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SUBJECT: Responds to Generic Ltr 89-13, "Svc Water Sys Problems Affecting Safety-Related Equipment."

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February 5, 1990
G02-90-017

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Docket No. 50-397

J. B. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Dear Mr. Martin:

Subject: NUCLEAR PLANT NO. 2, OPERATING LICENSE NPF-21
RESPONSE TO GENERIC LETTER 89-13, SERVICE WATER
SYSTEM PROBLEMS AFFECTING SAFETY-RELATED EQUIPMENT

Reference: 1) Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment", dated July 18, 1989

2) Letter, G02-089-205, GC Sorensen (SS) to NRC same subject, dated November 9, 1989

Summary

Reference 1 was received by the Supply System on August 2, 1989. It requested each licensee to advise the NRC whether it has established programs to implement Recommendations I - V of the generic letter or that it has pursued an equally effective alternative course of action. A 180 day response was to be submitted. This letter provides that response. The Supply System's response is to establish programs to implement the five recommendations, but within these basic recommendations some alternative approaches are planned. Where this is the case, the alternative approaches are clearly described. To aid in the review of this response a summary description of the WNP-2 standby service water system is also provided.

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System Description/Background

WNP-2's safety related service water system is called "Standby Service Water" (it is completely independent from WNP-2's non-safety related service water system referred to as "Plant Service Water"). The Standby Service Water system consists of two 100 percent redundant loops. Each loop consists of the spray ponds (A and B), a single pump (1A or 1B), and piping supplying the associated residual heat removal system heat exchanger, standby diesel generator, essential HVAC coolers, RHR pump mechanical seal coolers, LPCS pump motor upper bearing oil cooler, sample coolers, and post LOCA hydrogen recombiner aftercoolers. Each of the loops is completely independent. However they share the same spray ponds as a source of water. All loads supplied by a loop are normally aligned to receive Standby Service Water cooling whenever the respective service water pump is running. Standby Service Water pumps can be started manually, and they also automatically start whenever either the supplied emergency diesel generator is started or when any supplied ECCS system requiring cooling is started.

Additionally, one ECCS system at WNP-2 has its own cooling water system, "HPCS Service Water." This system consists of a third independent loop containing its own pump which supplies the high pressure core spray (HPCS) diesel generator and essential HVAC units provided for that generator and the HPCS Pump itself. The source of cooling water is service water pond "A." The HPCS service water pump can be started manually, and it will automatically start if either the HPCS emergency diesel generator is started or when the HPCS pump is started. As with the Standby Service Water loops, all HPCS service water supplied loads are normally aligned to receive cooling whenever the HPCS service water pump is running.

The two concrete lined spray ponds that serve as the ultimate heat sink have a capacity of 12,620,000 gallons of water and contain redundant piping and spray facilities. A syphon between the ponds allows for water flow from one pond to the other. The ponds are replenished by a non-seismic I makeup system that takes water directly from the Columbia River. Pond water is treated with a chemical to control corrosion. It also possesses dispersant capabilities to minimize the potential for any corrosion products to settle and solidify in the system piping or components.

Standby Service Water piping is primarily carbon steel. Protective coatings on the inner piping walls are not utilized anywhere in the system.

The Standby Service Water system and HPCS service water system have been relatively trouble free systems. The fouling of service water heat exchangers has not evidenced itself as a particular problem. Prior to the spring 1989 refueling outage (R4), no service water heat exchanger had ever been opened because of a flow or heat exchange deficiency. During R4, three Standby Service Water heat exchangers were examined as representative examples to determine and document the conditions that existed after approximately five years of service with no corrective maintenance. This was done to support a conceptual study of the potential use of biological control measures and also help assess WNP-2's needs relative to the anticipated release of the generic letter. The "A" RHR heat exchanger (RHR-HX-1A), the "B" hydrogen recombiner aftercooler (CAC-EV-1B), and the 1A2 emergency diesel generator jacket water heat exchanger (DCW-HX-1A2) were opened, visually inspected, and tubes were eddy current tested. The inspections revealed that the heat exchangers were in good condition. No tube degradation was uncovered by the eddy current testing, and none of the tubes in all three heat exchangers were found blocked with debris.

