ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	50-397
License No.:	NPF-21
Report No.:	50-397/99-10
Licensee:	Energy Northwest
Facility:	Washington Nuclear Project-2
Location:	Richland, Washington
Dates:	September 5 through October 16, 1999
Inspectors:	G. D. Replogle, Senior Resident Inspector G. A. Pick, Senior Project Engineer P. A. Goldberg, Reactor Inspector
Approved By:	Linda Joy Smith, Chief Project Branch E Division of Reactor Projects

ATTACHMENT: Supplemental Information

EXECUTIVE SUMMARY

Washington Nuclear Project-2
NRC Inspection Report No. 50-397/99-10

This information covers a 6-week period of resident inspection.

Operations

- Operators conducted themselves in a professional and safety conscious manner. Operators demonstrated good coordination and control of the plant shutdown. Operators were consistently knowledgeable of important plant issues and, in most instances, properly anticipated plant operations. The inspectors found systems properly aligned for the plant conditions (Sections O1.1 and O2.1).

- Operators did not meet licensee expectations with respect to reactor water level control on one occasion during the shutdown. Shortly after the planned reactor scram, operators entered the emergency operating procedures, as expected, on low vessel level. After operators initiated the reactor core isolation cooling system, they did not maintain reactor water level lower than the system trip setpoint, which was part of the emergency operating procedure recommended band (Section O1.2).

- Operators performed error free fuel movements for the third consecutive refueling outage, which demonstrated sustained superior refueling performance (Section O1.3).

Maintenance

- The inspectors identified a violation of Technical Specification 5.4.1.a in that electricians failed to follow procedures and opened the breaker to the wrong valve. The breaker de-energized the low pressure core spray system minimum flow valve, which rendered the system inoperable. Operators identified the problem and restored the low pressure core spray valve to service within 10 minutes. This Severity Level IV violation is being treated as a noncited violation, consistent with Appendix C of the NRC Enforcement Policy. The problem is in the licensee's corrective action program as Problem Evaluation Request 299-1903 (Section M1.2).

- Management response to the inadvertent de-energization of an electrical bus was excellent. No consequences resulted because of the loss of the electrical bus that occurred when an electrician opened an incorrect electrical cabinet door. Management recognized that, had the mistake occurred when the Division III diesel generator was required to be operable, an emergency safety features actuation would have occurred. Consequently, management utilized the occurrence to reinforce important attention-to-detail concepts with the staff (Section M1.3).

- Overall, the licensee managed the outage well, and work reflected an appropriate focus on safety. The licensee addressed and dispositioned emergent issues, such as fuel bundle assembly problems and unexpected loss-of-fill alarms during reactor core isolation cooling system operation, in a thorough and effective manner (Section M8.1).

Engineering

- Engineers performed a thorough evaluation of an unexpected reactor core isolation cooling system loss-of-fill annunciator. The annunciator alarmed after the system automatically secured on high reactor water level. Engineers determined that the system remained full, but the pressure was less than expected because of known system out-leakage through a lube oil cooler. Short-term corrective measures were acceptable (Section E2.1).

- Engineers effectively evaluated improperly assembled fuel bundles. Licensee contractors identified that the vendor had assembled at least three fuel bundles 90 degrees from the correct configuration. Approximately 25 percent of the core was potentially susceptible to the problem. Plant and vendor engineers successfully demonstrated that the existing core analysis remained conservative assuming the worst-case bundle arrangement (Section E2.2).

Plant Support

- While most systems were in good material condition, the inspectors identified poor painting and preservation of some standby service water system valves (e.g., valves in the residual heat exchanger rooms) (Section O2.1).

- During routine plant tours, the inspectors verified that the licensee properly maintained emergency preparedness facilities and found on-shift staffing consistent with the Emergency Plan (Section P2.1).

- During routine tours, the inspectors observed no problems with protected area illumination levels, maintenance of the isolation zones around protective area barriers, controls associated with de-vitalization of the Division III diesel generator room, and the status of security power supply equipment (Section S2.1).

Report Details

Summary of Plant Status

At the beginning of the inspection period, the plant operated at 78 percent power. Power gradually coasted down to 73 percent on September 18, when operators shut down the plant to begin Refueling Outage R14.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

Operators were knowledgeable of important plant parameters and problems and appropriately focused on safety. For the most part, operators conducted the shutdown in a thorough and methodical manner.

