ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-397/95-14

License: NPF-21

Licensee: Washington Public Power Supply System
3000 George Washington Way
P.O. Box 968, MD 1023
Richland, Washington

Facility Name: Washington Nuclear Project-2

Inspection At: Richland, Washington

Inspection Conducted: April 24 through May 23, 1995

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Inspection Summary

Areas Inspected: Routine, announced inspection of refueling and inservice inspection activities, and licensee response to NRC Bulletin 90-01, Supplement 1, "Loss of Fill-Oil in Transmitters Manufactured by Rosemount," in accordance with Temporary Instruction 2515/122, "Evaluation of Rosemount Pressure Transmitter Performance and Licensee Enhanced Surveillance Programs." Also, followup was performed on the securing of the residual heat removal system while in the shutdown cooling mode.

Results:

Plant Operations

- Excellent performance was observed during refueling operations. Communications were found to be effective and very good (Sections 2 and 3).

- The licensee violated the Technical Specifications by allowing shutdown cooling to remain off for 25 minutes more than permitted by the Technical Specifications. This was a noncited violation (Section 6.2).

Maintenance

- Magnetic particle testing was performed well by certified examiners (Section 4.2).
- A failure to implement procedures for certifying qualification of nondestructive test personnel was identified as a noncited violation (Section 4.3).
- Procedures for the performance of ultrasonic testing were well written, in general. One example was identified as a noncited violation for not adequately addressing criteria for determining that important activities had been accomplished (Section 4.4).
- With only one exception, transmitter data from calibrations required by the preventive maintenance program were found to be properly recorded (Section 5.8).

Engineering

- There were strong technical elements in the Rosemount transmitter enhanced surveillance program (Section 5.3.2).
- The transmitter trending program conservatively exceeded the scope recommended by the vendor (Section 5.4).
- The failure to question or pursue missing or incomplete data for the enhanced surveillance program was a weakness (Section 5.7).
- Licensee actions related to the identification and disposition of failed or failing transmitters were conservative (Section 5.9).

Plant Support

- Foreign material controls were good (Section 2).
- Initial and continuing training provided to instrument and control technicians regarding loss of fill-oil in Rosemount transmitters, was a strength (Section 5.3.2).

Management Overview

- The operations manager provided strong oversight by his presence on the refueling bridge during refueling operations and his guidance given to operators during off-normal working hours (Sections 2 and 3).

Summary of Inspection Findings:

- Three examples of noncited violations were identified (Sections 4.3, 4.4, and 6.2).
- Inspection Followup Item 397/9514-01 was opened (Section 5.8).

Attachments:

- Attachment 1 - Persons Contacted and Exit Meeting
- Attachment 2 - Data Required by Temporary Instruction 2515/122

DETAILS

1 PLANT STATUS

During this inspection period, the plant was shutdown for the tenth refueling outage.

2 REFUELING ACTIVITIES (60710)

The purpose of this part of the inspection was to ascertain whether refueling activities were being controlled and conducted by operations in accordance with Technical Specifications, approved procedures, and safe practices.

The inspectors observed core alterations on four different shifts of operators during this inspection. The inspectors found that the required Technical Specifications and administrative procedures were followed.

Prior to the commencement of core alterations, contractor-supplied personnel performed hydrolasing on the feedwater nozzles to reduce radiation levels. The inspectors observed this activity and noted that the procedure was being followed by the workers.

In order to ascertain whether the procedures were being properly implemented, the inspectors reviewed the fuel handling and service procedures, and the refueling operations procedures. The inspectors also reviewed the procedure for foreign material control. The procedures were:

Procedure	Title	Revision	Date of Issue
1.3.18	Foreign Material Control Around the Spent Fuel Pool, the Reactor Cavity and the Dryer-Separator Pit	12	April 12, 1995
2.14.1	Refueling Bridge Operation	11	April 27, 1995
6.3.2	Fuel Shuffling and/or Offloading and Reloading	9	April 26, 1995
6.3.5	Full Core Verification	7	May 10, 1994
6.3.28	Nuclear Component Transfer List Preparation	2	February 27, 1995
7.4.9.6	Refuel Platform Crane and Hoist Interlock Surveillance	13	April 27, 1995

The inspectors observed excellent performance by the operators on the bridge during core alterations. The communications were very good; repeat backs were used effectively. Whenever an operator had a question related to the core alteration, activities stopped until the question was resolved. The inspectors observed the operations manager inform the operators that they should ensure that they understood exactly what was being done; if not, then they were to stop and resolve the issue. The operations manager told the senior reactor operator not to worry about the schedule, but ensure the activities were performed properly.

The inspectors also observed core alterations from the control room. The operator assigned to the core alterations had no concurrent responsibilities and was keeping the control room supervisor informed. At one point, the control room supervisor stopped core alterations because the containment pressure had dropped below the Technical Specification allowable for approximately 30 seconds while the ventilation was shifted from the standby gas treatment system to normal containment ventilation. The control room supervisor did not allow core alterations to restart until the ventilation system was returned to normal with acceptable containment pressure. The inspectors considered these actions proper and conservative.

The inspectors found the control of foreign material to have been very good in spite of a procedure that was difficult to implement. On April 27, 1995, an operator on the refueling floor initiated a problem evaluation request that identified components that were not secured on the bridge in accordance with Procedure 1.3.18. The inspectors observed the operator take the immediate corrective actions before bridge activities were allowed to continue.

The inspectors discussed the responsibilities of the foreign material control watch person with several of the watch standers. Most of the watch standers were familiar with the intent of the procedure, but stated that they had questioned how they were to implement portions of the procedure. The areas of most concern were documenting what material was in the foreign material control zone and who was responsible for it. The inspectors discussed this with the reactor engineering manager who was responsible for the refueling activities. The inspectors found that the reactor engineering manager was aware of the difficulties and that improvements were being discussed and evaluated as part of the response to the problem evaluation request. The inspectors considered this to have been the proper approach to resolving the difficulties experienced by the watch standers.

3 SPENT FUEL POOL ACTIVITIES (86700)

The purpose of this part of the inspection was to ascertain that the spent fuel handling activities were performed in accordance with Technical Specifications, regulatory requirements, and safe practices.

