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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM RELIEF REQUESTS

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

WASHINGTON NUCLEAR PLANT NO. 2

DOCKET NUMBER 50-397

1.0 INTRODUCTION

The Code of Federal Regulations, 10 CFR 50.55a(f), requires that inservice testing (IST) of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda, except where relief has been requested by the licensee and granted by the Commission pursuant to § 50.55a ¶ (f)(6)(i), or where the alternative has been authorized pursuant to § 50.55a ¶ (a)(3)(i) or ¶ (a)(3)(ii). In requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance with certain requirements of the applicable Code edition and addenda is impractical for its facility. Section 50.55a ¶ (f)(4)(iv) provides that inservice tests of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in ¶ (b) of § 50.55a, subject to the limitations and modifications listed, and subject to Commission approval. NRC guidance contained in Generic Letter 89-04, *Guidance on Developing Acceptable Inservice Testing Programs*, provided alternatives to the Code requirements determined to be acceptable to the staff and authorized the use of the alternatives in Positions 1, 2, 6, 7, 9, and 10 provided the licensee follow the guidance delineated in the applicable position. When an alternative is proposed which is in accordance with Generic Letter 89-04 guidance and is documented in the Inservice Testing Program, no further evaluation is required; however, implementation of the alternative is subject to NRC inspection.

These regulations authorize the Commission to grant relief from or approve alternatives for ASME Code requirements upon making the necessary findings. The NRC staff's findings with respect to granting or not granting the relief requested or authorizing the proposed alternative as part of the licensee's IST Program are contained in this Safety Evaluation (SE).

The licensee submitted Revisions 3 and 3B of the Washington Public Power System, Nuclear Plant Number 2 (WNP-2), inservice testing (IST) program in letters dated June 17, 1985, and October 12, 1987, respectively. A Safety Evaluation (SE) was transmitted to the licensee in a letter dated May 7, 1991,

which contained a Technical Evaluation Report (TER) prepared by EG&G, Idaho. Table 1 of the SE summarizes the status of each new and revised relief request submitted by the licensee. Appendix B of the TER contained 18 items which the licensee was requested to address. The licensee submitted a response to the items in a letter dated December 3, 1991, which also included Revision 4 of their IST program. In addition to the responses, Relief Requests RP-7, RV-26, and RV-27 were also included in this submittal. Relief Request RV-27 has already been granted by the staff in an SE dated May 19, 1992. A supplemental response to items 2, 3, 12, and 13 was submitted by the licensee on July 6, 1992. Relief Request RV-22 was also submitted with this letter. In addition, Relief Requests RP-7 and RV-26 were denied in an SE dated September 23, 1992. In a submittal dated December 22, 1992, the licensee withdrew Relief Request RP-7 and submitted Relief Requests RP-8, RP-9, and RP-10. Relief Request RV-13, granted in the May 7, 1991, SE, was revised and included in the licensee's December 22, 1992, submittal. Finally the licensee resubmitted Relief Request RP-9 in a submittal dated May 27, 1993. The staff's evaluations of the licensee's responses to the items listed in Appendix B of the TER are provided in Table 1. Relief Requests RP-8, RP-9, RP-10, RV-13, and RV-22 are evaluated below. The Washington Nuclear Plant No. 2 IST Program was developed to the 1981 Edition of ASME Section XI, for the first ten-year interval which began December 13, 1984.

2.0 NEW RELIEF REQUESTS

2.1 Relief Request RP-8

The licensee is requesting relief from the inservice test procedure requirements of Section XI, Paragraph IWP-3100, for the standby service water pumps SW-P-1A and SW-P-1B, and high pressure core spray pump HPCS-P-2. The licensee has proposed to use pump reference curves instead of fixed reference values to conduct pump testing.

2.1.1 Licensee's Basis for Requesting Relief

The licensee states:

> "1. Service water systems are designed such that the total pump flow cannot be adjusted to one finite value for the purpose of testing without adversely affecting the system flow balance and Technical Specification operability requirements. Thus these pumps must be tested in a manner that the service water loop remains properly flow balanced during and after the testing and each supplied load remains fully operable per Technical Specifications to maintain the required level of plant safety during power operation.
>
> 2. The service water system loops are not designed with a full flow test line with a single throttle valve. Thus the flow cannot be throttled to a fixed reference value every time. Total pump flow rate can only be measured using the total system flow indication installed on the

common return header. There are no valves in any of the loops, either in the common supply or return lines, available for the purpose of throttling total system flow. Only the flows of the served components can be individually throttled. Each main loop of service water supplies 17-18 safety related loads, all piped in parallel with each other. The HPCS-P-2 pump loop supplies four loads, each in parallel. Each pump is completely independent from the others (no loads are common between the pumps). Each load is throttled to a FSAR required flow range which must be satisfied for the load to be operable. All loads are aligned in parallel, and all receive service water flow when the associated service water pump is running, regardless of whether the served component itself is in service. During power operation, all loops of service water are required to be operable per Technical Specifications. A loop of service water cannot be taken out of service for testing without entering an action statement for a limiting condition of operation (LCO). Individual component flows outside of the FSAR mandated flow ranges also induce their own Technical Specification action statements that in turn can induce full plant shutdown in as little as two hours, depending on the load in question.

3. Each loop of service water is flow balanced before exiting each annual refueling outage to ensure that all loads are adequately supplied. A flow range is specified for each load to balance all the flows against each other. Once properly flow balanced, very little flow adjustment can be made for any one particular load without adversely impacting the operability of the remaining loads (increasing flow for one load reduces flow for all the others). Each time the system is flow balanced, proper individual component flows are produced, but this in turn does not necessarily result in one specific value for total flow. Because each load has an acceptable flow range, overall system full flow (the sum of the individual loads) also has a range. Total system flow can conceivably be in the ranges of 9247 - 10,079 gpm for SW-P-1A pump, 9212 - 10,043 gpm for SW-P-1B pump, and 1050 - 1158 gpm for HPCS-P-2 pump. Consequently, the desire to quarterly adjust service water loop flow to one specific flow value for the performance of inservice testing conflicts with system design and component operability requirements (i.e. flow balance) as required by Technical Specifications."

