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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 122 TO FACILITY OPERATING LICENSE NO. NPF-21

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

NUCLEAR PROJECT NO. 2

DOCKET NO. 50-397

1.0 INTRODUCTION

Washington Public Power Supply System (WPPSS) submitted a February 17, 1994, letter to the NRC requesting changes to the Technical Specifications (TS) for Nuclear Project No. 2. Their May 13, 1994, letter supplemented this information. The proposed changes would:

- add special test exception TS 3.7.10 that applies during inservice leak testing and hydrostatic testing
- add a new minimum reactor vessel metal pressure-temperature curve for ≤ eight effective full power years (EFPY)
- delete Table B 3/4.4.6-1 *Reactor Vessel Toughness* from the TS bases

Discussions of these items follow.

American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PVC) Section XI requires the licensee to perform certain reactor coolant system (RCS) inservice hydrostatic and system leakage pressure tests once every 10 years. Normally, the licensee must do these tests with the average reactor coolant temperature > 200°F. This puts the plant into Operational Condition 3 (hot shutdown). However, WPPSS wants to be able to consider the plant to be in Operational Condition 4 (cold shutdown) during the testing, while keeping average reactor coolant temperature > 200°F but not > 212°F. Considering the plant to be in Operational Condition 4 allows WPPSS to:

- do outage-related maintenance on certain emergency core cooling systems (ECCS) that are not required to be operable
- not have primary containment established during testing

Doing outage-related maintenance on these systems during RCS hydrostatic and system leakage pressure testing reduces the refueling outage duration. Not having primary containment integrity during testing allows plant personnel to inspect the RCS.

9406070339 940527
PDR ADOCK 05000397
P PDR

The licensee's proposed special test exception would allow WPPSS to—

- consider the plant to be in Operational Condition 4 while keeping average reactor coolant temperature > 200°F but not > 212°F
- suspend TS 3.4.9.2 Operational Condition 3 residual heat removal shutdown cooling mode requirements
- require implementing certain other Operational Condition 3 requirements, including maintaining secondary containment and the standby gas treatment system operable.

The problem in keeping the plant in Operational Condition 4 during testing is that TS 3.4.6.1 gives RCS pressure and temperature (P-T) limits for the tests. Current TS 32-EFPY P-T curves require reactor vessel metal temperature to be about 236°F for hydrostatic testing. This exceeds the ≤ 200°F average reactor coolant temperature TS limit for plant Operational Condition 4. Thus, WPPSS has proposed using an 8-EFPY P-T curve where metal temperature will have to be only 180°F for testing.

Additionally, WPPSS proposes to delete Table B 3/4.4.6-1 *Reactor Vessel Toughness* from the TS basis. This table contains specific reactor vessel material composition design information which already is in the WNP-2 Final Safety Analysis Report (FSAR). WPPSS indicates that the information in the TS basis

- does not clarify the P-T curves
- makes the bases more complicated and harder to use
- can be removed from the TS bases without affecting TS adequacy

2.0 EVALUATION

We evaluated the licensee's request to (1) add a special test exception, (2) add a ≤ 8-EFPY P-T curve, and (3) delete Table B 3/4.4.6-1 from the TS bases below.

2.1 Special Test Exception TS 3.10.7

Various TS limiting conditions for operation (LCOs) apply under Operational Condition 3 and Operational Condition 4. Additional TS apply when transitioning from Mode 4 to Mode 3. This assures that the plant will have adequate shutdown cooling capability, containment integrity, and reactivity control.

Operating in Mode 4 during hydrostatic or leak testing with reactor coolant temperature above 200°F is an exception to Mode 3 requirements. Significant exceptions are not having primary containment operable, and not having the

full complement of redundant ECCS. However, secondary containment remains operable under the test exception when primary containment is open for RCS inspection.