O1.2 Poor Reactor Level Control During Reactor Core Isolation Cooling System Operation

a. Inspection Scope (71707)

The reactor core isolation cooling system was placed into service on September 18, but tripped on high reactor vessel level shortly thereafter. The inspectors reviewed the details surrounding this unexpected occurrence after noting the issue during the review of operator logs.

b. Observations and Findings

The inspectors observed that operators did not meet licensee expectations with respect to reactor water level control on one occasion during the shutdown. After the planned reactor scram, operators entered the emergency operating procedures, as expected, on low vessel level. Operators then initiated the reactor core isolation cooling system to maintain reactor vessel inventory. Since the operators remained in the emergency operating procedures, they were expected to maintain vessel level from +13 inches (reactor scram setpoint) to +54 inches. Contrary to the expectations, operators failed to take positive control of the reactor core isolation cooling system operation and the system tripped at +54.5 inches (automatic reactor core isolation cooling trip setpoint).

The licensee stated that the level increased faster than expected because of low decay heat, rapid quenching of the steam by the reactor core isolation cooling system, and level swell caused by rapid pressure changes. Nonetheless, since the approximate decay heat level and other normal plant responses were known, operators did not properly anticipate plant response prior to initiating the reactor core isolation cooling system.

c. Conclusions

Operators did not meet licensee expectations with respect to reactor water level control on one occasion during the shutdown. Shortly after the planned reactor scram,

operators entered the emergency operating procedures, as expected, on low vessel level. After operators initiated the reactor core isolation cooling system, they did not maintain reactor water level lower than the system trip setpoint which was part of the emergency operating procedure recommended band.

O1.3 Refueling Operations

a. Inspection Scope (71707)

The inspectors monitored refueling operations.

b. Observations and Findings

Fuel movements were accomplished in a systematic and error-free manner. This was the third consecutive refueling outage with error-free refueling operations, which demonstrated sustained superior refueling performance.

O2 Operational Status of Facilities and Equipment

O2.1 Engineered Safety Feature System Walkdowns

a. Inspection Scope (71707, 71750)

The inspectors walked down accessible portions of the following safety-related systems:

- High pressure core spray
- Low pressure core spray
- Residual heat removal, Trains A, B, and C
- Reactor core isolation cooling
- Division I, II, and III emergency diesel generators
- Standby gas treatment system, Trains A and B
- Standby liquid control system
- Standby service water system, Trains A, B, and C

b. Observations and Findings

The inspectors found the systems properly aligned for the plant conditions and generally in good material condition. The inspectors identified that painting and preservation of some standby service water system valves was poor. Service water system valves in the residual heat removal system heat exchanger rooms were unusually corroded, when compared to components in other areas of the plant.

II. MAINTENANCE

M1 Conduct of Maintenance

M1.1 General Comments - Maintenance

a. Inspection Scope (61726, 62707)

The inspectors inspected the following maintenance and surveillance activities:

- Work Order OOBC6 - high pressure core spray system electrical panel modification
- Reactor core isolation cooling keepfill system troubleshooting (event-related review)
- Procedure ISP-EFC-B108, "Excess Flow Check Valve Test of Containment Atmosphere and Suppression Pool Level Instrument Sensing Lines," Revision 3
- Procedure TSP-CONT-R801, "Containment Isolation Valve and Penetration Leak Test Program," Revision 2
- Procedure ESP-MOV-GRP2, "MOV Thermal Overload Group 2," Revision 1 (event-related review)
- Bus SM-3 troubleshooting plan (event-related review)

b. Observations and Findings

Maintenance and surveillances were generally conducted in a thorough and professional manner utilizing three-way communications. The inadvertent de-energization of Valve LPCS-V-11, low pressure core spray system minimum flow valve, is discussed in Section M1.2. The inadvertent de-energization of the Division II bus is discussed in Section M1.3. A problem with the reactor core isolation cooling keepfill system is discussed in Section E2.1.