The inspectors observed the manipulation of spent and new fuel in the spent fuel pool. In order to determine if the operation was in accordance with procedures, the inspectors reviewed the following procedures related to handling fuel assemblies in the spent fuel pool.

Procedure No.	Title	Revision	Date of Issue
1.3.40	WNP-2 Outage Mode Change or Refueling Activity Readiness Evaluation	6	April 24, 1995
2.8.5	Fuel Pool Cooling and Cleanup System	19	January 10, 1995
6.3.10	Post Irradiated Fuel Surveillance	4	May 10, 1994
6.3.16	Irradiated Fuel Channel Inspection	2	June 15, 1993
6.3.23	Handling Irradiated Fuel in the Spent Fuel Pool	3	April 26, 1995

The inspectors verified that the procedures contained: a limitation on the number of fuel assemblies that could be out of safe geometry locations simultaneously (Procedure 6.3.23); provisions for verifying that the spent fuel storage area crane interlocks or physical stops prevented the crane from passing over fuel storage positions (Procedure 6.3.2); provisions for verifying that the spent fuel pit hoist and related handling tools were checked for proper operation (Procedure 6.3.2); verification that procedures did not rely on limit switches to function as normal stopping devices (Procedure 2.14.1); and, provisions to verify that the spent fuel area ventilation system was operating as required, that the efficiency of the absolute and charcoal filter systems had been determined, that secondary containment would isolate on a high radiation signal, that the minimum water level requirements were monitored, and that radiation and airborne radioactivity monitors were operable (Procedure 1.3.40). The inspectors noted that the spent fuel pool cooling and cleanup system was not a system required specifically by the Technical Specifications. These systems were operated in accordance with Procedure 2.8.5, "Fuel Pool Cooling and Cleanup System," Revision 19, issued January 10, 1995.

The inspectors verified by direct observation that: the spent fuel pool water level was higher than the minimum level established in the Technical Specifications; the secondary containment ventilation system maintained the building at the specified negative pressure, except as discussed above; the spent fuel pool cooling and cleanup system was maintaining pool temperature; personnel handling fuel were properly qualified and supervised; fuel handling activities received reviews required by the Technical Specifications; an accurate record of the fuel location was being maintained; and, spent fuel pool activities were conducted in accordance with approved procedures.

The inspectors observed the same excellence, noted above, in the handling of fuel assemblies in the spent fuel pool. Communications were very good among the operators.

On April 7, 1995, the Washington Public Power Supply System sent a letter of notification of a change in commitment to the NRC. The change was to perform visual inspection only on discharged fuel where there was indication of either actual or suspected gross cladding defects or anomalies. This differed from the previous commitment to perform a visual inspection on 5 to 10 percent of the highest burnup assemblies of the discharged fuel.

The inspectors reviewed the last three reports for the inspections and found that no problems were identified. A reactor engineer informed the inspectors that there had not been any fuel failures since the original (Cycle 1) fuel had been replaced.

The inspectors also reviewed Procedure 6.3.10, "Post Irradiated Fuel Surveillance," Revision 4, issued May 10, 1994, and Procedure 6.3.16, "Irradiated Fuel Channel Inspection," Revision 2, issued June 15, 1993. The inspectors found the procedures provided adequate instructions for the inspection of the irradiated fuel assemblies and channels.

The inspectors inquired about the licensee plans to change fuel vendors and how that could affect the change in commitment. The inspectors were informed that fuel from the new vendor had been installed for several operating cycles and had been inspected during the refueling outages. No indications of excessive crud or oxide layer buildup were found during any of the inspections. The reactor engineer considered those inspections to have been adequate to demonstrate that there should not be any problems when a full core load of the new fuel occurs, therefore, the change in commitment should not have a negative effect on safety. The inspectors found this deduction to be reasonable.

4 INSERVICE INSPECTION (73753)

The objective of this part of the inspection was to determine whether inservice inspection examinations were performed in accordance with Technical Specifications and the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code.

The inspection was primarily conducted with major emphasis placed on observation of examination performance, nondestructive examination personnel qualifications, and evaluation of nondestructive examination procedures. Minor emphasis was placed on the inservice inspection program status.

4.1 Inservice Inspection Program

The second 10-year interval inservice inspection program plan, "ISI Program Plan, Interval - 2," Revision 0, dated December 1994, in effect at the time of this inspection, was developed to meet the 1989 Edition of Section XI of the

ASME Code. The inspectors found that guidance for implementation of the inservice inspection program was provided in Nuclear Operating Standards NOS-33, "Inservice Inspection," Revision 7, and Engineering Directorate Procedure EDP-4.4, "Preparation of Inservice Inspection Program Plans," Revision 5. The inspectors also noted that Section 2.0 of the qualification and certification program, "Qualification/Certification of Examination Personnel in Accordance with SNT-TC-1A for Nondestructive Examination," Revision 9, contained the guidance and responsibilities for personnel certifications, and is discussed in more detail below (Section 4.3).

4.2 Observation of Nondestructive Examinations

The inspectors observed the following weld examinations: magnetic particle examination of main steam line pipe to Elbow Weld 26MS(1)A-6 on April 28, 1995; magnetic particle examination of main steam line penetration pipe to Valve Weld 26MS(1)A-17, on May 1, 1995; two ultrasonic examinations of reactor feedwater line pipe to Elbow Weld 12RFW(1)AC-6 and elbow to Pipe Weld 12RFW(1)AC-7, on May 1, 1995; three ultrasonic examinations of main steam line penetration pipe to Valve Weld 26MS(1)A-17, valve to Pipe Weld 26MS(1)A-18, and pipe to Pipe Weld 26MS(1)A-19, on May 2, 1995; and, three ultrasonic examinations of reactor feedwater line pipe to Valve Weld 24RFW(1)A-1A, valve to Pipe Weld 24RFW(1)A-1, and pipe to Weldolet Weld 24RFW(1)A-1/5RFW(11)-4, on May 2, 1995.