2.1.2 Alternate Testing

The licensee proposes:

"As discussed above in the basis for relief section, it is extremely difficult or impossible to return to a specific value of flow rate or differential pressure for testing of these pumps. Multiple reference points could be established according to the Code, but it would be impossible to obtain reference values at every possible point, even over a small range. An alternate to testing requirements of IWP-3100 is to base the acceptance criteria on a reference curve. Flow rate and discharge pressure are measured during inservice testing in the as found condition and compared to an established reference curve. Discharge pressure instead of differential pressure is used to determine pump operational readiness as allowed by Relief Request RP-3 (Relief granted per SER/TER Reference 2.3.1, dated May 7, 1991). The following elements are used in developing and implementing the reference pump curves.

1. A reference pump curve (flow rate vs discharge pressure) has been established for SW-P-1A and SW-P-1B from data taken on these pumps when they were known to be operating acceptably. These pump curves represent pump performance almost identical to preoperational test data. The methodology employed for establishing a reference pump curve is similar to that for performing a comprehensive test being proposed by the OM Code Committee.

2. Pump curves are based on seven or more test points beyond the flat portion of the curve (at flow rates greater than 4800 gpm). Rated capacity of these pumps is 12,000 gpm. Three or more test data points were at flow rates greater than 9,000 gpm. The pumps are being tested at full design flow rate.

3. To reduce the uncertainty associated with the pump curves and the adequacy of the acceptance criteria, special test gages (±0.5% full scale accuracy) were installed to take this data in addition to plant installed gages and transient data acquisition system (TDAS). All instruments used either met or exceeded the Code required accuracy.

4. For HPCS-P-2 pump, the reference pump curve is based on the manufacturer's pump curve which was validated during the preoperational testing.

5. Review of the pump hydraulic data trend plots indicates close correlation with the established pump reference

curves, thus further validating the accuracy and adequacy of the pump curves to assess pump operational readiness.

6. The reference pump curves are based on flow rate vs discharge pressure. Acceptance criteria curves are based on differential pressure limits given in Table IWP-3100-2. Setting the Code acceptance criteria on discharge pressure using differential limits is slightly more conservative for these pump installations with suction lift (Relief Request RP-3, SER/TER Reference 2.3.1, dated May 7, 1991). See the attached sample SW-P-1A pump Acceptance Criteria sheet" [Note: The sample SW-P-1A pump acceptance criteria sheet is not included in this Safety Evaluation. Please see licensee submittal dated December 22, 1992.] "Area 1-2-3-4 is the acceptable range for pump performance. Areas outside 1-2-3-4 but within 5-6-7-8 define the Alert Range, and the areas outside 5-6-7-8 define the required action range. These acceptance criteria limits do not conflict with Technical Specifications or Final Safety Analysis Report operability criteria.

7. Only a small portion of the established reference curve is being used to accommodate flow rate variance due to flow balancing of various system loads.

8. Review of vibration data trend plots indicates that the change in vibration readings over the narrow range of pump curves being used is insignificant and thus only one fixed reference value has been assigned for each vibration location.

9. After any maintenance or repair that may affect the existing reference pump curve, a new reference pump curve shall be determined or the existing pump curve revalidated by an inservice test. New reference pump curves shall be established based on at least 5 points beyond the flat portion of the curve.

Implementing Schedule:

These pumps are being tested quarterly using a pump reference curve. This relief request supersedes the testing requirements specified in Relief Request RP-7 which was denied by the NRC per SER dated September 23, 1992 (TAC No. M82292).

Quality/Safety Impact:

Design of WNP-2 service water system and the Technical Specifications requirements make it impractical to

adjust system flow to a fixed reference value for inservice testing without adversely affecting the system flow balance and Technical Specification operability requirements. Proposed alternate testing using a reference pump curve for each pump provides adequate assurance and accuracy in monitoring pump condition to assess pump operational readiness and shall adequately detect pump degradation. Alternate testing will have no adverse impact on plant and public safety."

2.1.3 Evaluation

ASME Section XI, Article IWP-3000, requires that pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and allow detection of hydraulic degradation. For pumps where it is impractical to test at a reference value of flow and differential pressure, testing in the "as-found" condition and comparing values to an established reference curve may be an acceptable alternative. Pump curves represent an infinite set of reference points of flow rate and differential pressure. Establishing a reference curve for a pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation, though not in accordance with the Code. There is, however, a higher degree of uncertainty associated with using a curve to assess operational readiness. Therefore, the development of the reference curve should be as accurate as possible. Additionally, when using reference curves, it may be more difficult to identify instrument drift or to trend changes in component condition.

For the SW and HPCS pumps specified by the licensee in this relief request, it is impractical to alter the pump flow rate to obtain a repeatable reference value. The SW and HPCS systems supply cooling water to multiple safety related loads within the plant. Each system loop is flow balanced prior to plant startup from a refueling outage. Varying the flow rate of one of the safety related cooling loads will effect the remaining loads in that loop. There are no valves currently installed in any of the loops that have the capability of throttling the total system flow. Requiring the licensee to install valves to throttle total system flow would be a burden because of the design, fabrication, and installation changes that would have to be made.

The licensee has proposed to utilize reference curves to verify that the specified pumps conform to the Code requirements. The licensee has generated a reference pump curve for each pump in this relief request. A sample curve for pump SW-P-1A was provided in the December 22, 1992, submittal. The licensee stated that these curves were constructed when the pumps were known to be operating acceptably. The data points were generated by instrumentation that was at least as accurate as required by the Code. The range covered by the curve does not reside on the flat portion of the pump curve and its acceptance criteria is based on the differential pressure limits given in Table IWP-3100-2. The licensee stated that these acceptance limits do not conflict with TS or FSAR operability criteria. The licensee also stated that pump vibration does not vary significantly over the range of pump curves being used; therefore, one

reference vibration value has been assigned for each vibration location. Finally, the licensee stated that a new reference pump curve containing a minimum of 5 points will be generated after any maintenance or repair is performed on the pump which could possibly effect the existing pump curve. The procedure described by the licensee to generate and validate pump reference curves for purposes of IST related to the use of reference curves provides an adequate method for monitoring the hydraulic condition of these pumps when it is impractical to meet the Code requirements.