M1.2 Inadvertent Loss of Low Pressure Core Spray Valve LPCS-V-11

a. Inspection Scope (62707)

On September 21, 1999, an electrician inappropriately opened the breaker to Valve LPCS-V-11 that was required to be operable. The inspectors reviewed the event circumstances.

b. Observations and Findings

During motor-operated valve testing, an electrician erroneously opened the feeder breaker to Valve LPCS-V-11, which de-energized the valve and rendered the system

inoperable. Operators responded well and repositioned the affected breaker within 10 minutes of the misoperation. The licensee initiated an incident review board.

The incident review board found that the electrician had accidentally referenced an inappropriate document when performing the work. The work package required the electrician to open the valve breaker identified on a specific page in the work package itself. Instead, the electrician referenced the same page number in a related procedure, which specified working on Valve LPCS-V-11. Nonetheless, the electrician was briefed on protected status of the low pressure core spray system earlier in the shift and should have known not to work on Valve LPCS-V-11. The failure to perform work specified by the work package was a violation of Technical Specification 5.4.1.a. This requirement, in part, specifies that maintenance procedures be properly implemented. This Severity Level IV violation example is being treated as a noncited violation, consistent with Appendix C of the NRC Enforcement Policy. The problem is in the licensee's corrective action program as Problem Evaluation Request 299-1903 (50-397/99010-01).

As corrective measures, the licensee reinforced attention-to-detail concepts and briefed the event to all maintenance crews. Additionally, the licensee conspicuously posted the protected systems in several plant locations. The inspectors found the corrective measures acceptable.

c. Conclusions

The inspectors identified a violation of Technical Specification 5.4.1.a in that electricians failed to follow procedures and opened the breaker to the wrong valve. The low pressure core spray system minimum flow valve was de-energized, which rendered the system inoperable. Operators identified the problem and restored the low pressure core spray valve to service within 10 minutes. This Severity Level IV violation is being treated as a noncited violation, consistent with Appendix C of the NRC Enforcement Policy. The problem is in the licensee's corrective action program as Problem Evaluation Request 299-1903.

M1.3 Inadvertent Loss of Nonsafety-Related Bus SM-2

a. Inspection Scope (62707, 61726)

On October 13, electricians did not follow work instructions and inappropriately opened a panel on Bus SM-3. A panel safety feature de-energized all the components in the panel, which ultimately resulted in the loss of power to Bus SM-2. The inspectors observed the site management response to the event.

b. Observations and Findings

Buses SM-2 and SM-3 are nonsafety-related electrical buses that power loads such as circulating water pumps and other nonsafety components that are normally needed at power. The buses also feed safety-related Buses SM-8 (Division II, fed from SM-3) and SM-4 (Division III, fed from SM-2).

The work required electricians to view a misaligned SM-3 grounding bar that prevented cabinet closure. The feeder breaker to Bus SM-3 (S3) was open at the time. Since part of the grounding bar was not easily accessible, the electricians needed to open another panel below the grounding bar. The electricians failed to heed a warning statement cautioning against opening the panel because they thought the statement no longer applied. The electricians failed to realize that there was still power to the line side of the breaker, where some undervoltage control circuits still received power. When the panel was opened, power was lost to undervoltage control circuits associated with the SM-2 and SM-3 buses. The SM-2 feeder breaker (S2) subsequently tripped and extinguished local area lighting. No significant consequences resulted because no major SM-2 or SM-3 components were needed. Since the misoperated components were not safety-related, no violation of NRC requirements occurred.

The inspectors considered the management response to be excellent. Plant management recognized that, had the problem occurred at a different time, an emergency safety features actuation would have occurred. Normally, a loss of Bus SM-2 would result in the autostart of the Division III diesel generator, but the diesel generator was out of service. This type of event, with no actual safety consequences, could have easily been ignored. Instead, management utilized the event to refocus the site on attention-to-detail concepts and the importance of a questioning attitude. Refocusing the staff in this manner was effective at precluding more significant human performance errors. No additional human performance errors were experienced during the remainder of the inspection period.

c. Conclusion

Management response to the inadvertent de-energization of an electrical bus was excellent. There were no consequences to the loss of the electrical bus that resulted when an electrician opened an incorrect electrical cabinet door. Management recognized that, had the mistake occurred when the Division III diesel generator was required to be operable, an emergency safety features actuation would have occurred. Consequently, management utilized the occurrence to reinforce important attention-to-detail concepts with the staff.