The observed magnetic particle examinations were performed well by certified examiners using qualified Nondestructive Examination & Inspection Instruction QCI 4-3, "Magnetic Particle Examination - WNP-2," Revision 6 (see Section 4.4 below). The examiners verified the yoke-lifting capacity and established the yoke-leg spacing at 6 inches. Upon completion of the examinations, the examiners properly documented the results of the examinations in Examination Reports 2MSM-010 and 2MSM-011.

The eight observed ultrasonic examinations were performed by certified examiners using qualified Nondestructive Examination & Inspection Instruction QCI 6-13, "Ultrasonic Examination of Ferritic Steel Piping Welds," Revision 7 (See Section 4.4 below). The inspectors verified that the examiners checked surface temperature and assured proper cleanliness of the area to be examined. To the extent that geometry allowed, the examinations of the circumferential welds were conducted in two directions for each of the perpendicular and parallel scans to the weld axis, using a 45°, 2.25 MHz shear wave transducer. The examiners also performed a calibration check at the beginning and end of each examination. Upon completion of the examination, the examiners properly documented the results in Examination Reports 2-011 through 2-018.

Before the ultrasonic examinations were conducted on May 1, 1995, the inspectors observed the system calibration which included both axial and circumferential scans. The transducer selection, sensitivity calibration, and construction of the distance amplitude correction curve were performed

appropriately in accordance with the procedure. The inspectors also verified, by review of the certified material test report, that the correct calibration block was used (i.e., similar to the component to be examined in terms of material, diameter, and wall thickness).

During observation of ultrasonic examinations, two instances arose which appeared to indicate confusion on the part of certain examiners regarding what constituted a recordable indication. On two separate occasions, the inspectors questioned the examiners when it appeared that indications of approximately 50 percent of the distance amplitude correction curve were observed on the scope without any apparent actions taken by the examiners to determine whether the indications were of geometric or metallurgical origin. Both examiners stated that they considered the indications to be geometric in nature. Upon questioning by the inspectors about the observations, the examiners took appropriate measurements/recordings in order for the required determinations to be made. The inspectors reviewed the subsequent evaluations of the examiners' data, which included reexamination using a 60° transducer. The Level III examiner for the plant determined that the indications were of geometric origin, and validated the examiners' understandings. Further review of the procedure by the inspectors indicated weaknesses which are described below (see Section 4.4, below).

4.3 Personnel Qualifications and Certifications

The inspectors were informed that the licensee had contracted with a vendor to provide nondestructive examination personnel, equipment, and services, in order to perform the scheduled inservice inspections. The inspectors reviewed the qualification files of the five nondestructive examination personnel who performed the examinations observed by the inspectors. The files contained proper certifications for the examiners in the examination methods that the inspectors observed. The inspectors also noted that the examiners had been certified in accordance with American Society of Nondestructive Testing Recommended Practice SNT-TC-1A, 1984.

The inspectors verified that each of the examiners had received the ASME Code-required annual near-distance vision acuity and color vision examinations. The examinations, all of which were current, had been conducted by the vendor. Each of the examiners' certification packages had been reviewed and certified by the corporate certification examiner in accordance with paragraph 3.0, "Responsibility," of the qualification and certification program manual.

Paragraph IWA-2321, in Section XI of the 1989 Edition of the ASME Code, stated that personnel shall demonstrate natural or corrected near-distance acuity, with at least one eye, by reading the Jaeger No. 1 print on a Jaeger test chart at not less than 12 inches. Equivalent measures of near-distance acuity may be used (e.g., Ortho-Rater test). During review of the vision records, the inspectors noted that three records were not consistent with ASME Code requirements (i.e., they showed results that did not demonstrate Jaeger No. 1 natural or corrected near-distance acuity). The inspectors, in order to

determine the review and acceptance standards associated with contractor personnel certifications, reviewed paragraph 4.4, "Vision Examination," in the qualification and certification program manual, and found the vision examination requirements to be different from the 1989 Edition of the ASME Code. The inspectors noted that the three vision records mentioned above were consistent with the requirements of Paragraph 4.4 in the program manual, which, during discussion with the corporate certification examiner, was found to be the basis for his review and certification process.

The nondestructive examination supervisor informed the inspectors that paragraph 4.4, "Vision Examination," was written to incorporate ASME Code Case N-490-1, dated May 13, 1991. Review of the Code Case showed that it provided alternative vision test requirements for nondestructive examiners in lieu of Section XI near-distance acuity requirements. The nondestructive examination supervisor stated that the code case was supposed to have been included in the second 10-year interval inservice inspection program at the time of submittal to the NRC; however, the code case was inadvertently left out. Since the submitted inservice inspection program was developed to meet the 1989 Edition of the ASME Code, any use of a code case not committed to in that submittal has the potential to at least create an administrative conflict.

Since the licensee had established and implemented a procedure that incorporated the use of a code case not authorized by their program, indeterminate vision examination results were obtained and accepted, thus, allowing examiners who may not have met the requirements of the 1989 Edition of the ASME Code to perform nondestructive examinations. The nondestructive examination supervisor on May 4, 1995, initiated the following two problem evaluation requests.

Problem Evaluation Request 295-0466 addressed the issue of using a code case that had not been committed to in the inservice inspection program submitted to the NRC. The corrective action was to revise paragraph 4.4 Section 2.0 of the qualification and certification program manual, to remove the provisions of Code Case N-490-1.

Problem Evaluation Request 295-0467 addressed the issue of the vendor's use of alternative vision examination requirements while testing the inservice inspection personnel, and the failure to detect the documented use of the alternative requirements. The nondestructive examination supervisor took immediate corrective action by stopping all nondestructive examinations and administering new vision examinations to the affected personnel, all of whom passed. The inspectors verified that the vision examinations met the requirements of the 1989 Edition of the ASME Code.

The inspectors informed the nondestructive examination supervisor that the use of a procedure not appropriate to the circumstances was a violation of Criterion V to Appendix B to 10 CFR Part 50. The violation, however, will not be cited because the criteria specified in Section VII.B.(1) of Appendix C to 10 CFR Part 2 have been met.