WNP-2 FSAR Section 15.6.4 describes postulated main steam line break (MSLB) accident analysis. MSLB outside containment accident analysis conservatively bounds the consequences of a RCS leak under pressure testing conditions with secondary containment integrity maintained. The FSAR analysis assumes the following:

- the reactor is operating at a power level which will cause the maximum primary system mass release
- RCS pressure is 1060 psig (higher than the 1005 → 1035 psig test pressure range the licensee indicated in their May 13, 1994, letter)
- an instantaneous circumferential MSLB occurs

Comparing these assumptions to the expected test conditions shows that a RCS leak during testing will not challenge secondary containment as severely as a MSLB. The following three factors contribute to this conclusion:

- reactor heat and recirculation pump energy input to the coolant are well below the reactor power assumed in MSLB analysis
- a leak would rapidly depressurize the RCS due to the solid plant condition
- frequent RCS leak inspections during testing should readily detect small failures before they develop further

The resulting exposures determined in the FSAR analysis are a fraction of 10 CFR 100 offsite dose requirements. Proposed TS 3.10.7 also requires that the following equipment remain operable:

- secondary containment automatic isolation valves (TS 3.6.5.2)
- standby gas treatment system (TS 3.6.5.3)
- associated automatic actuation instrumentation (TS 3.3.2)

The FSAR analysis and TS required operable equipment assure that any potential airborne contamination from RCS leaks will be within 10 CFR 100 limits.

The special test exception allows suspending TS 3.5.1 requirements that the three ECCS divisions be operable. TS 3.5.2, "ECCS - Shutdown" will then be in force, requiring two of the five ECCS systems to be operable. The licensee considers this advantageous since it would allow ECCS maintenance during the testing, thereby shortening the outage duration.

The reactor vessel would rapidly depressurize if a large RCS leak occurred. This allows the low pressure core cooling systems to operate. The TS 3.5.2 required low pressure coolant injection and core spray subsystems are adequate to maintain the core covered and prevent fuel damage for any mode 4 condition, regardless of the decay heat level. Using the test exception will allow coolant temperature to be 12°F higher than allowed in Mode 4. This is not a large enough temperature difference to alter the ability of the TS 3.5.2 required ECCS to successfully respond to a LOCA when the utility uses the test exception. The low reactor decay heat conditions expected after refueling outages (approximately forty days following shut down) will add assurance that the required ECCS capabilities will successfully counter a LOCA.

TS 3.10.7 also requires that the control rod drive housing supports are in place when the utility uses the test exception. TS 3.1.3.8 requires this in Modes 1, 2 and 3. Having the supports in place is a prudent measure to assure that a control rod will not withdraw if a control rod drive housing fails when the licensee pressurizes the reactor vessel.

The proposed Special Test Exception permits suspending TS 3.4.9.2 required shutdown cooling capability. We do not find this to be acceptable. TS 3.4.9.2 requires two operable residual heat removal (RHR) loops in Mode 4. TS 3.4.9.2 also currently requires shutdown cooling to be in operation unless a recirculation pump is operating. However, it specifically allows the utility to stop shutdown cooling during hydrostatic testing.

The licensee explains that they need to suspend TS 3.4.9.2 so they can stop shutdown cooling operation and do maintenance on the RHR system. TS 3.4.9.2, as written, and the testing conditions that maintain recirculation pumps running allow stopping shutdown cooling operation during the testing. The TS 3.4.9.2 Action Statement requires the licensee to use alternate shutdown cooling methods if a RHR shutdown cooling mode loop becomes inoperable. This requirement emphasizes the importance of maintaining shutdown cooling capability for response to potential loss of cooling events. The TS assures that operators will not eliminate cooling capabilities during unusual shutdown plant configurations. Suspending all TS 3.4.9.2 provisions to maintain operability of the shutdown cooling mode of RHR or an alternative means of cooling is not necessary. It could also potentially lead to shutdown cooling unavailability and is thus not acceptable. The remaining part of TS 3.10.7 is acceptable with the phrase "and the requirements of LCO 3.4.9.2, 'Reactor Coolant System - Cold Shutdown,' may be suspended" removed from the proposed TS.

The NRC's Acting Project Manager talked with WNP's Manager of Regulatory Programs on May 16, 1994, about this issue. The licensee acknowledged that TS 3.10.7 should not suspend LCO 3.4.9.2 requirements, and understood that the NRC will remove WNP's proposed phrase "and the requirements of LCO 3.4.9.2, 'Reactor Coolant System - Cold Shutdown,' may be suspended" from proposed TS 3.10.7. The licensee will document this understanding in a letter to the NRC.