Based on the impracticality of performing testing in accordance with the Code requirements, and in consideration of the burden on the licensee if the Code requirements were imposed on the facility, relief is granted pursuant to § 50.55a ¶ (f)(6)(i), as requested.

2.2 Relief Request RP-9

The licensee is requesting relief from the inservice test procedure requirements of Section XI, Paragraph IWP-3100, for the low pressure core spray pump LPCS-P-1, the residual heat removal pumps, RHR-P-2A, RHR-P-2B, and RHR-P-2C, the high pressure core spray pump HPCS-P-1, and the reactor core isolation cooling pump RCIC-P-1. The licensee has proposed to use pump reference curves instead of fixed reference values to conduct pump testing.

2.2.1 Licensee's Basis for Requesting Relief

The licensee states:

> "Reference values are defined as one or more fixed sets of values of quantities as measured or observed when the equipment is known to be operating acceptably. All subsequent test results are to be compared to these reference values. Based on the operating experience, flow rate (independent variable during inservice testing) for these pumps cannot be readily duplicated with the existing flow control systems. Flow control for these systems can only be accomplished through the operation of relatively large motor operated globe valves as throttling valves. Because these valves are not equipped with position indicators which reflect percent open, the operator must repeatedly jog the motor operator to try to make even minor adjustments in flow rate. These efforts, to exactly duplicate the reference value, would require excessive valve manipulation which could ultimately result in damage to valves or motor operators."

2.2.2 Alternate Testing

The licensee states:

> "As discussed above in the basis for relief section, it is extremely difficult or impossible to return to a specific value of flow rate or differential pressure for testing of these pumps. Since the independent reference variable (flow rate) for these pumps is very difficult to adjust to a fixed reference value and requires excessive valve manipulation, the maximum variance shall be limited to ± 2% of the reference value. Thus

flow rate shall be adjusted to be within ± 2% of the reference flow rate and the corresponding differential pressure shall be measured and compared to reference differential pressure value determined from the pump reference curve established for this narrow range of flow rate. Slope of the pump reference curve is not flat even over this narrow range of flow rate. Assuming the flow rate to be fixed over this narrow range can result in additional error in calculating the deviation between the measured and reference differential pressure and at times this deviation can be non-conservative. ASME Section XI allows establishing multiple reference points but does not specify any variance from the fixed reference values. Since the dependent variable (differential pressure) can be assumed to vary linearly with flow rate in this narrow range, establishing multiple reference points in this narrow range is similar to establishing a reference pump curve representing multiple reference points. This assumption of linearity between differential pressure and flow rate is supported by the manufacturer pump curves in the stable design flow rate region. For RCIC-P-1 pump both flow rate and speed are adjusted to be within ± 2% of their respective reference values and the differential pressure is measured. The following elements are used in developing and implementing these reference curves.

1. A reference pump curve (flow rate vs differential pressure) has been established for RHR pumps from data taken on these pumps when they were known to be operating acceptably. These pump curves represent pump performance almost identical to manufacturer's test data. The methodology employed for establishing a reference pump curve is similar to that for performing a comprehensive test being proposed by the OM Code Committee.

2. For RCIC-P-1, a variable speed drive pump, flow rate is set within ± 2% of reference flow rate and the reference curve is based on speed with acceptance criteria based on differential pressure. This is done because of the difficulty in setting speed to a specific reference value as specified by the Code. additionally, evaluation of manufacturer pump data, preoperational and special test data used to establish pump reference curve indicates insignificant change (0.25 psi/gpm) in differential pressure with small variation (± 12 gpm) in flow rate.

3. For HPCS-P-1 and LPCS-P-1 pumps, the reference pump curve is based on the manufacturer pump curve which was validated during the preoperational testing.

4. RHR and RCIC pump curves are based on seven or more test points beyond the flat portion of the curve. These ECCS pumps have minimum flow rate requirements specified in Technical Specifications and are being tested at full design flow rate.

5. To reduce the uncertainty associated with the pump curves and the adequacy of the acceptance criteria, special test gages (±0.5% full scale accuracy) were installed to take test data in addition to plant installed guages and Transient Data Acquisition System

(TDAS). All instruments used either met or exceeded the Code required accuracy.

6. Review of the pump hydraulic data trend plots indicated close correlation with the established pump reference curves, thus further validating the accuracy and adequacy of the pump curves to assess pump operational readiness.

7. Acceptance criteria curves are based on differential pressure limits given in Table IWP-3100-2. See the attached sample RHR-P-2A pump Acceptance Criteria shees [Note: The sample RHR-P-2A pump Acceptance Criteria Sheet is not included in this SE. Please see licensee submittal dated December 22, 1992]. Area 1-2-3-4 is the aceeptable range for pump performance. Areas outside 1-2-3-4 but within 5-6-7-8 define the alert range, and the areas outside 5-6-7-8 define the required Action Range. These acceptance criteria limits do not conflict with Technical Specifications or Final Safety Analysis Report operability criteria.

8. Only a small portion of the established reference curve is being used to accomodate flow rate variance.

9. Review of vibration data trend plots indicates that the change in vibration readings over the narrow range of pump curves being used is insignificant and thus only one fixed reference value has been assigned for each vibration location.

10. After any maintenance or repair that may affect the existing reference pump curve, a new reference pump curve shall be determined or the existing pump curve revalidated by an inservice test. New reference pump curves shall be established based on at least 5 test points beyond that flat portion of the curve.