4.4 Inservice Inspection Procedures

The inspectors reviewed the following nondestructive examination procedures, including the two used during the performance of the observed examinations, to verify that they were consistent with the requirements of the 1989 Edition of the ASME Code. These were: Nondestructive Examination & Inspection Instructions QCI 3-3, "Liquid Penetrant Examination - WNP-2," Revision 5; QCI 4-3, "Magnetic Particle Examination - WNP-2," Revision 6; and, QCI 6-13, "Ultrasonic Examination of Ferritic Steel Piping Welds," Revision 7. The inspectors verified that the procedures had been reviewed and approved by the appropriate licensee personnel and by the authorized nuclear inservice inspector.

In general, the procedures were found to be well written and contained sufficient detail and instructions to perform the intended examinations. One exception was identified; it pertained to ultrasonic examination Procedure QCI 6-13. Mandatory Appendix III to Section XI specified minimum information requirements that must be included in written ultrasonic examination procedures. One of those requirements (Article III-2300 (g)) dealt with the data to be recorded, the method of recording, and, by reference (III-4510) the methodology to be used in determining whether indications were of geometric or metallurgical origin. The inspectors' review of Procedure QCI 6-13 revealed that Step 6.2.1 required the recording of geometric or metallurgical indications if they were 50 percent of distance amplitude correction curve, or greater. Step 6.1.3 required the recording of any other indications which were determined not to be of geometrical or metallurgical origin, if they were 20 percent of distance amplitude correction curve, or greater. However, the procedure was silent regarding the Code-required methodology to make the determination regarding geometric or metallurgical indications.

Upon informing the nondestructive examination supervisor of the apparent procedural deficiency, the supervisor immediately held a documented training session with all of the inservice inspection personnel performing ultrasonic examinations. This session, held on May 2, 1995, was devoted to the steps in Section 6.0 of Procedure QCI 6-13, regarding clarification of recording requirements for consistent application. In addition, a procedural change was initiated to clarify the recording requirements and to address the ASME Code-required indication interpretation methodology. The initiated procedure change was entered and was to be tracked in the plant tracking log under the assigned Number A-114645.

The inspectors, after reviewing the inservice inspection status of completed ultrasonic examinations and discussing the above issues with the examiners, determined that the examiners had complied with the procedure, and based on their experience, had also applied the indication determination methodology.

The inspectors informed the nondestructive examination supervisor that the use of a procedure which did not adequately address criteria for determining that important activities have been accomplished was a second violation of

Criterion V to Appendix B to 10 CFR Part 50. The violation, however, will not be cited because the criteria specified in Section VII.B.(1) of Appendix C to 10 CFR Part 2 have been met.

5 EVALUATION OF ROSEMOUNT PRESSURE TRANSMITTER PERFORMANCE AND LICENSEE ENHANCED SURVEILLANCE PROGRAM (TEMPORARY INSTRUCTION 2515/122)

This portion of the inspection was conducted at the Washington Nuclear Project-2 site on May 15-19, 1995.

5.1 Background

On March 9, 1990, the NRC issued Bulletin 90-01, "Loss of Fill-Oil in Transmitters Manufactured by Rosemount." The bulletin discussed certain Rosemount pressure and differential pressure transmitter models identified by the manufacturer as being susceptible to fill-oil leakage, which could result in premature failure.

With the gradual leakage of fill-oil, a transmitter may not have the long-term accuracy, time response, and reliability needed for its intended safety function. Further, this condition could go undetected over a long period. The bulletin requested licensees to identify whether these transmitters were, or may later be, installed in safety-related systems. Actions were detailed for licensee implementation if the identified transmitters were presently installed in safety-related systems. This requested action included a historical review of installed transmitter calibration data to identify any potential failure of installed transmitters. The bulletin endorsed diagnostic methodology recommended in four technical bulletins previously issued by the vendor.

On December 22, 1992, the NRC issued NRC Bulletin 90-01, Supplement 1, to inform licensees of continued NRC staff and industry actions in evaluating loss of fill-oil in Rosemount transmitters and to request actions to be taken by licensees to assure the reliability of transmitters in use. Licensees were requested to replace, or place in an enhanced surveillance program Model 1153B, 1153D, and 1154 transmitters manufactured before July 11, 1989, that were installed in safety-related applications.

The purpose of the enhanced surveillance program was to ensure that installed Rosemount transmitters met design criteria as highly reliable components for which failures could be readily detected. Pressure transmitters other than Models 1153B, 1153D, and 1154 were excluded from the actions requested in the supplement, due primarily to few confirmed fill-oil loss failures and differences in the oil sensor design. Similarly, due to transmitter design, manufacturing process improvements, and few confirmed failures, Model 1153B, 1153D, and 1154 transmitters, which were manufactured after July 11, 1989, were also excluded from the bulletin supplement actions. Additional data collected on those transmitters that are outside of the scope of the supplement will be used to verify failure reports, determine to what extent

licensees notify Rosemount of transmitter failures, and to confirm that the actions requested by the bulletin supplement are sufficient.

Model 1151, 1152, and 1153A transmitters were excluded from the actions requested by Supplement 1 due primarily to the few confirmed fill-oil loss failures and differences in the oil sensor design as compared to Model 1153B, 1153D, and 1154 transmitters. These design differences were thought to make Model 1151, 1152, and 1153A transmitters less likely to experience loss of fill-oil failure. However, as a result of a possible similar failure mode, additional insight into their performance was necessary to confirm that their inclusion in an enhanced surveillance program was not needed. Similarly, due to transmitter design and process improvements and few confirmed failures, Model 1153B, 1153D, and 1154 transmitters manufactured after July 11, 1989, were excluded from the list of bulletin supplement actions. For these transmitters, the information requested in the inspection guidance will be used to verify failure reports, determine the extent to which licensees notify Rosemount of transmitter failures, and confirm that actions taken in the bulletin supplement were sufficient.

The Washington Nuclear Project-2 licensee response to the bulletin supplement was provided to the NRC in Letter GO2-93-055, dated March 8, 1993. Response to a followup NRC request for additional information was provided in Letter GO-94-124, dated May 23, 1994. In the initial response, the licensee committed to comply with requested actions of the bulletin supplement.

