U. S. NUCLEAR REGULATORY COMMISSION

REGION V

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| Report No.: | 50-397/92-26 |
| Docket No.: | 50-397 |
| License No.: | NPF-21 |
| Licensee: | Washington Public Power Supply System<br>P. O. Box 968<br>Richland, WA 99352 |
| Facility Name: | Washington Nuclear Project No. 2 (WNP-2) |
| Inspection at: | WNP-2 site near Richland, Washington |
| Inspection Conducted: | June 15 through June 19, 1992 |
| Inspector: | D. E. Corporandy, Reactor Inspector |
| Approved by: | Anthony F. Gody Jr. 7/7/92<br>A. T. Gody, Jr., Acting Chief, Engineering Section — Date Signed |


Summary:

Inspection on June 15 through 19, 1992 (Inspection Report No. 50-397/92-26)

Areas Inspected:

This inspection reviewed the licensee's modifications program with emphasis on the snubber program, since extensive modifications had recently been performed in that area. Inspection procedure 37700 was used as guidance for the inspection.

Results:

General Conclusions and Specific Findings

In general, the plant modifications program and procedures for snubbers were thorough and well controlled. Calculations appeared adequate, and the program staff appeared knowledgeable of regulations and related technical issues. However, the following problems were observed:

- incomplete guidance for use of response spectra damping
- lack of procedural guidance directing review of dynamic loading of passive valves



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- questionable adequacy of overlap criteria for combining piping calculations (refer to Follow-up Item 50-397/92-26-01)
- use of square root of the sum of the squares (SRSS) methodology for combining independent support group responses on some multiple level response spectra (MLRS) analyses (refer to Follow-up Item 50-397/92-26-02)
- cumbersome documentation for determining as-built configuration of piping systems
- out of date information in the Final Safety Analysis Report (FSAR)

Summary of Violations and Deviations: None

Open Items Summary:

Two inspector follow-up items were identified.

## DETAILS

### 1.0 Personnel Contacted

* J. Baker, Plant Manager
* J. Cole, Principal Engineer, Civil/Stress Engineering
* J. D. Harmon, Maintenance Manager
* P. Harness, Manager, Mechanical Design Engineering
* L. T. Harrold, Assistant Plant Manager
* R. James, ALARA (As Low As Reasonably Achievable) Coordinator
* S. Kim, ALARA Engineer
* D Larson, Manager, Emergency Preparedness
* P. Macbeth, Radwaste Supervisor
* C. R. Madden, Senior Engineer, Plant Quality Assurance
* M. J. Mann, Acting Operations Manager
* L. Mauws, Supervisor, Specialty Programs, Plant Technical
* L. L. Mayne, Supervisor, Plant Health Physics
* J. V. Parrish, Assistant Director of Operations
* D. J. Pisarcik, Chemistry Manager, Health Physics
* R. Rana, Lead Engineer, Specialty Programs, Plant Technical (Snubber Program)
* G. C. Sorensen, Manager, Regulatory Programs
* D. Swank, Compliance Engineer
* R. L. Wardlow, Supervisor, Radiological Services
* S. L. Washington, Manager, Nuclear Safety Engineering
* R. L. Webring, Plant Technical Manager

The inspectors also interviewed other licensee and contractor personnel during the inspection.

* Denotes those attending the exit meeting on June 19, 1992.

### 2. Plant Modifications Inspection (37700)

### 2.1 Plant Modifications Inspection Plan

The inspector focused on the licensee's snubber program, because extensive modifications had recently been performed in that area. Furthermore, the modifications involved changes to the design input, design methodology, and acceptance criteria on several high safety significant systems. The inspector used Inspection Procedure 37700 to review the licensee's documentation, including related procedures, for modifications to relax snubber testing criteria and to remove or replace snubbers. Systems reviewed by the inspector included:

- Residual Heat Removal (RHR)
- Standby Liquid Control (SLC)
- Reactor Water Cleanup (RWCU)
- Main Steam (MS) and Main Steam Relief Valve Discharge (MSRV)
- Reactor Pressure Vessel Head Vent

## 2.2 Plant Modifications Program Review

### 2.2.1 Modification Control, Review, and Approval

**a. Background:**

The purpose of a snubber is to allow thermal growth to accommodate plant operating conditions while providing restraint for dynamic events such as earthquakes. Snubbers are periodically sampled and performance tested to ensure their ability to perform their design function. It is important to establish acceptance criteria for these tests which provide assurance of a snubber's ability to perform without imposing excessively restrictive limits. Excessively restrictive limits increase the probability of test failures which in turn leads to increased testing, unnecessary snubber replacements, and excessive radiation exposure to workers. Snubber failures, on the other hand, can place a system in an unanalyzed condition and, at worst, render it inoperable.