Implementating Schedule:

These pumps are being tested quarterly using a pump reference curve. This relief request supersedes the testing requirements specified in Relief Request RP-7 which was denied by the NRC per SER dated September 23, 1992 (TAC No. M82292).

Quality/Safety Impact:

Due to impracticality and difficulty of adjusting independent variables (flow rate, and speed for variable drive RCIC pump) to a fixed reference value for inservice testing without system modifications, alternate testing to vary the variables over a very narrow range (±2% of reference values) and using pump reference curves for this narrow range is being proposed. Alternate testing using a reference pump curve for each pump provides adequate assurance and accuracy in monitoring pump condition to assess pump operational readiness and shall adequately detect pump degradation. Alternate testing will have no adverse impact on plant and public safety."

2.2.3 Evaluation

ASME Section XI, Article IWP-3000, requires that pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and allow detection of hydraulic degradation. For pumps where it is impractical to test at a reference value of flow and differential pressure, testing in the "as-found" condition and comparing values to an established reference curve may be an acceptable alternative. Pump curves represent an infinite set of reference points of flow rate and differential pressure. Establishing a reference curve for a pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation, though not in accordance with the Code. There is, however, a higher degree of uncertainity associated with using a curve to assess operational readiness. Therefore, the development of the reference curve should be as accurate as possible. Additionally, when using reference curves, it may be more difficult to identify instrument drift or to trend changes in component condition.

For the RHR, LPCS, HPCS, and RCIC pumps specified by the licensee in this relief request, it is impractical to alter the pump flow rate to obtain a repeatable reference value. The flow control valves used in these systems are large motor operated globe valves which do not have any position indication that would facilitate achieving a repeatable reference value. Requiring the licensee to install flow control valves with more accurate flow adjustment capability would be a burden because of the design, fabrication, and installation changes that would have to be made.

The licensee proposed in their December 22, 1992, submittal to limit the variance in the flow rate of these pumps to ±1% of the value. Subsequent to this letter, the licensee discovered through testing that obtaining a reference value within the tolerance they specified may require up to two hours of jogging the throttle valve to achieve the desired flow rate. The licensee submitted a revision to Relief Request RP-9 dated May 27, 1993, stating they were modifying the pump curves to reflect a variance of the pump reference value flow rate.

The licensee has generated a reference pump curve for each pump in this relief request. A sample curve for pump RHR-P-2A was provided in the May 27, 1993, submittal which reflects the ±2% variance in the pump flow rate. The licensee stated that these curves were constructed when the pumps were known to be operating acceptably. The data points were generated by instrumentation that was at least as accurate as required by the Code. The range covered by the curve does not reside on the flat portion of the pump curve and its acceptance criteria is based on the differential pressure limits given in Table IWP-3100-2. The licensee stated that these acceptance limits do not conflict with TS or FSAR operability criteria. The licensee also stated that pump vibration does not vary significantly over the range of pump curves being used; therefore, one reference vibration value has been assigned for each vibration location. Finally, the licensee stated that a new reference pump curve containing a minimum of 5 points will be generated after any maintenance or repair is performed on the pump which could possibly affect the existing pump curve. The procedure described by the licensee to generate and validate pump

reference curves for purposes of IST related to the use of reference curves provides an adequate method for monitoring the hydraulic condition of these pumps when it is impractical to meet the Code requirements.

Based on the impracticality of performing testing in accordance with the Code requirements, and in consideration of the burden on the licensee if the Code requirements were imposed on the facility, relief is granted pursuant to § 50.55a ¶ (f)(6)(i) as requested.

2.3 Relief Request RP-10

The licensee is requesting relief from the instrument range requirements of Section XI, Paragraph IWP-4120, for residual heat removal pumps RHR-P-2A, RHR-P-2B, and RHR-P-2C, and the high pressure core spray pump HPCS-P-1. The licensee is proposing to use the installed instrumentation for inservice testing.

2.3.1 Licensee's Basis for Requesting Relief

The licensee states:

"1. Article IWP-4000 specifies both accuracy and range requirements for each instrument used in measuring pump performance parameters. The purpose of instrument requirements is to ensure that pump test measurements are sufficiently accurate and repeatable to permit evaluation of pump condition and detection of degradation. Instrument accuracy limits the inaccuracy associated with the measured test data. Thus higher instrument accuracy lowers the uncertainty associated with the measured data. The purpose of the Code range requirement is to ensure reading accuracy and repeatability of test data.

2. Transient data acquisition system (TDAS) converts output signal from the pressure transmitter into a digital format and thus can indicate discharge pressure with the same accuracy and readability over the entire calibrated range. Since the output of TDAS is identical to a digital instrument with a digital readout, full scale range requirements are not applicable for digital instruments according to later Code editions.

3. Since the TDAS data is being obtained to an accuracy of ±1% of full scale, it consistently yields measurements more accurate than would be provided by instruments meeting the Code instrument accuracy requirements of ±2% of full scale and range requirements of three times the reference value. Equivalent Code accuracy being obtained by TDAS measurements is calculated below.

Pump	Test Parameter	Instr. I.D.	Range (PSIG)	Ref. Value (PSIG)	Instr. Loop Accuracy	Equivalent Code Accuracy
RHR-P-2A	Discharge Pressure	RHR-PT-37A TDAS PT 155	0-600	136	±1% ±6 psig	6/(3x136)x 100=1.47%
RHR-P-2B	Discharge Pressure	RHR-PT-37B TDAS PT 076	0-600	132	±1% ±6 psig	6/(3x132)x 100=1.52%
RHR-P-2C	Discharge Pressure	RHR-PT-37C TDAS PT 091	0-600	143	±1% ±6 psig	6/(3x143)x 100=1.40%
HPCS-P-1	Discharge Pressure	HPCS-PT-4 TDAS PT 107	0-1500	430	±1% ±15 psig	15/(3x430) x100=1.16%

Thus the range and accuracy of TDAS instruments being used to measure pump discharge pressure results in data measurements of higher accuracy to that required by the Code and thus should provide reasonable assurance of pump operational readiness. It should also be noted that the TDAS system averages many readings therefore giving a significantly more accurate reading than would be obtained by visual observation of a gauge.