Program to Meet the Requirements of the Generic Letter

The generic letter delineates five "recommended actions" to be taken. WNP-2 has studied the requirements of the letter as it applies to the safety related service water systems at WNP-2 and has determined a set of actions to be taken to meet those requirements. The planned actions are presented below under headings that paraphrase each of the generic letter's requirements (they are also listed in the order that the "recommended actions" of the generic letter appear.)

I. Implement and Maintain an Ongoing Program of Surveillance and Control Techniques to Significantly Reduce the Incidence of Flow Blockage Problems as a Result of Biofouling.

1. WNP-2 will annually inspect the service water spray ponds for macroscopic biological fouling organisms in addition to the annual inspections that are already being performed on the Standby Service Water pump intake screens and at the Columbia River intake structure for the plant's makeup water. Any fouling accumulations will be removed.

2. WNP-2 will complete a conceptual study by September, 1990 to determine what, if any, biological control agent(s) will be used to treat the service water pond water. Should physical hardware changes/additions to the plant be required, we will provide a schedule for these modifications by November 1990. Should the recommended course of action be merely a batch-add type of treatment requiring no new hardware or changes to be installed, WNP-2 will initiate the treatment by June 30, 1992, assuming that no problems occur in obtaining Washington State EPA approval.

3. WNP-2 will continue to perform periodic flow balancing of each of the service water loops for technical specification operability verifications. This will assure that macrofouling will be detected if it occurs in any of the loads. As noted in the introduction section to this response, there are no infrequently used service water loops or loads as all supplied loads receive flow whenever a service water pump is actively pumping water.

4. WNP-2 will sample annually the spray pond water and sediment for the presence of the Asiatic Clam.

Although the spray pond water is not totally devoid of biological life (algae blooms routinely occur and water insects inhabit the pond), the ponds are relatively inactive from a biological standpoint. No load serviced by any of the service water loops has ever been fouled by any type of biological organisms. As previously discussed, inspections made of selected heat exchangers during the R4 refueling outage to support conceptual work determined that biological fouling is not currently a significant threat. Eddy current testing of those same heat exchangers revealed no tube damage, confirming that microbial induced corrosion is not a problem. Although the Asiatic Clam is known to live in the Columbia River and Asiatic Clam shells have been found in the circulating water system, no evidence of it has ever been found in either service water spray pond or in any Standby Service Water component or piping at WNP-2. The ponds have been inspected annually to monitor spray ring structure corrosion rates, and no clam shells have been seen in the debris (wind blown sand) on the pond floor. The spray pond floors were vacuumed in the Spring of 1989, and a search through the vacuumed material did not uncover any clam shells. It appears that either the clam larvae have yet to be introduced to the spray ponds, or the pond and system environment is not conducive to supporting a clam population.

In attempting to preclude a potential problem that for WNP-2 has not manifested itself as a significant threat, WNP-2 is concerned that through the use of additional biocides, a significant corrosion problem could be inadvertently introduced. The majority of possible control agents cause some amount of corrosion in metals and use of such agents is a compromise between biological and corrosion control. Because plant history and the last outage's physical inspections have shown that biological fouling organisms are not a significant threat, WNP-2 plans to proceed carefully in the introduction of any biocontrolling agents to the pond water.

II. Conduct a Test Program to Verify the Heat Transfer Capability of All Safety Related Heat Exchangers Cooled by Service Water.

1. WNP-2 will monitor and record cooling water flow and inlet and outlet temperatures for all affected heat exchangers during the modes of operation in which cooling water is flowing through the heat exchangers. The data collection will be performed as special test procedures, one for each of the two loops of service water and also one for HPCS service water. The tests will take the data in the flow balanced condition such that all the loads will be tested with design flow present. Initial testing will be completed by the end of outage R5 (June 1990). The tests will then be performed annually over the next three refueling cycles. Depending upon the trends observed, the periodicity of testing will be revised accordingly.