2.2 New 8-Effective Full Power Year Pressure-Temperature Curve

We used the following NRC regulations and guidance to evaluate the P-T limits:

- 10 CFR Part 50, Appendix G
- Generic Letter 88-11
- Regulatory Guide (RG) 1.99, Rev. 2
- Standard Review Plan (SRP) Section 5.3.2

Appendix G of 10 CFR Part 50 requires that "...pressure-temperature limits for the reactor vessel must be at least as conservative as those obtained by following the methods of analysis and the required margins of safety of Appendix G of the ASME Code...." Appendix G also puts requirements on the minimum temperature for criticality, the closure head flange, and hydrostatic pressure tests or leak tests.

Generic Letter 88-11 requires licensees to use RG 1.99, Rev. 2 methods to predict neutron irradiation effects on reactor vessel materials. This guide defines the adjusted reference temperature (ART) to be the sum of un-irradiated reference temperature, the increase in reference temperature resulting from neutron irradiation, and a margin to account for uncertainties in the prediction method. SRP 5.3.2 describes a step-by-step P-T limits calculation using fracture mechanics methodology that Appendix G to the ASME Code, Section III specifies.

The proposed P-T limits were based on the limiting material (plate C1272-1) adjusted reference temperature. The plate contains 0.15% copper and 0.6% nickel. The initial RT_{ndt} is 28°F. The licensee calculated a reference temperature shift of 51.1°F at the 1/4T (T is the beltline vessel thickness plus cladding) location based on a fluence of 1.7E17 neutron/cm^2 for the limiting plate. We identified the same plate as the limiting material, and we verified that the licensee's calculated temperature shift of 51.1°F is acceptable. The adjusted reference temperature is 79.1°F (51.1°F plus the initial RT_{ndt} of 28°F). We substituted the ART of 79.1°F into equations in SRP 5.3.2, and verified that the proposed P-T limits for hydrotest and non-nuclear heating meet Appendix G of the ASME Code.

Appendix G of 10 CFR Part 50 also imposes pressure and temperature requirements based on the closure head flange reference temperature. Appendix G, paragraph IV.A.2, has special requirements when the primary system pressure exceeds 20 percent of the preservice hydrostatic test pressure. In this case, the temperature of the closure flange regions highly stressed by the bolt preload must exceed the reference temperature of the material in those regions by at least 120°F for normal operation and by 90°F for hydrostatic pressure tests and leak tests. Paragraph IV.A.3 requires the minimum permissible

temperature to be 60°F above the closure flange reference temperature when water level is within the normal range for power operation and pressure is less than 20 percent of the hydrotest pressure. We determined that the proposed P-T limits include this requirement, based on the licensee's reported 20°F flange nil-ductility transition reference temperature.

2.3 Deleting Table B 3/4.4.6-1 From the Technical Specifications Bases

Table B 3/4.4.6-1 *Reactor Vessel Toughness* contains specific reactor vessel material composition design information. The following WNP-2 FSAR tables give similar, more detailed information:

- 5.3-1a
- 5.3-1b
- 5.3-2
- 5.3-3
- 5.3-4
- 5.3-5
- 5.3-6
- 5.3-7
- 5.3-8

WPPSS indicates the information does not clarify the P-T curves, and makes the TS bases more complicated and harder to use. There does not appear to be any benefit from maintaining this information in the TS bases. We thus agree that the utility can remove the information from the TS bases without affecting TS adequacy.

3.0 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.

4.0 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 (59 FR 14902). 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.

5.0 CONCLUSION

We find that the proposed Special Test Exception, TS 3.10.7, as modified to remove the phrase "and the requirements of LCO 3.4.9.2, 'Reactor Coolant System - Cold Shutdown,' may be suspended" is acceptable. We also find that the proposed hydrotest and non-nuclear heating P-T limits conform to 10 CFR Part 50, Appendix G requirements and Generic Letter 88-11. Accordingly,

the licensee may incorporate the limits into the plant TS. The limits are valid for less than or equal to 8 EFPY. The licensee may also delete Table B 3/4.4.6-1 *Reactor Vessel Toughness* from the TS bases.

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.

Principal Contributors: John Tsao, EMCB
Joseph Donogue, SRXB
Mark Padovan, PD IV-3

Date: May 27, 1994