4. Installing temporary test gages every quarter to obtain discharge pressure readings would be burdensome and costly and would not provide pressure measurement that is any more accurate and reliable. Additionally, using different test gages for IST from one test to another may introduce its unique systematic error and thus affect the quality and repeatability of test data."

2.3.2 Alternate Testing to be performed:

"During quarterly pump inservice testing, pump discharge pressure which is used to determine differential pressure shall be measured by respective TDAS points listed above for each pump.

Quality/Safety Impact:

TDAS data will consistently provide acceptable accuracy to ensure that the pumps are performing at the flow and pressure conditions to fulfill their design function. TDAS data is sufficiently accurate for evaluating pump condition and in detecting pump degradation. The effect of granting this relief request will have no adverse impact on plant and public safety. Test quality will be enhanced by getting slightly better, more trendable data."

2.3.3 Evaluation

The licensee has requested relief from the Code instrument range requirements for the pressure indicators listed in this relief request which are used for inservice testing of pumps. The Code requires that the full-scale range of each instrument shall be three times the reference value or less. The licensee has proposed to use the installed instrumentation to measure pump discharge pressure.

The installed pressure indicators are calibrated to an accuracy of ±1% of full scale. The licensee's calculations provided in the table in Section 2.3.1 show that the actual variance has a value which is less than the maximum variance allowed by the Code. The installed instrumentation provides an acceptable level of quality and safety because the variance in the actual test results is more conservative than that allowed by the Code for analog instruments. Therefore, the alternative to the Code instrument accuracy requirements is authorized, pursuant to § 50.55a ¶ (a)(3)(i), based on the alternative providing an acceptable level of quality and safety.

3.0 REVISED RELIEF REQUESTS

3.1 Relief Request RV-22

The licensee is requesting relief from the test frequency and stroke time requirements of Section XI, Paragraphs IWV-3411 and IWV-3413, for the emergency chilled water valves, SW-TCV-11A, SW-TCV-11-B, SW-TCV-15A, and SW-TCV-15B. The licensee is proposing to perform a full calibration verification of each valve actuator every refueling outage.

3.1.1 Licensee's Basis for Requesting Relief

The licensee states:

"1. All four of these hydraulically actuated valves serve as regulating thermostatic control valves. The valves do not function to rapidly isolate or de-isolate the piping into which they are installed. Rather, their function is to slowly regulate throughout their entire stroke range to control the outlet temperatures of the components they serve in response to a 4-20 Ma control

signal provided by their respective instrument control loops. The valves are spring-to-open/oil-to-close; recirculating oil pumps inside the actuators for the valves constantly apply a source of oil to a piston that acts against the spring. The 4-20 Ma control signal varies the amount of oil constantly bled from the operating piston (back to the internal actuator reservoir). In this fashion the valves are regulated anywhere within the entire stroke length. SW-TCV-11A & 11B are controlled by thermostats which regulate main control room air temperature. SW-TCV-15A & 15B regulate service water flow leaving the condenser of the emergency control room chillers and are controlled by the control logic for those units.

2. It is difficult to accurately measure the stroke time of these valves. None of these valves are provided with any form of override that would allow them to be manually cycled. Additionally, none of them are provided with position indication. Partial stroking of these valves can be verified by observing system operational parameter changes, but accurate timing of full-stroke for trending purposes is impractical.

3. Manual control of these valves can only be obtained by lifting the 4-20 Ma control leads to inject a test signal to the hydraulic actuator. This in turn requires that the Technical Specification required systems they serve be taken out of service. The systems they serve are required to remain in service when the plant is not shut down.

4. Modification of the existing valves or installation of new valves to provide manual control and position indication would be burdensome and costly."

3.1.2 Alternate Testing

The licensee proposes:

"1. Annually, during each refueling outage, perform a full calibration verification of the actuator for each of these valves per instructions provided by the valve vendor ITT General Controls Division. Each calibration verification is performed with the actuator coupled to its valve. A variable 4-20 mA test signal is applied to the actuator, and the actuator is verified to respond to stroke the valve in a linear fashion throughout its entire stroke length (i.e. from full open to full closed). Full stroke length of the valve is measured and verified that it is within acceptable range. Stroke length outside the

acceptable range will indicate valve degradation requiring corrective action.

2. Concurrently with the testing described in (1) above, the fail-safe position on a loss of power (OPEN) shall be verified.

Implementing Schedule:

All these valves have been calibration tested during the 1992 refueling outage and shall be calibration tested annually during each refueling outage..."

Quality/Safety Impact:

"The alternative testing to be performed (actuator calibration verification) will verify proper operation of the valve to meet its design function. These valves are designed to operate as slow moving regulation valves and must be able to achieve and maintain any position called for by its control instrumentation. Inability to meet the tolerances of the calibration throughout the entire range of motion will require further investigation (e.g. valve maintenance) to correct the problem to produce a satisfactory calibration check. Because the valves cannot be tested without the adverse affect of taking the associated required safety related systems out of service, testing will be annual vice quarterly. However, this form of testing is more rigorous than a quarterly stroke time test of the valves. Consequently, lengthening the time interval will not preclude timely evaluation of valve operability. Adequate assurance of material quality and maintenance of public safety will be provided."

3.1.3 Evaluation

The emergency chilled water power operated valves are hydraulically actuated regulating thermostatic control valves which regulate the outlet temperatures of components that control the main control room air temperature and the service water flow leaving the condenser of the emergency control room chillers. The Code requires that these four valves be stroke time tested quarterly in order to verify the functioning of the valves and to determine the extent of any valve degradation. The function of these valves is to regulate water flow across their entire stroke range. These valves have a safety function to open and fail open on a loss of actuator power. Stroke timing these valves in the conventional manner using position indicating lights is impractical due to design limitations. Additionally, based on the design and operating characteristics of the valve and valve actuators, there is no provision in the valve control logic to conduct a stroke time test. Manual control of these valves can only be obtained by lifting the control

leads and inserting a test signal. Redesigning the system to allow stroke timing of these valves would be a burden on the licensee because of the design changes that would have to be made on the control valves.