**b. Review of Licensee's Program:**

The licensee appeared to choose a twofold approach to optimize snubber performance, relaxation of snubber testing criteria and removal of snubbers where feasible. The inspector reviewed Mechanical Engineering Standard (MES)-3, Revision 1, "Piping Design Guide," because it provided much of the technical guidance the licensee used for performing calculations to optimize their snubber program. In general, the inspector found the guide to be well organized and comprehensive. However, the inspector found some areas of concern.

The guide did not provide sufficient guidance for performing response spectra analyses on piping systems which consider the maximum horizontal with vertical response (i.e. the higher of north-south with vertical or east-west with vertical earthquake). Specifically, damping values for earthquakes were not clearly defined to be exclusively 1/2% and 1% for operating basis (OBE) and safe shutdown earthquakes (SSE) respectively. The inspector observed that licensee personnel who performed these types of analyses were knowledgeable of the proper damping values, and the inspector could find no examples of any misuse.

In response to the inspector's concerns, the licensee initiated procedure amendments to ensure use of applicable response spectra and to specifically exclude the use of higher damped Regulatory Guide 1.61 and American Society of Mechanical Engineers (ASME) Code Case N-411. Use of these higher damped response spectra would not be conservative for these applications.

Paragraph 5.1.1 of the guide provided instructions to forward increased valve accelerations on active valves to the licensee's valve qualification group for review and approval. The inspector asked the licensee why passive valves were not being included. The licensee informed the inspector that their practice has been to forward accelerations for all safety related valves, active or passive, to their

valve qualification group for review and approval. The licensee initiated procedure amendments to show that all safety related valve accelerations required review and approval by their valve qualification group.

The inspector was concerned with the guidance for overlapping piping calculations in the absence of a single anchor-to-anchor calculation. Although the licensee's guidance implied that restraints in the overlap region should be sufficient to isolate dynamic loads on one side of the overlap region from those on the other side, the guidance suggested that two restraints in each of the three orthogonal directions would be sufficient to establish such a boundary. This was less stringent than overlap guidance given in NUREG 1980, which in part, called for a minimum of two 90 degree bends in the overlap region and four restraints in each of the three orthogonal directions. Neither the licensee nor the inspector were able to find any examples of safety related piping analyses performed with the overlap method.

In response to the inspector's concerns, the licensee proposed to develop a plan to determine if any safety related piping was affected and to review their design guide overlap criteria for adequacy. This will be an inspector follow-up item. (Follow-up Item 50-397/92-26-01)

The inspector observed that for their snubber reduction calculations on ASME Code Class 1 piping, some of the licensee's multiple level response spectra (MLRS) analyses were being performed by using the square root of the sum of the squares method (SRSS) to combine the responses of independent support groups. This methodology was only used if the original design calculation (as performed by the Nuclear Steam Supply System (NSSS) vendor or Architect/Engineer) had been performed in a similar fashion. The Nuclear Regulatory Commission's (NRCs) position as defined in NUREG 1061, Volume 4, is that the responses from the independent support groups be combined by the absolute summation (ABS) method unless the applicant provides sufficient written documentation for NRCs review and approval on a case by case basis. The NRC had not received any such applications from the NSSS vendor or Architect/ Engineer.

The NRCs position on combining independent support levels for MLRS analyses is based, in part, on recent industry studies such as Electric Power Research Institute (EPRI) Report NP-6153, "Seismic Analysis of Multiply Supported Piping Systems," dated March 1989. The results of this study show that for some cases, the SRSS method for combining independent support level responses may not be conservative.

In response to the inspector's concern, the licensee committed to perform a technical evaluation of their calculations which use the SRSS method for combining independent support level responses in light of current industry studies, in particular EPRI report NP-6153. Review of the licensee's evaluation is an inspector follow-up item. (Follow-up Item 50-397/92-26-02)

The inspector reviewed modification packages for some snubber optimized piping systems. The packages and applicable procedures were well organized and appeared to provide sufficient detail for review and approval.