   Additionally, concurrent with the testing described immediately above, WNP-2 will measure, record, and trend differential pressure across each of the heat exchangers to ensure that tube fouling that could be masked by the capacity of the manual flow throttle valves used for flow balancing each of the loads is not occurring undetected.

2. For the water-to-water heat exchangers that can be thermally loaded through system operation, WNP-2 will conduct additional thermal performance tests. The results will be recorded and trended. Specifically, these are the residual heat removal (RHR) heat exchangers (RHR-HX-1A and RHR-HX-1B) and the emergency diesel generators jacket water heat exchangers (DCW-HX-1A1, DCW-HX-1A2, DCW-HX-1B1, DCW-HX-1B2, and DCW-HX-1C.) Initial testing will be completed by the end of Spring 1990 R5 refueling outage. The tests then will be performed annually over the next three refueling cycles. Depending upon the trends observed, the periodicity of testing will be revised accordingly.

Additionally, for these large water-to-water heat exchangers whose designs allow for access to the heat exchanger tubing, WNP-2 will open, inspect, clean, and eddy-current test the service water side of each of these heat exchangers on a regularly scheduled basis as preventive maintenance. This will also help to correlate the performance test results to actual physical tube conditions.

The small water-to-water heat exchangers that cannot be thermally tested through system operation will either be differential pressure tested as per section II.1 above or will be functionally tested per an existing technical specification surveillance. Specifically, the mechanical seal coolers for RHR pumps 2A and 2B will be differential pressure tested. The post accident sample coolers will be functionally tested per their quarterly surveillance where hot samples are drawn and service water cooling flow verified.

Although the fuel pool cooling heat exchangers (FPC-HX-1A and FPC-HX-1B) can be aligned to be cooled by the Standby Service Water System as a back up source of cooling water, they are normally cooled by the Reactor Closed Cooling Water System, a closed loop system containing water of relatively high purity. As such, the fuel pool cooling heat exchangers will not be included within the scope of the testing required to meet the requirements of the generic letter.

3. For the air-to-water heat exchangers (HVAC cooling coils), in addition to the testing performed in section II.1 above, WNP-2 will measure, record, and trend fan differential pressures (indicative of air flow). Initial testing will be completed by the end of outage R5. The tests will then be performed annually over the next three refueling cycles. Depending upon the trends observed, the periodicity of testing will be revised accordingly.

   Additionally, in lieu of precise thermal performance testing, WNP-2 will perform annual preventive maintenance inspections on the air side of <u>all</u> the air-to-water cooling coils to ensure the coil fins are clean and clear.

   The differential temperatures across both the air and water sides of these coils during normal operation are so small that errors in instrumentation accuracy make the acquisition of statistically significant test data virtually impossible.

4. The actions to be taken for the types of heat exchangers not addressed above are as follows:

A. Hydrogen Recombiner Aftercoolers (CAC-EV-1A and CAC-EV-1B):

In addition to the testing to be performed per section II.1 above, WNP-2 will inspect, clean, and eddy-current test the Standby Service Water side of these heat exchangers on a regularly scheduled basis in lieu of thermal performance testing.

The hydrogen recombiner aftercoolers are designed to cool the hot gases leaving hydrogen recombiner chamber before those gases are returned to the primary containment. The only time this actually would occur is if there were hydrogen gas present in primary containment as a result of post-LOCA zirconium hydriding of the fuel cladding. Consequently, meaningful thermal testing is not feasible. However, the scheduled inspections, in conjunction with the testing of section II.1, will provide adequate assurance that the heat exchangers can perform their function.

B. Control Room Chiller Condensers (CCH-CU-1A and CCH-CU-1B):

In addition to the testing to be performed per section II.1 above, WNP-2 will inspect, clean, and eddy-current test the Standby Service Water side of these heat exchangers on a regularly scheduled basis in lieu of thermal performance testing. WNP-2 will also continue to perform the operational surveillances that verify the unit properly loads and operates (a functional verification that the heat removal capability of the chiller condenser is adequate to support chiller operation.)