The licensee has proposed to test these valves every refueling outage by performing a full calibration verification of the valve actuators for each of these valves. This test is recommended by the manufacturer to be conducted every 20,000 hours of valve operation, but can be conducted every refueling outage without degrading the performance of the valve. This test measures the full stroke length of the valve and is used to determine valve degradation. The licensee stated that corrective action would be taken for valves in which their stroke length is outside of acceptable limits. In addition, the licensee stated in a phone conversation on January 22, 1993, that the emergency control room chiller test, which is currently conducted monthly, requires that this valve be functioning properly in order to maintain control room air temperature. Conducting a manual stroke test of the valve quarterly would verify that the valve was full open but would not provide specific information about valve degradation. Performing the calibration test every refueling outage, in combination with the testing involving the emergency control room chillers, provides reasonable assurance of operational readiness because operation of the valves is being verified monthly and the valves are being stroke tested on a refueling outage frequency.

Relief is granted pursuant to § 50.55a ¶ (f)(6)(i) based on the impracticality of performing testing in accordance with the Code stroke time requirements, and in consideration of the burden on the licensee if the Code requirements were imposed on the facility.

3.2 Relief Request RV-13

Relief from the Code test frequency and stroke time testing requirements for the auto-depressurization system (ADS) safety relief valves (SRVs) was granted in the SE dated May 7, 1991. In the licensee's submittal of December 22, 1992, Relief Request RV-13 was revised to state that a new valve position indication (VPI) system had been installed on all the SRVs. The new VPI system is used to determine SRV stem position directly. However, the licensee stated that since the new VPI and the SRV control switch are in different parts of the control room with no direct visual access between the two, measuring stroke times of the ADS SRVs remains impractical. Given the short time left in this IST interval, the staff is extending acceptance of Relief Request RV-13, granted by the Safety Evaluation dated May 7, 1991, until the end of this IST interval. However, to incorporate the new direct-reading VPI system into the test program to meet existing code testing requirements, and to address upcoming revisions to the code, the licensee should investigate methods to stroke time the ADS SRVs and submit an alternative test method in their next IST ten-year program submittal. The next ten-year interval is scheduled to start in December of 1994.

4.0 CONCLUSION

As discussed above, relief requests RP-8, RP-9, and RV-22 are granted pursuant to 10 CFR 50.55a(f)(6)(c) based on the finding that compliance with the code is impractical and consideration of the burden on the licensee if the requirements were imposed on the facility. The alternative proposed in relief request RP-10 is authorized pursuant to 50.55a(a)(3)(i), since it provides an acceptable level of quality and safety. Relief request RV-13 is extended until the end of this IST interval. 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 granted relief will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Joseph Colaccino

Date: September 30, 1993

Table 1
Washington Public Power Supply System
Nuclear Plant Number 2
NRC Safety Evaluation
Docket Number 50-397

Item Number (Relief Request)	Description in NRC SE Dated May 7, 1991	Licensee Actions as Described in Responses Dated December 3, 1991, and July 6, 1992	Remaining Actions
Item 1 (RG-1)	The licensee requested to change the method by which relief requests are evaluated and relief from the ASME Code, Section XI requirements are granted by the NRC. The method proposed by the licensee would allow the exemption of pumps or valves from testing to the Code requirements where the licensee determines that a precedent exists that is applicable for that component. Relief was denied because this method could result in delaying NRC review of significant changes to the licensee's IST program.	The licensee withdrew relief request RG-1.	No further NRC action is required.
Item 2 (RP-1)	The licensee proposed to use pump vibration velocity measurements instead of vibration displacement measurements for all pump vibration testing conducted in the IST program. Relief was granted provided the licensee conformed with all of the vibration measurement requirements of ANSI/ASME OM-6.	The licensee revised the IST program plan to incorporate the vibration requirements of ANSI/ASME OM-6 for all pumps in the IST program with the exception of the diesel fuel oil transfer and fuel pool cooling pumps (see Item 3).	The licensee has addressed the concerns of the anomaly. No further NRC action is required.
Item 3 (RP-1)	The licensee requested relief from the vibration acceptance criteria of ANSI/ASME OMa-1988, Part 6 (OM-6), for the fuel pool cooling and diesel fuel oil transfer pumps and proposed alternate alert and required action vibration velocity limits for these pumps. The licensee stated that these pumps historically operate at high vibration levels. Interim relief was granted for the licensee to investigate methods of reducing pump vibration to allow the use of OM-6 limits.	The licensee installed a specially designed "dynamic absorber" on the diesel fuel oil transfer pumps during the 1992 refueling outage. Vibration levels in these pumps have been reduced significantly and now fall within the vibration velocity acceptance criteria of OM-6. Acceptance criteria of the fuel pool cooling pumps was also revised by the licensee to be in compliance with the requirements of OM-6.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.