5.2 Licensee Disposition of Stored Transmitters

The inspector interviewed personnel and reviewed procurement records to determine how the licensee had dispositioned the transmitters, stored in the warehouse, with high potential for failure. Personnel stated that, in response to the bulletin supplement, a data search and inspections were conducted to identify those transmitters at high risk of failure. According to procurement records that were provided, a total of 13 transmitters had been returned to the vendor since NRC Bulletin 90-01 was issued. The majority of these transmitters were refurbished to eliminate the risk of failure and returned to the licensee.

The licensee was asked for a list of all Rosemount transmitters currently in the warehouse. A key word search on the procurement system database provided a list of all transmitters plus spare parts provided by Rosemount. The inspector reviewed the list and determined that a total of 80 Rosemount Model 1153B and 1153D transmitters were currently in the warehouse. According to the information provided, there were no Rosemount Model 1154 transmitters in the warehouse.

Transmitters manufactured after July 11, 1989, were identified by serial numbers greater than 500,000 and transmitters with serial numbers ending in "A", were not at high risk of failure. The licensee's database would not provide spare transmitter serial numbers or date of manufacture. The inspector held a discussion with a licensee representative to determine the

least intrusive method of checking spare transmitter serial numbers. The licensee representative agreed to check receipt inspection records and provide the inspector with the serial numbers. The inspector stopped the process after the inspection tags for 42 spare transmitters had been checked and all serial numbers verified to be greater than 500,000 or ending in "A." Based on this sample of 53 percent of the transmitters in the warehouse, with no adverse indication, the inspector concluded that all transmitters at high risk of failure had likely been removed from the licensee's warehouse facilities.

5.3 Enhanced Surveillance Program

5.3.1 Background

In a series of four technical bulletins issued by Rosemount, the required elements of an enhanced surveillance program were developed. These bulletins became appendices to the NRC inspection guidance for addressing the loss of fill-oil issue. The vendor segregated inservice transmitters into low, medium, or high pressure categories and further subdivided inservice transmitters into two groups:

- Transmitters that provided safety-related indications; and,
- Safety-related transmitters that monitored conditions and initiated reactor protection trip, engineered-safety features actuation, and anticipated trip without scram systems.

Therefore, the enhanced surveillance requirements for a given transmitter were determined from the transmitter service pressure and its particular safety function.

The affected groups of transmitters had been identified by model number and date of manufacture. The vendor also determined that the risk of fill-oil loss decreased as the transmitters aged in service at normal operating pressure. The vendor provided criteria expressed in psi-months to identify mature transmitters that did not require enhanced surveillance. The psi, as used by the vendor, was defined as normal operating pressure. The threshold criteria for ceasing enhanced surveillance was the attainment of 60,000 or 130,000 psi-months, depending on transmitter range code. Transmitters not attaining the required service life at operating pressure were classified as nonmature.

The following programmatic elements were generally recommended to effectively monitor suspect transmitters in safety-related service for impending failure:

- The identification of the affected transmitters to be monitored;
- The trend of calibration data on the percent shift of zero and span (limits for percent shift up or down were established to require transmitter evaluation);

- Comparative trending of operating data on the difference in the output of redundant transmitters (transmitter output differences were to be evaluated); and,

- The ability to detect failures after transmitters were mature and no longer included in an enhanced surveillance program.

Simultaneous trending of operational and calibrational data for a given transmitter was not needed for failure identification. The vendor technical bulletins also discussed monitoring methods based on the evaluation of transmitter sluggishness or noise. The required frequency of enhanced surveillance varied according to the various inservice categories and operating pressure.

5.3.2 Licensee Program

The licensee's enhanced surveillance program was implemented by Procedure 8.4.67, "Rosemount Transmitter Enhanced Monitoring," Revision 2. The procedure provided details in the following areas:

- Trending Data Acquisition,
- Calculation of Transmitter Drift,
- Calculation of Transmitter Drift Limits,
- Transmitter Trending,
- Determination of Suspected Oil-Loss Transmitters, and
- Actions for Suspected Oil-Loss Transmitters.

The inspector reviewed the procedure and found it to be comprehensive with sufficient detail to administer an effective program. A review of the two previous revisions revealed that the original program had been improved. The first revision implemented an automatic trending system and enhanced trending evaluation technique. The latest revision had added program information, added cautions for specific range code instruments, improved database instructions, and streamlined instructions for determination of drift limits and analysis of transmitter condition.

The enhanced surveillance program was administered by one engineer who had been responsible for all program and database development and implementation since inception. Due to a previous commitment, this individual was not available during the week of the inspection. However, the immediate supervisor was able to provide all of the information and documentation necessary to perform the inspection. The inspector requested, and was given, a demonstration of the automated trending database that was used to trend individual transmitter calibration data. The data required for a single transmitter calibration entry was the date and the transmitter output for the minimum and maximum points as-found and as-left values. With this information in the data base for at least two calibrations, the program would automatically calculate the interval between data entries, percent zero shift, and percent span shift since the last entry. The cumulative shift since the

start of data collection was also trended and tracked. For analytical purposes, the system would provide hard copy tabular and graphic information. Graphic and tabular depiction also included the span and zero shift limits for the specific transmitter range code as developed in the vendor technical bulletins. According to a licensee representative, the automated trending program had been endorsed by the vendor as fully capable of providing the required analytical information.

The inspector reviewed documentation and held discussions with maintenance training personnel to assess the effectiveness of training that had been provided to instrument and control technicians relative to loss of fill-oil from Rosemount transmitters. According to records provided, significant training was developed and administered to technicians prior to issuance of NRC Bulletin 90-01. All technicians (47) attended an industry events training presentation provided in Lesson Plan 82-14-3789-LP. Since the bulletin was issued, the Rosemount transmitter loss of fill-oil issue had been included in the New-Hire Training Course 82-ICT-1201-LP. This course was recently administered to a majority of current technicians as continuing training.