2.2.2 Relaxation of Snubber Testing Criteria

Background:

When mechanical snubbers are tested, two parameters are measured and compared against acceptance criteria to demonstrate operability. First, the snubber is stroked and drag (i.e. friction) loads are measured and compared to acceptance criteria which are given as a percent of snubber rated load capacity. Second, an impact load is applied to the snubber and the acceleration at which the snubber actuates (i.e. locks up to provide dynamic restraint) is measured. The acceleration is measured as a fraction of the acceleration due to gravity in units of g. The two tests are designed to verify that snubber friction loads impose little resistance to thermal motion while providing the ability to actuate at low enough accelerations to prevent excessive dynamic loading on the system.

Review of Licensee's Program:

The inspector considered two issues to be important. The first issue regarded the licensee's ability to demonstrate the capability of their piping systems (e.g. including pipe supports, valves, equipment, and supporting structures) to be able to accommodate increased loads, stresses and displacements from increasing snubber drag and acceleration threshold. The inspector reviewed the licensee's calculations and found them to adequately address piping system capability.

The second issue was verification from the snubber vendor that any increases in drag and acceleration threshold would still remain within the operability range of their snubbers. At the time of the inspection, the licensee was able to present documents showing the vendor's acceptance of increased snubber drag, but there were no documents supporting increased acceleration threshold. In response to the inspector's concern, on June 18, 1992, the licensee obtained a letter from the snubber vendor which accepted the increased acceleration threshold.

2.2.3 Snubber Optimization

Background:

In order to remove snubber supports from piping systems, calculations are performed to demonstrate that piping and component loads, stresses, and displacements continue to meet acceptance criteria as defined in the

Final Safety Analysis Report (FSAR) and other associated design commitment documents. Iterative calculations would likely be performed to determine which snubbers must remain, which can be removed, and which can be replaced by rigid restraints.

**Review of Licensee's Program:**

The inspector performed a cursory review of licensee snubber optimization calculations. With the exceptions noted in subsection 2.2.1, the calculations appeared to use appropriate design input, methodologies, and acceptance criteria in demonstrating capability of piping systems with revised support configurations.

2.2.4 As Built Documentation

The inspector reviewed the licensee's as-built documentation for their snubber modifications. Upper tiered documents such as piping and instrument drawings (P&IDs), which would be used in the control room appeared to be revised on a timely basis. Lower tiered documents appeared to receive a different priority. Piping and support changes were typically included in field change notices (FCNs). The user would have to determine as-built configuration using all of these documents together. The inspector considered the licensee's system for determining as-built status to be cumbersome and a weak area of their modifications program. The licensee informed the inspector of their intentions to incorporate FCNs into final as built drawings, but stated that progress was slow due to resource limitations.

2.2.5 Safety Evaluations and FSAR Updates

The inspector reviewed licensee safety evaluations for modifications involving snubber removal. The inspector found that the evaluations clearly documented that changes in piping system snubber and support configuration did not constitute an unreviewed safety question.

The inspector verified that the licensee had appropriately amended their FSAR in August of 1990 to indicate their use of ASME Code Case N-411 damping values (subject to the restrictions of Regulatory Guide 1.84) for snubber support optimization. The inspector identified that page C.3-80 of the FSAR addressed the licensee's use of Regulatory Guide (RG) 1.92. RG 1.92 is used in conjunction with ASME Code Case N-411 damping. According to page C.3-80:

> " This regulatory guide is not applicable to WNP-2..."

A recent electrical distribution system functional inspection at WNP-2 found several examples of out-of-date information in the licensee's FSAR. The inspector expressed concern over this most recent example. In response to the inspector's concern, the licensee proposed to update and amend page C.3-80.

## 2.3 Summary of Plant Modifications Program

In general, the licensee's plant modifications program for snubbers appeared thorough and well controlled. Licensee personnel involved in the snubber program appeared knowledgeable of regulations and related technical issues. Supporting calculations and evaluations appeared adequate. The inspector noted what appeared to be isolated problems in some areas. These were:

- incomplete guidance for use of response spectra damping
- lack of procedural guidance directing review of dynamic loading of passive valves
- questionable adequacy of overlap criteria for combining piping calculations (refer to Follow-up Item 50-397/92-26-01)
- use of SRSS methodology for combining independent support group responses on some MLRS analyses (refer to Follow-up Item 50-397/92-26-02)
- cumbersome documentation for determining as-built configuration of piping systems
- out of date information in the FSAR

## 3. Exit Meeting

The inspector met with licensee management representatives denoted in Section 1 on June 19, 1992. The scope of the inspection and findings were discussed. The licensee acknowledged the scope and content of the inspection findings.