The control room chillers are hermetically sealed centrifugal air conditioning units that contain a condenser, an evaporator, and a variable pitch vaned compressor which constantly responds to its load. The refrigerant that the condenser cools in turn cools another chilled water loop via the evaporator. Thermal performance testing of the chiller condenser would require accurately determining the efficiency of the centrifugal unit itself, which in practice is extremely difficult. Given the inaccuracies of the test equipment and the inherent errors in the determination of machine efficiency, statistically significant test data acquisition is not possible. However, the scheduled inspections, in conjunction with the testing of section II.1, will provide adequate assurance that the heat exchangers can perform their function.

C. Low Pressure Core Spray Pump Upper Bearing Oil Cooler:

In addition to the testing to be performed per section II.1 above, WNP-2 will monitor, record and trend the upper bearing temperatures of the low pressure core spray pump (LPCS-P-1) during operation of the pump under rated load (i.e. full flow) conditions. This pump is also frequently tested for technical specification operability surveillances as well as for ASME Section XI IST requirements. Degradation of the oil cooler that would preclude it from performing its design function would be detected by the above testing and surveillances.

The LPCS-P-1 upper bearing oil cooler consists of a helically wound coil that sits emersed in the pump motor upper bearing oil bath. Although thermal performance testing is not practical with this arrangement, adequate heat exchanger performance can be inferred through pump motor performance.

D. Service Water Pump Upper Bearing Motor Coolers:

WNP-2 will monitor, record and trend the upper bearing temperatures of both of the service water pumps (SW-P-1A and SW-P-1B) during operation of the pumps under rated load conditions. These pumps are also frequently tested for technical specification operability surveillances as well as for ASME Section XI IST requirements. Degradation of the oil coolers that would preclude them from performing their design function would be detected by this monitoring and the surveillances.

The service water pump upper bearing oil coolers consist of a helically wound coil that sits emersed in each of the pump motor upper bearing oil baths. Although thermal performance testing is not practical with this arrangement, adequate heat exchanger performance can be inferred through pump motor performance.

III. Ensure by Establishing a Routine Inspection and Maintenance Program for Service Water System Piping and Components that Corrosion, Erosion, Protective Coating Failure, Silting, and Biofouling Cannot Degrade the Performance of Safety Related Systems Supplied by Service Water.

1. WNP-2 will, on a regularly scheduled basis, open, inspect, clean, and eddy-current test as preventive maintenance the service water side of all service water heat exchangers whose tubes are accessible by heat exchanger design. Specifically, these heat exchangers with such accessibility are the RHR heat exchangers (RHR-HX-1A and RHR-HX-1B), the emergency diesel generator jacket water heat exchangers (DCW-HX-1A1, DCW-HX-1A2, DCW-HX-1B1, DCW-HX-1B2, and DCW-HX-1C), the hydrogen recombiner aftercoolers (CAC-EV-1A and CAC-EV-1B), and the control room chillers (CCH-CU-1A and CCH-CU-1B). As noted in section II above, some of these routine inspections will be utilized in lieu of thermal performance testing where thermal performance testing is not practical.

2. WNP-2 will perform annual preventive maintenance inspections on the air side of all the air-to-water service water cooling coils to ensure the coil fins are clean and clear.

3. Where the testing outlined in section II above indicates that corrective maintenance is necessary to restore adequate heat exchanger performance, WNP-2 will clean or replace the affected heat exchangers via maintenance work request (MWR).

4. WNP-2 will install a corrosion coupon monitoring system to assess the conditions present in service water system piping and components. This monitoring system will subject coupons representative of the materials present in the service water system to service water flow whenever the service water pumps are running. Corrosion and fouling of the coupons will be monitored, and the information utilized to adjust chemistry control of the water as necessary. This system will be installed in the plant by the end of the spring refueling outage of 1991, R6.