The maintenance training organization had developed, and put into operation, a hands-on laboratory facility containing test loops with actual components and instrumentation. This training facility was used by all disciplines to actually troubleshoot, repair, overhaul, and calibrate equipment similar or identical to that installed in the plant. Formal training packages had been developed to train and evaluate personnel in the laboratory.
Course 82-ICT-4100-LP, "Maintenance Work Practices," contained a scenario that required a trainee to perform a calibration on an instrument loop that contained a Rosemount transmitter. A laboratory guide contained evaluation elements that evaluated trainee ability to identify a transmitter failure due to loss of fill-oil.

The inspector was also shown documentation related to training operations personnel about the loss of fill-oil issue. The continuing training program for licensed and non-licensed operators had resulted in the administration of training through the periodic industry events presentations.
The training that the licensee had provided to technicians was more comprehensive than similar training observed by the inspector at other facilities. In addition, the technical elements of the enhanced surveillance program were strong.

5.4 Scope of Trending Program

The Washington Nuclear Project-2 program was currently trending 62 transmitters that had been identified by the bulletin supplement to be at high risk of failure. The inspector verified that these transmitters had been placed into the correct surveillance category in accordance with the recommendations of the bulletin supplement. The licensee had decided not to replace, or return to the vendor for refurbishment, the originally installed transmitters. Therefore, all of the transmitters identified to be at increased risk of failure were being trended. However, all but one of these

transmitters could have been removed from the enhanced surveillance program because they were in a low-pressure application or had matured past 60,000 or 130,000 psi-months. To remove these transmitters from enhanced surveillance, required the licensee to have the ability to identify a transmitter failure within the normal activities associated with transmitter maintenance or surveillance, which was within the licensee's capabilities.

The inspector determined that the licensee's program was also trending and analyzing:

- 26 Model 1153B and 1153D transmitters manufactured after July 11, 1989, in safety-related applications and not at risk of failure;
- 35 Model 1151 transmitters; and
- 3 Model 1152 transmitters.

The licensee's effort exceeded the scope recommended by the bulletin supplement.

5.5 Test Interval

All transmitters subject to calibration data trending in accordance with the bulletin supplement fell into categories where the recommended interval between data collection was 24 months. However, a significant fraction of transmitters were being trended annually simply because annual data was available. Therefore, all test intervals were meeting the recommendations of the bulletin supplement.

5.6 Monitoring Techniques

Rosemount Inc., developed methods with guidelines to independently or in combination, identify transmitters suspected of oil loss. This section discusses the licensee's implementation of those methods.

5.6.1 Process Noise Analysis

Because of interpretation difficulties and a lack of universal applicability due to differences in transmitter application, the vendor discontinued the development in the use of noise as a diagnostic tool. The licensee did not include this monitoring technique in the enhanced monitoring program to detect loss of fill-oil.

5.6.2 Output Drift Analysis

There were two options for output drift analysis. Normal calibration data (as-found versus as-left data) could be evaluated to determine any cumulative positive or negative drift trends. Also, trending and comparison of actual operating data on processes with redundant transmitters, could identify

suspect transmitters. Both techniques were field tested and showed the ability to detect leaking sensors. The licensee did not employ any operating data trending, but relied on calibration data trending to predict or identify transmitter failure.

5.6.3 Sluggish Response

Sluggish response of transmitters was detectable with two optional methods. One was a qualitative test where experienced technicians could detect slow response during normal calibration by monitoring transmitter output while simulating a process input. Additionally, a bench test could be performed on suspect units to confirm and quantify the slow response. The vendor technical bulletins stated that monitoring for sluggish response was an acceptable method of detecting a failed transmitter after it was removed from an enhanced surveillance program.

5.6.4 Licensee Methodology

Procedure 10.24.32, "PM CAL/TEST - Rosemount DP Transmitters," Revision 9, required the calibrating technician to identify and report any sluggish behavior of transmitter output during calibration. The procedure for Rosemount transmitter calibration also required that transmitter output be measured directly at the transmitter. This required the removal of transmitter end covers to expose transmitter test terminals which opened an environmentally qualified barrier on transmitters potentially subject to a harsh environment. The procedure addressed this issue by providing instructions on evaluating and properly restoring the barrier following successful calibration. The inspector concluded that the licensee was employing the proper monitoring techniques needed to detect failed or failing transmitters.

5.7 Review and Trending of Calibration Data

The inspector reviewed the trended calibration data and analysis for the original 62 transmitters that were identified as susceptible to failure, according to the supplement. The amount of data collected for most transmitters was sufficient to provide for statistically valid trends. The implementing procedure contained acceptance for transmitter drift that mimicked the criteria specified by the vendor technical bulletin.

A question arose concerning the accuracy of the data trended. Technical information from the vendor recommended that transmitter output data be recorded and trended using milliampere fractions to three decimal places. The licensee's program used milliampere fractions normally expressed to two decimal places. The licensee had queried the vendor as to the adequacy of this process for identifying failed or failing transmitters. The vendor responded that transmitter output data measured at the transmitter in two decimal place fractions and inserted into the automatic trending database was sufficiently accurate to identify failures. The inspector concluded that the

trending of calibration data was being performed in accordance with Rosemount Technical Bulletin No. 4.

During the extensive review of the hardcopy trending information, the inspector raised several questions about specific transmitter trending and analysis to the licensee representatives. The majority of these questions were related to excessive elapsed time between data entries and past due or missing calibration data. The inspector questioned if the required surveillance or preventive maintenance performed by the calibration performance had been missed. Based on the reaction of licensee personnel, it appeared to the inspector that these questions had not been asked before. Personnel were eventually able to locate the missing data or explain irregularities in the information. However, this indicated the lack of a questioning attitude about missing or incomplete data that was required to be processed by the licensee's program. This was considered a weakness.

5.8 Rosemount Transmitters Calibration Procedure Review

The opportunity did not arise for the inspector to observe the performance of a transmitter calibration. Therefore, a sample of recently completed calibration procedures and master data sheets was reviewed. The inspector also reviewed Procedure 10.24.1, "I&C [Instrumentation and Control] Data Record Compilation and Filing," Revision 9. This procedure provided guidance on using, recording, and handling documentation related to plant instrument calibration and setpoint adjustment. For those completed calibrations reviewed, the inspector noted that the transmitter data was never entered onto the master data sheet. Only loop component data was recorded on the master data sheet. Transmitter data was recorded on the instrument work sheet.