M8 Miscellaneous Maintenance Issues

M8.1 Outage Management and Control (62707)

Overall, the licensee managed the outage well, and work reflected an appropriate focus on safety. The outage progressed essentially on schedule and the licensee maintained appropriate resources. Accordingly, the licensee addressed and dispositioned emergent issues, such as fuel bundle assembly problems and unexpected loss-of-fill alarms during reactor core isolation cooling system operation, in a thorough and effective manner.

III. ENGINEERING

E2 Engineering Support of Facilities and Equipment

E2.1 Unexpected Reactor Core Isolation Cooling System Operation

a. Inspection Scope (37551)

On September 18, 1999, the reactor core isolation cooling system isolated on high reactor vessel level. Following the isolation, the loss-of-fill annunciator alarmed, which was unexpected. The inspectors reviewed the engineering work associated with troubleshooting and correcting this problem.

b. Observations and Findings

In response to the annunciator, operators secured the reactor core isolation cooling system and filled and vented the discharge piping. Loss of fill was a concern because a water hammer could cause significant damage to the system. In lieu of the reactor core isolation cooling system, operators utilized the condensate system for reactor vessel makeup for the remainder of the shutdown.

Engineering later determined that the system had not lost fill; however, system pressure had dropped to just below the alarm setpoint but remained a few pounds greater than the point for onset of voiding. The engineers performed additional testing and determined that the pressure loss resulted from an existing leakage pathway. When the system starts, a valve to the lube oil cooler opens. At reactor vessel high level when the system secures, the valve remains open, which diverted sufficient flow to decrease pressure and actuate the loss-of-fill annunciator. Overall, the inspectors determined that engineers performed a thorough evaluation.

As a corrective measure, the licensee revised the alarm response procedures to instruct operators to close the lube oil cooler valve when the loss-of-fill annunciator alarms. However, the inspectors observed that the procedure change constituted an operator workaround. The system cycles on and off many times during the course of an event, and the annunciator might alarm each time the system cycles off. As such, operators might have to take manual action to close the lube oil cooling valve several times. The licensee acknowledged the comment and indicated that longer-term corrective actions may address this concern.

c. Conclusions

Engineers performed a thorough evaluation of an unexpected reactor core isolation cooling system loss-of-fill annunciator. The annunciator alarmed after the system automatically secured on high reactor water level. Engineers determined that the system remained full, but the pressure was less than expected because of known system out-leakage through a lube oil cooler. Short-term corrective measures were acceptable.

E2.2 Misassembled Fuel Bundles

a. Inspection Scope (37551)

During fuel cladding inspections, contractors identified that one first burn fuel bundle had been assembled 90 degrees from the proper orientation. The inspectors evaluated the engineering response to the problem.

b. Observations and Findings

The licensee inspected a total of 8 first-burn fuel bundles and 10 new fuel bundles manufactured at the ABB (Asea Brown Bovari) Hematite facility. The licensee found additional assembly problems with two new fuel bundles, and properly reassembled them prior to use. All of the misoriented bundles were manufactured at the same time. ABB operates under its own NRC-approved quality assurance program.

The licensee determined that approximately 280 fuel bundles, including new, first-burn, and second-burn fuel, were potentially susceptible to the assembly problem. This was the total population of fuel assembled at the ABB Hematite facility.

While the fuel itself is symmetrically loaded in each fuel bundle, the burnable poisons are not. The bundle rotation interchanged the location of two 1-percent and two 4-percent poison rods. The licensee performed an analysis, assuming worst-case bundle locations and multiple bundle misorientations and determined that: (1) the problem resulted in a negligible impact on the existing thermal limit analysis and (2) the existing Core Operating Limits Reports for Cycles 13, 14, and 15 remained conservative and valid. Using a similar analysis, ABB came to the same conclusions. Therefore, the licensee determined that no additional fuel inspections to look for this specific problem would be performed. The inspectors found the analysis and conclusions to be acceptable.

c. Conclusions

Engineers effectively evaluated improperly assembled fuel bundles. Licensee contractors identified that the vendor had assembled at least three fuel bundles 90 degrees from the correct configuration. Approximately 25 percent of the core was potentially susceptible to the problem. Plant and vendor engineers successfully demonstrated that the existing core analysis remained conservative assuming the worst-case bundle arrangement.