Item Number (Relief Request)	Description in NRC SE Dated May 7, 1991	Licensee Actions as Described in Responses Dated December 3, 1991, and July 6, 1992	Remaining Actions
Item 4 (RP-3)	The licensee requested relief from the Code inlet and differential pressure measurement requirements for the standby service water and HPCS diesel cooling water pumps and proposed to verify proper spray pond level and to measure pump discharge pressure and flow rate to demonstrate pump operational readiness. Relief was granted provided the licensee assigned acceptance criteria to discharge pressure that gives protection equivalent to that provided by the Code as described.	The licensee reviewed the HPCS diesel and standby service water pumps to determine if the acceptance criteria based on discharge pressure was less conservative than specified in the Code. These pumps have their suction source at a greater elevation than the discharge piping, thus the discharge pressure is smaller than the pump differential pressure because of the difference in static head. Therefore, the acceptance criteria based on discharge pressure is conservative.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.
Item 5 (RP-5)	The licensee requested relief from the Code flow rate measurement requirements for the diesel fuel oil transfer pumps and proposed to calculate this value by determining the volume of fuel pumped and dividing this quantity by the total pump operating time. Relief was granted provided the pump flow rate calculation meets the Code accuracy requirements listed in Table IWP-4110-1.	The licensee reviewed the testing procedures and determined that their proposed testing did not meet the Code accuracy requirements. The licensee revised the surveillance procedures to require the pump run time to be a minimum of 25 minutes. The increased run time and the corresponding increase in the level change ensures the Code accuracy requirement of ±2% is met.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.
Item 6 (RP-6)	The licensee requested relief from the Code requirements for differential pressure measurement for the diesel fuel oil transfer pumps and proposed to calculate this valve by measuring the height of fluid above the pump suction. Relief was granted provided the pump differential pressure calculation meets the Code accuracy requirements listed in Table IWP-4100-1.	The licensee reviewed the testing procedures and determined that the proposed testing did not meet the Code accuracy requirements. The licensee revised the surveillance procedures to insure the inlet pressure is determined to be within the Code accuracy requirement of ±2%.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.

Item Number (Relief Request)	Description in NRC SE Dated May 7, 1991	Licensee Actions as Described in Responses Dated December 3, 1991, and July 6, 1992	Remaining Actions
Item 7 (RV-4)	The licensee proposed to establish target leak rate values based on valve type and size for those valves being leak tested in accordance with Appendix J, Type C. Leak rate testing of these Category A containment isolation valves (CIVs) is to be performed in accordance with 10 CFR 50, Appendix J, and WNP-2 Technical Specification (TS) requirements. The 10 CFR 50, Appendix J, leak testing does not trend or establish corrective actions based on individual valve leakage rates as required in IWV-3426 and IWV-3427. Relief should be granted from IWV-3421 through IWV-3425 provided the licensee complies with IWV-3426 and IWV-3427(a).	The licensee revised their plant surveillance procedures to include specific acceptance criteria and require valve repair or replacement in accordance with IWV-3426 and IWV-3427(a).	The licensee has addressed the concerns of the anomaly. No further NRC action is required.
Item 8 (RV-4)	The licensee proposed to repair or replace pressure isolation valves (PIVs) when the leakage rate of a PIV exceeds the limiting leakage rate. The NRC position is that when a valve serves both a CIV function and a pressure boundary isolation function, it must be tested to both the Appendix J requirements, to assure its CIV function, and to the IWV-3420 and plant TS requirements to assure its PIV function. Any PIVs that also perform a containment isolation function must be leak rate tested to the Appendix J and IWV-3426 and 3427(a) requirements to verify their ability to perform a CIV function. This relief request does not clearly state that the licensee meets this position.	The licensee stated that testing of PIVs at WNP-2 comply with the requirements of IWV-3426 and IWV-3427(a). These valves are tested at a nominal pressure differential of 950 psid and have a leakage rate acceptance criteria specified in plant TS 3.4.3.2.e of 1.0 gpm. The WNP-2 Appendix J program, specified in plant TS 4.6.1.2.d.4, specifically excludes ECCS and RCIC containment isolation valves from an Appendix J test. Therefore, these valves meet the Appendix J criteria (by exception) and the Section XI criteria. The licensee revised Note D of their IST program to clarify these positions.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.
Item 9 (RV-17)	The licensee requested relief from exercising the water leg fill and pressurization check valves in accordance with the Section XI test method requirements and proposed to full-stroke exercise these series valves open, verifying at least one valve of the series shuts, and operate the stop-check manually, quarterly. Relief was granted provided the pair of series check valves is verified closed quarterly and if excessive leakage is noted, both valves are repaired or replaced prior to their return to service.	The licensee's IST program stated that these check valves are full-stroke exercise tested to the required position of the valve on a quarterly frequency. If excessive leakage is observed in closure testing, both valves in the series are declared inoperable. The licensee stated that plant procedures require corrective action and a retest on both valves when excessive leakage is detected.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.

Item Number (Relief Request)	Description in NRC SE Dated May 7, 1991	Licensee Actions as Described in Responses Dated December 3, 1991, and July 6, 1992	Remaining Actions
Item 10 (RV-25)	The licensee requested relief from the Code test frequency requirements for valves that can be tested only during cold shutdowns and proposed to test these valves during cold shutdowns at the frequency described in their specific relief request. For any valve, or class of valves, that cannot be tested during each cold shutdown of sufficient duration to complete all testing, a relief request must be submitted and approved by the NRC prior to implementation. Relief was granted only for valves that could be tested during any cold shutdown.	The licensee formally responded to this item in a letter to the NRC dated July 31, 1991. Relief Requests RV-9, 11, 18, and 25 have been revised to comply with the SE/TER. Relief requests for all valves which cannot be tested at each cold shutdown have been submitted with the IST Program Plan and approved by the NRC in the SE. If new valves are added to the IST Program Plan which would require the containment to be deinerted for testing, relief requests will be submitted to allow testing at cold shutdown with the containment deinerted.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.
Item 11 (RV-16)	The licensee requested relief from exercising the vacuum relief valves for the reactor core isolation cooling turbine exhaust and proposed to full-stroke exercise both valves open and at least one of these valves shut quarterly and to verify closure of each valve at refueling outages. Relief was denied because the licensee did not provide adequate justification for conducting this testing quarterly.	The licensee withdrew this relief request in Revision 4 of the IST program. The surveillance procedure has been revised to test the vacuum relief valves in accordance with the Code requirements.	No further NRC action is required.