An irregularity was noted in the recent loop calibration for Transmitter SLC-PT-4, which was the instrument loop for the discharge pressure of the standby liquid control pump. Licensee personnel identified the irregularity as they were delivering and explaining the documentation to the inspector. Loop calibration was a refueling frequency preventive maintenance task. According to the data provided, the instrument had been calibrated on March 2, 1995, to meet a due date of March 5, 1995. The stated late date was July 9, 1995. The exact problem noted was that the transmitter output data had not been recorded as required by Step 6.1.8 of Procedure 10.24.32. Data had been recorded for the other loop components identified as a pressure indicator and a plant computer point input, but the required data for the transmitter was missing.

The inspector asked the licensee personnel who had provided the documentation how they intended to correct this deficiency. They responded that they would initiate a problem evaluation request and allow the corrective action system to identify the specific problem(s) and provide detailed specific and generic corrective action. In a later conversation with management, the inspector was informed that the transmitter output as-found and as-left data existed in other documentation but had not been transcribed to the final documentation package. The inspector believed that the method of recording calibration data

was probably a factor in this oversight. The NRC followup on the licensee's actions to resolve this item will be tracked as Inspection Followup Item 397/9514-01.

5.9 Transmitter Failure Analysis and Reporting

The licensee's program had identified potentially failing transmitters in the past. According to documentation provided, the licensee had returned six of the transmitters, which had a high potential for failure, to the vendor for verification of loss of fill-oil. Three of these were confirmed as failed or failing due to loss of fill-oil. During the current outage, a suspected transmitter was being replaced and returned to the vendor for evaluation. The vendor had not been consulted prior to the decision to replace the transmitter due to the important function of the transmitter. Recently, the licensee had requested the vendor to evaluate the trended data of a transmitter suspected of failing. The vendor determined that the transmitter was not failing and further provided information that the present rate of drift would not affect transmitter performance in the near future.

Based on the above, the licensee had a policy of returning transmitters suspected of failure to the vendor for analysis. Also, the programmatic criteria that had been developed to identify failed transmitters was conservative, and actions taken by the licensee staff related to the identification of failed or failing transmitters tended to be conservative.

6 PROMPT ONSITE RESPONSE TO EVENTS AT OPERATING POWER REACTORS (93702)

This portion of the inspection was conducted during the period May 19-23, 1995 at the Washington Nuclear Project-2 site and in the Region IV office.

6.1 Background

On May 12, 1995, the licensee's operating crew failed to maintain residual heat removal system shutdown cooling as required by Technical Specification 3.9.11.1. The specification required that shutdown cooling flow be maintained and restored in 1 hour if lost. The requirement for maintaining flow was modified to allow flow to be stopped for up to 2 hours in any 8 hour period for any reason determined to be necessary. An inspector followed up on the event to assess the licensee's initial assessment and preliminary corrective action. Following is a sequence of significant events describing what occurred during the morning of May 12, 1995:

TIME	ACTIVITY
0343	Shut off Loop A of the residual heat removal system in the shutdown cooling mode to support reactor pressure vessel inspection activities.

0518 Started Loop B of the residual heat removal system in the shutdown cooling mode.

≈0815 A message was put out in the daily outage meeting that shutdown cooling should be secured at 0930 to support more vessel inspection activity.

0845 Shift Manager returned to control room and told operators that shutdown cooling was to be secured at 0930.

≈0855 Shift Manager left the control room to perform other assigned duties.

0951 Shutdown cooling secured.

1121 Restarted Loop B of the residual heat removal system in the shutdown cooling mode.

Within minutes of restoring shutdown cooling following the second shutdown, the control room operating crew reviewed the log and determined that shutdown cooling was secured for a total of 185 minutes during the rolling 8 hour period between 0343 and 1143. This time exceeded the 2-hour limit plus the 1 hour allowance for recovery in Technical Specification 3.9.11.1. Problem Evaluation Request 295-0546 was initiated at 1125 prior to the end of the rolling 8-hour period. Additionally, licensee management immediately initiated a review in accordance with Procedure 1.1.8, "Incident Review Board," Revision 3.

6.2 Followup

The inspector reviewed documentation and interviewed personnel to evaluate the licensee's initial assessment of the event. Inservice inspection personnel were interviewed to ascertain the nature of the vessel inspection activity and verify that it was necessary to stop shutdown cooling flow. The inspector determined that contractor personnel were performing activities in accordance with General Electric Nuclear Energy Procedure ADM-WNP-2-1022V0, "WNP-2 Shroud OD Inspectability Study," Revision 0. This procedure had been approved by the licensee for the contractor to use in order to determine the accessibility for a detailed ultrasonic examination of vessel shroud peripheral welds currently scheduled for the next refueling outage. The study methodology consisted of using long handled go/no-go gages to measure access to areas of concern. A very high resolution color video camera was used to observe the available clearance as the gages were inserted into the spaces being measured. The camera was very light, tethered only by a single line and, therefore, easily affected by any flow in the annulus between the vessel and shroud. The inspector viewed video from the camera in a situation with shutdown cooling flow present, and agreed that flow stoppage was necessary to obtain the needed information.

Within a short time the licensee incident review board determined the following facts regarding the event:

- The iteration of stopping shutdown cooling for vessel inspection had been going on for several days;
- No individual or position was specifically assigned to track shutdown cooling off time;
- There was only an informal method of determining when shutdown cooling could be shut down;
- The crew, supervisor, and manager were fully aware of the Technical Specification;
- The crew was supporting several activities associated with the outage; and,
- Management oversight did not question shutdown cooling previously being secured.

The incident review board made the following recommendations:

- Clearly identify responsibility for tracking shutdown cooling off time and verifying shutdown/restart times prior to stopping;
- Establish a formal method for tracking shutdown cooling off time;
- Identify any other issues being similarly informally tracked and establish clear responsibilities (this may extend beyond operations); and,
- Planning and scheduling should schedule windows for shutdown cooling outages and other evolutions such as entering the drywell exclusion area.