E8 Miscellaneous Engineering Issues (92903)

E8.1 (Closed) Inspection Followup Item 50-397/98023-01: Kaowool fire seal not installed in accordance with design.

The NRC identified that the Kaowool barrier material installed in Penetration X099 was not adequately packed and did not did not conform to the penetration design. Licensee Drawing KW-1, Revision 0, specified that the Kaowool should be adequately compressed in the opening.

The inspectors reviewed Problem Evaluation Request 298-2023, dated December 16, 1998, which addressed the problem. The corrective actions included: (1) reworking the penetration; (2) performing an inspection of the accessible, similar penetrations; (3) reworking seals; and (4) revising procedures to provide clear inspection criteria. The inspectors verified that the corrective actions were complete and found the measures to be acceptable.

The inspectors determined that the improper installation of the Kaowool did not constitute a violation of NRC requirements. In the Final Safety Analysis Report, the licensee had only committed to provide a seal capable of radiant protection from fires in the reactor building. The Kaowool was not a rated fire barrier. The as-found Kaowool penetration met the licensee's commitments to the NRC.

E8.2 (Closed) Unresolved Item 50-397/99007-03: Missing ABB fuel pin compression springs.

After the licensee identified two fuel bundles with missing springs, the inspectors opened this item pending further analysis of the as-found condition. The licensee was concerned that other fuel bundles in the core might be missing springs.

The springs, located at the top of each fuel pin, hold the fuel pins in place during shipping, while horizontal to prevent damage, and plant operations. The licensee worked with ABB and determined that the issue was not a safety concern. A secondary purpose is to maintain the fuel pins in their seats during operations. However, the licensee and ABB determined that the weight of each pin would maintain the pins secured under worst case flow conditions. Finally, the springs hold the upper tie plate in place; however, because of the small force requirements, most springs could be missing without experiencing a problem. The evaluation was acceptable.

IV. Plant Support

P2 Status of Emergency Preparedness Facilities, Equipment, and Resources

P2.1 General Comments (71750)

During routine plant tours, the inspectors verified that the emergency preparedness facilities were properly maintained and that the licensee maintained at least the minimum staffing required by their Emergency Plan. No problems were found.

S2 Status of Security Facilities and Equipment

S2.1 General Comments (71750)

During routine tours, the inspectors observed protected area illumination levels, maintenance of the isolation zones around protective area barriers, and the status of security power supply equipment. Additionally, the inspectors verified that the devitalization of the Division III diesel generator room was properly controlled. No problems were observed.

V. MANAGEMENT MEETINGS

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management on October 19, 1999. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

J. V. Parrish, Chief Executive Officer
D. K. Atkinson, Engineering Manager
I. M. Borland, Radiation Protection Manager
S. A. Boynton, Quality Assurance Manager
J. W. Dabney, Outage Manager
P. J. Inserra, Licensing Manager
D. W. Martin, Security Manager
W. S. Oxenford, Operations Manager
D. J. Poirier, Maintenance Manager
G. O. Smith, Vice President - Generation/Nuclear Plant General Manager
R. L. Webring, Vice President - Operations Support

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observations
IP 62707:	Maintenance Observations
IP 71707:	Plant Operations
IP 71750:	Plant Support
IP 92903:	Engineering Followup

ITEMS OPENED AND CLOSED

Opened and Closed

50-397/99010-01	NCV	Low pressure core spray system rendered inoperable because of failure to follow procedure (Section M1.2)

Closed

50-397/98023-01	IFI	Kaowool not installed per design (Section E8.1)
50-397/99007-03	URI	Missing fuel pin compression springs (Section E8.2)

LIST OF ACRONYMS USED

ABB	Asea Brown Bovari
CFR	Code of Federal Regulations
IFI	inspection followup item
NCV	noncited violation
NRC	U. S. Nuclear Regulatory Commission
PDR	public document room
URI	unresolved item
WNP-2	Washington Nuclear Project-2