Item Number (Relief Request)	Description in NRC SE Dated May 7, 1991	Licensee Actions as Described in Responses Dated December 3, 1991, and July 6, 1992	Remaining Actions
Item 12 (RV-21, RV-24, RV-12, and RV-22)	The licensee requested relief from the Section XI stroke time measurement requirements for various power operated valves and proposed to stroke these valves quarterly without measuring stroke times. The proposed testing did not provide a reasonable long term alternative to the Code requirements because the testing method is not likely to detect valve degradation. Interim relief was granted to allow the licensee to investigate methods to stroke time or adequately monitor the condition of these valves.	The inlet valves for cooling water flow to the emergency diesel generator heat exchangers, SW-V-214, SW-V-215, SW-V-216, and SW-V-217, have been removed from the system and subsequently have been deleted from the licensee's IST program. Relief request RV-21 has also been deleted from the IST program.	No Further NRC action is required.
		The licensee stated that a testing technique was developed to stroke time the emergency nitrogen bottle isolation valves listed in relief request RV-24. These valves were tested successfully in the licensee's R7 refueling outage in June of 1992. Reference values and acceptance criteria will be established after performance of the next two scheduled surveillances or the R8 outage which is scheduled for the spring of 1993, whichever is sooner.	The licensee should continue to investigate methods to stroke time these valves in accordance with the schedule provided in the July 6, 1992, letter which states that reference values and acceptance criteria will be established no later than the R8 outage (Spring 1993). A revised relief request should be submitted if the testing is not in compliance with the Code requirements.
		The day tank overfill prevention solenoid valves, DO-V-40A and DO-V-40B, have been removed from the system and subsequently have been deleted from the licensee's IST program. Relief request RV-12 has also been deleted from the IST program.	No Further NRC action is required.
		The licensee has revised relief request RV-22 and an evaluation is included in this SE.	Relief granted (f)(6)(i)

Item Number (Relief Request)	Description in NRC SE Dated May 7, 1991	Licensee Actions as Described in Responses Dated December 3, 1991, and July 6, 1992	Remaining Actions
Item 13 (RV-19)	The licensee requested relief from the individual stroke time measurement requirements of four groups of power operated hydraulic control system valves listed in this relief request. The proposed test method did not provide an adequate demonstration of the operational readiness of the valves since it only monitors the stroke time of the slowest valve of the group for an indication of degradation. In addition, the licensee did not demonstrate the impracticality of performing this testing in accordance with the Code. Relief was denied and the licensee instructed to stroke time test these valves individually each cold shutdown in accordance with the Code requirements.	The licensee revised the surveillance procedures to individually stroke time test these valves at cold shutdown. The licensee stated that these valves have been successfully stroke time tested four times since September of 1991. Reference values and acceptance criteria for each valve have been established by the licensee in accordance with ASME Section XI requirements.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.
Item 14	The NRC considers the operability of the emergency diesel generator (EDG) to be safety related. Due to the designed system redundancy, the operational readiness of the diesel air start valves are not verified individually during routine EDG testing. EDG air start system valves perform a function important to safety and the staff recommended that these valves by included in the IST Program Plan and individually tested to the Code requirements.	The licensee included the EDG air start solenoid valves, DSA-SPV-5A 1/2, -5A 1/4, -5A 2/2, -5A2/4, -5B 1/2, -5B 1/4, -5B 2/2, -5B 2/4, -5C 1/1, and -5C 1/2, in Revision 4 of their IST Program Plan. These valves are non-Code class valves and are not required to be tested in accordance with ASME, Section XI. The licensee committed to test these valves in their December 3, 1991, letter on a yearly frequency. In addition, although the valves are tested in pairs, the licensee states that failure of a single valve is detectable in their testing.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.
Item 15	The NRC regards the following control rod drive system valves on each of the 185 hydraulic control units (HCUs) at WNP-2 as important to safety and should be tested in accordance within the guidelines of Generic Letter (GL) 89-04, Position 7: check valve to scram header HCU-114, charging water check valve HCU-115, drive water air operated valve (AOV) HCU-126, withdraw AOV HCU-127, and cooling water check valve HCU-138.	The licensee acknowledged that the HCU valves listed by the staff do perform a safety function. These are non-Code class valves; however, because of their safety significance and because the new O&M Code will require these valves to be added to the IST program in the future, these HCU valves have been included in Revision 4 of the licensee's IST Program Plan. The testing will be conducted in accordance with GL 89-04, Position 7.	The licensee has addressed the concerns of the anomaly. No further NRC action is required.

Item Number (Relief Request)	Description in NRC SE Dated May 7, 1991	Licensee Actions as Described in Responses Dated December 3, 1991, and July 6, 1992	Remaining Actions
Item 16	P&ID M556 F-9 and G-9 show valves CIA-V-104A and B as manually operated globe valves. Revision 4 of the licensee's IST Program Plan shows these valves to be check valves. This licensee should review this and correct any discrepancies.	The licensee stated that Revision 4 of the IST Program Plan shows these valves to be 0.5 inch manual operated globe valves.	No further NRC action is required.
Item 17	The licensee was requested to investigate the applicability of IWV-3420 for CIVs which are also relief valves. These valves are listed in Revision 4, Section 9.b, page 4.4-56 of the licensee's IST Program Plan and categorized as A/C.	The licensee stated that relief valves categorized as C or A/C are required to be tested in accordance with IWV-3512. The last sentence of IWV-3512 states that valves so tested are not required to be additionally leak tested in accordance with IWV-3420.	No further NRC action is required.
Item 18	The licensee was requested to investigate the safety significance of the containment atmospheric control system valves CAC-TCV-4A and CAC-TCV-4B. If these valves were found to perform a safety function, the licensee was instructed to include these valves in the IST program and test them to the applicable Code requirements.	The licensee stated that these valves have a fail safe safety related function. These valves are skid-mounted and are not required to be in the licensee's IST program. The testing of these components is required by 10 CFR 50, Appendices A and B. They are currently tested once every 18 months during the skid performance test to ensure that each valve cycles based on temperature.	No further NRC action is required. It is expected that future clarification for testing skid-mounted components will be provided by the O&M Committee and/or NRC regulations. Until such time, the testing described by the licensee is acceptable