP) data at low power and flow conditions, but did not address the issue of obtaining useful data at low power/flow conditions, nor did it provide for the option of waiting until power is increased to begin performing the surveillance. NUREG/CR-3052 also did not address the issue of data scatter when the surveillance testing criteria are used at low power levels. Industry operating experience has shown that performance of the surveillance requirement at low power does not provide a reliable indication of jet pump operability. Typically, higher flow rates, only attainable at reactor power levels exceeding 25 percent (due to concern for pump cavitation), are required in order to obtain valid data. For example, the Grand Gulf Nuclear Station experienced a displaced jet pump mixer assembly in September 1993. Low power testing indicated some anomalous readings, but the displaced mixer could not be positively identified until power was increased (References 6 and 7).

The staff finds that documented industry operational experience has shown that performance of jet pump testing at power levels below 25 percent does not provide reliable indication of jet pump operability. The staff also notes that the likelihood of an event requiring jet pump operability (i.e., a design basis LOCA) occurring during the relatively short time period between entering Operational Condition 2 and exceeding 25 percent of rated thermal power is small. Delaying jet pump testing until the power level exceeds 25 percent is

also consistent with guidance contained in NUREG-1433 and NUREG-1434. Therefore, the staff finds that revising the specification to allow performance of jet pump testing to be delayed until 24 hours after exceeding 25 percent power is acceptable.

Revision of Allowable Jet Pump Diffuser-to-Lower Plenum Differential Pressure

The licensee proposed to revise the acceptance range for deviation from established patterns of diffuser-to-lower plenum dP from 10 percent to 20 percent. The licensee stated that the GE SIL recommended an allowable variance of 10 percent for plants measuring individual jet pump flow, and 20 percent for plants measuring individual jet pump diffuser-to-lower plenum dP. The WNP-2 surveillance requirement measures dP; however, the licensee stated that by an oversight an acceptability range of 10 percent for dP variance was incorporated in the WNP-2 TS at the time of issuance.

A 20 percent acceptability range is consistent with the recommendations contained in the GE SIL and has been accepted by the staff in NUREG/CR-3052. It is also consistent with guidance contained in Standard Technical Specifications. The staff finds that an acceptability range of 20 percent for diffuser-to-lower plenum dP is adequate to detect significant jet pump degradation and is acceptable.

Administrative Changes

The licensee requested an editorial correction to TS 4.4.1.2.2.c., which currently reads, in part, "The indicated difference-to-lower plenum. . . ." The licensee requested that this be revised to read, "The indicated diffuser-to-lower plenum. . . ." The proposed change corrects a typographical error which was introduced during development of the WNP-2 TSs. The staff finds that the proposed change provides for proper identification of the required surveillance criterion, is administrative in nature, and is therefore acceptable.

The licensee also requested approval of a correction to TS 3.8.3.1.b.1 regarding identification of power distribution panels required to be energized. The licensee proposed that the description of item d) be revised from "125-VDC Critical Switchgear and Remote Shutdown Distribution Panel DP-S1-1D" to "125-VDC Remote Shutdown Distribution Panel DP-S1-1D," and that item i), "125-VDC Critical Switchgear Distribution Panel DP-S1-1F" be added. The proposed correction is identical to a correction to TS 3.8.3.2.b.1 approved in Amendment 4 to the WNP-2 technical specifications. The licensee stated that an oversight prevented this same correction from being made to TS 3.8.3.1.b.1 at that time. The staff finds that the proposed changes to TS 3.8.3.1.b.1 provide for proper identification of equipment required to be energized, are administrative in nature, and are therefore acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Washington State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (57 FR 22272 and 60 FR 16204). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

1. NUREG-1433, Rev. 0, "Standard Technical Specifications for General Electric Plants, BWR/4," September 1992.

2. NUREG-1434, Rev. 0, "Standard Technical Specifications for General Electric Plants, BWR/6," September 1992.

3. NRC Bulletin IEB 80-07, "BWR Jet Pump Assembly Failure," April 4, 1980.

4. GE Service Information Letter No. 330, "Jet Pump Beam Cracks," June 9, 1990.

5. NUREG/CR-3052, "Closeout of IE Bulletin 80-07: BWR Jet Pump Assembly Failure," November 1984.

6. NRC Information Notice 93-101, "Jet Pump Hold-down Beam Failure," December 17, 1993.

7. Memorandum for W. T. Russell, "BWR Jet Pump Hold-down Beam Failure," December 22, 1993.

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