5. Service water piping is currently included in the ASME Section XI ISI program. No additional piping inspections are planned to meet the requirements of the subject generic letter as plant history has not shown service water piping blockage or pipe wall thinning to be a generic problem. The periodic system flow balancing that is performed for technical specification surveillances will detect piping blockages should they occur. Should either the surveillances or the ISI program indicate that corrective maintenance is necessary, such work would be accomplished via maintenance work request (MWR).

The scheduled inspections and cleaning of accessible heat exchangers and corrective maintenance when the monitoring of flows and differential pressures indicate that fouling is occurring should preclude system degradation fouling, either by silt or biological organisms. The heat exchanger inspections in conjunction with the ISI program should adequately identify system degradation. As stated previously, protective coatings on the inner piping walls are not utilized anywhere in the system and so are not an issue.

IV. Confirm that the Service Water System Will Perform its Intended Function in Accordance with the Licensing Basis of the Plant.

WNP-2 will include this confirmation as part of a Safety Systems Functional Inspection (SSFI) on the entire service water system. In view of the importance that has been assigned service water performance, the service water SSFI is the next WNP-2 system to be evaluated. Because the SSFI requires study of many more factors than those raised in the generic letter, we know at this time that the SSFI including the elements of Action IV will not be completed until December 1990. Recognizing that this completion date is slightly beyond the requirements of the generic letter, the NRC was informed of this plan and schedule in reference 2. WNP-2 will, by February 1991, provide confirmation of the completion of this activity based upon the results and corrective actions of the SSFI.

V. Confirm that Maintenance Practices, Operating and Emergency Procedures, and Training that Involves the Service Water System are Adequate to Ensure that Safety Related Equipment Cooled by the Service Water System Will Function as Intended and that Operators of this Equipment Will Perform Effectively.

1. WNP-2 will verify before the completion of the R5 outage that all operating procedures relating to the service water system have received within the last two years a review for technical accuracy and completeness. Procedures to be reviewed include the system operating procedure, alarm response procedures, abnormal procedures, surveillance procedures, and the emergency operating procedures (EOPs). The current program at WNP-2 requires that all these procedures be reviewed biennially (every two years) in accordance with plant procedure PPM 1.2.6, "Biennial Review of Plant Procedures".

2. WNP-2 will verify before the completion of the R5 outage that all maintenance procedures relating to the service water system have received within the last two years a review for technical accuracy and completeness. The current program at WNP-2 requires that all these procedures be reviewed biennially (every two years) in accordance with plant procedure PPM 1.2.6, "Biennial Review of Plant Procedures".

3. WNP-2 will review the training modules addressing the service water system for technical accuracy and completeness prior to the completion of R5.

WNP-2's recently completed Individual Plant Evaluation (IPE) System Notebook for the service water system describes the system design functions both at the system and component level. As this document received a formal technical review prior to its issuance and was approved for use on August 7, 1989, WNP-2 considers the generic letter's requirement for review within the last two years to be satisfied.

Very truly yours,

GC Sorensen

G. C. Sorensen, Manager
Regulatory Programs

CMM/bk
Attachments

cc: Document Control Desk
NS Reynolds - BCP&R
RB Samworth - NRC
DL Williams - BPA/399
NRC Site Inspector - 901A

STATE OF WASHINGTON)
)
COUNTY OF BENTON)

Subject: Response to GL 89-13

I, G. C. SORENSEN, being duly sworn, subscribe to and say that I am the Manager, Regulatory Programs, for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that I have full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information and belief the statements made in it are true.

DATE 5 FEB, 1990

G. C. Sorensen
G. C. SORENSEN, Manager
Regulatory Programs

On this day personally appeared before me G. C. SORENSEN to me known to be the individual who executed the foregoing instrument and acknowledged that he signed the same as his free act and deed for the uses and purposes herein mentioned.

GIVEN under my hand and seal this 5th day of February, 1990.

Bernice Kosko
Notary Public in and for the
State of Washington

Residing at Kennewick, Wa