Soon after the event, the licensee operations department made temporary changes to the procedure for logs and operating data requiring the shutdown cooling off time to be tracked in the control room logs. On May 19, 1995, Procedure 3.1.10, "Operating Data and Logs," Revision 4, underwent a major revision. The inspector reviewed Revision 5 of the procedure and noted that the control room log had been changed to include a sheet for logging and tracking of the residual heat removal system in the shutdown cooling mode for operating Modes 4 and 5.

The inspector concluded that the licensee's immediate action was adequate to address immediate concerns and prevent recurrence. A detailed analysis was planned to be performed in conjunction with the problem evaluation report that had been initiated in response to the event. The licensee's self-identification of the issue, initiation of prompt corrective action to prevent recurrence, and the addressing of generic implications met the requirements of Section VII.B.(1) of Appendix C to 10 CFR Part 2 for discretion. Therefore,

the violation of Washington Nuclear Project-2 Technical Specification 3.9.11.1 will not be cited.

ATTACHMENT 1

PERSONS CONTACTED AND EXIT MEETING

1 PERSONS CONTACTED

1.1. Washington Public Power Supply System

[1]D. Atkinson, Manager, Reactor/Fuel Engineering
[2]D. Becker, Supervisor, Engineering
[2]R. Barbee, Manager, System Engineering
[2]P. Bemis, Manager, Regulatory Programs
[1]P. Bentrup, Station Nuclear Engineer
[2]A. Chiang, Principal Engineer
[2]C. Foley, Licensing Engineer
[1]C. King, Acting Manager, Materials and Inspection
[1]T. Love, Manager, Chemistry
[2]J. McDonald, Manager, Technical Services
[2]T. Meade, Manager, Technical Programs
[2]M. Monopoli, Manager, Maintenance
[2]A. Moore, Acting Manager, Analytical Support
[1]J. Muth, Manager, Plant Assessments
[2]V. Parrish, Vice President, Nuclear Operations
[2]P. Powell, Licensing Engineer
[2]M. Pratt, Operations
[1]D. Ramey, In-Service Inspection Engineer
[1]M. Reddemann, Manager, Technical Services Division
[1]C. Schwarz, Manager, Operations
[1,2]J. Swailes, Plant Manager
[1]D. Swank, Manager, Licensing
[1]D. Welch, Supervisor, Non-Destructive Examination/In-Service Inspection
[2]M. Widmeyer, Supervisor, Performance Monitoring
[1]L. Woosley, Quality Assurance Engineer

1.2 Nuclear Regulatory Commission

[2]R. Barr, Senior Resident Inspector
[2]J. Dyer, Deputy Director, Division of Reactor Projects
[2]D. Proulx, Resident Inspector
[2]P. Qualls, Reactor Inspector

In addition to the personnel listed above, the inspectors contacted other personnel during this inspection period.

[1]Denotes attendance at the exit meeting on May 3, 1995.
[2]Denotes attendance at the exit meeting on May 18, 1995.

2 EXIT MEETING

An exit meeting was conducted on May 3, 1995, to discuss the findings related to in-service inspection and fuel handling. During this meeting, the inspectors reviewed the scope and findings of the report. The licensee did not express a position on the inspection findings related to in-service inspection and fuel handling documented in this report.

Another exit meeting was conducted on May 18, 1995, to discuss the findings related to Temporary Instruction 2515/122, "Evaluation of Rosemount Pressure Transmitter Performance and Licensee Enhanced Surveillance Program." The licensee did not express a position on the inspection findings related to the Rosemount pressure transmitter inspection documented in this report.

A telephonic exit was conducted on May 23, 1995, among Messrs. J. Whittemore and D. Chamberlain, of Region IV, and Mr. D. Swank, of Washington Nuclear Project-2, to discuss the followup on the stopping of the residual heat removal system while in the shutdown mode. The licensee did not express a position on the findings related to the inspection of the loss of shutdown cooling event.

The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

ATTACHMENT 2

DATA REQUIRED BY TEMPORARY INSTRUCTION 2515/122

PERFORMANCE SURVEY FOR ROSEMOUNT MODEL 1151, 1152, AND 1153A TRANSMITTERS IN ACCORDANCE WITH TI 2515/122, ENCLOSURE 1.

Based on a review of licensee records, the following general information on Model 1151, 1152, and 1153A, transmitters in safety-related (non-pressure boundary application) is provided:

1. Total number of transmitters currently installed..... 11

2. Total number of transmitters installed as of January 1991..... 11

For those Model 1151, 1152, and 1153A transmitters that show symptoms of oil loss based on the trending results, provide the following information:

3. Total number of transmitters that exhibit loss of fill-oil symptoms.. 0

4. Total number of transmitters (identified by licensee or inspector) that exhibit loss of fill-oil symptoms which were not previously identified by the licensee..... 0

5. Total number of transmitters identified above in Item 3 which were also confirmed by Rosemount as loss of fill-oil.....0

PERFORMANCE SURVEY FOR ROSEMOUNT MODEL 1153B/D AND 1154 POST-JULY 11, 1989 MANUFACTURED TRANSMITTERS IN ACCORDANCE WITH TI 2515/122, ENCLOSURE 2.

Based on a review of licensee records, the following general information on Model 1153B, 1153D, and 1154, post-July 11, 1989, manufactured transmitters in safety-related (non-pressure boundary applications) is provided:

1. Total number of 1153B/D transmitters currently installed..... 10

   Total number of 1154 transmitters currently installed 0

2. Total number of transmitters installed as of January 1991..... 2

For those Model 1153 and 1154 transmitters manufactured after July 11, 1989, that show symptoms of oil loss based on the trending results, provide the following information:

3. Total number of transmitters that exhibit loss of fill-oil symptoms.. 0

4. Total number of transmitters that exhibit loss of fill-oil symptoms which were not previously identified by the licensee..... 0

5. Total number of transmitters identified above in Item 3 which were also confirmed by Rosemount as loss of fill-oil..... 0