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January 29, 1990

Nuclear Regulatory Commission
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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
RESPONSE TO GENERIC LETTER 89-13, SERVICE WATER SYSTEM
PROBLEMS AFFECTING SAFETY-RELATED EQUIPMENT (TAC NO 74037)

Generic Letter 89-13, dated July 18, 1989 requires Consumers Power Company to review the Service Water System at Palisades with respect to problems identified in the letter. Consumers Power Company is also required to advise the NRC as to whether or not we have established programs or equally effective alternative courses of action to implement the recommended actions of the Generic Letter. Consumers Power Company's response is attached.

As detailed in the Attachment, Consumers Power Company intends to implement the recommended actions of the Generic Letter. As a result of previously identified design concerns Consumers Power Company has completed extensive testing of Palisades cooling water systems and has implemented inspection programs to address these concerns. Incorporation of the Generic Letter recommendations enhances our existing programs. The attachment also includes schedules of our plans for implementation of the various actions. In addition, Consumers Power Company will confirm to the NRC, in writing, the completion of the implementation of all of our actions within 30 days of completion of the last action.

Kenneth W Berry

Kenneth W Berry
Director, Nuclear Licensing

CC Administrator, Region III, USNRC
NRC Resident Inspector - Palisades

Attachment

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CONSUMERS POWER COMPANY

Palisades Plant
Docket 50-255 License DPR-20

Response to Generic Letter No 89-13

At the request of the Commission and pursuant to the Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974, as amended, and the Commission's Rules and Regulations thereunder, Consumers Power Company submits our response to NRC letter dated July 18, 1989, entitled, "Service Water System Problems Affecting Safety-Related Equipment". Consumers Power Company's response is dated January 29, 1990.

CONSUMERS POWER COMPANY

To the best of my knowledge, information and belief, the contents of this submittal are truthful and complete.

By David P Hoffman

David P Hoffman, Vice President
Nuclear Operations

Sworn and subscribed to before me this 29th day of January 1990.

Elaine E Buehrer

Elaine E Buehrer, Notary Public
Jackson County, Michigan
My commission expires October 11, 1993

IC0190-0247-NL04

ATTACHMENT

Consumers Power Company
Palisades Plant
Docket 50-255

RESPONSE TO GENERIC LETTER 89-13
RECOMMENDED ACTIONS TO BE TAKEN

January 29, 1990

8 Pages

RESPONSE TO GENERIC LETTER 89-13 RECOMMENDED ACTIONS TO BE TAKEN

Recommended Action I

For open-cycle service water systems, 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. A program acceptable to the NRC is described in "Recommended Program to Resolve Generic Issue 51" (Enclosure 1). It should be noted that Enclosure 1 is provided as guidance for an acceptable program. An equally effective program to preclude biofouling would also be acceptable. Initial activities should be completed before plant startup following the first refueling outage beginning 9 months or more after the date of this letter. All activities should be documented and all relevant documentation should be retained in appropriate plant records.

Response

Per Enclosure 1 of the Generic Letter a surveillance and control program is described to satisfy the objectives called for by Recommended Action I. Since Palisades service water source is freshwater without clams, the following surveillance techniques are recommended by Enclosure 1 to identify the presence of marine fouling:

1. The intake structure should be visually inspected, once per refueling cycle, for macroscopic biological fouling organisms (for example, blue mussels at marine plants, American oysters at estuarine plants, and Asiatic clams at freshwater plants), sediment, and corrosion. Inspections should be performed either by scuba divers or by dewatering the intake structure or by other comparable methods. Any fouling accumulation should be removed.

2. Samples of water and substrate should be collected annually to determine if Asiatic clams have populated the water source. Water and substrate sampling is only necessary at freshwater plants that have not previously detected the presence of Asiatic clams in their source water bodies. If Asiatic clams are detected, utilities may discontinue this sampling activity if desired, and the chlorination (or equally effective) treatment program should be modified to be in agreement with paragraph 1 on following page 2.

To satisfy the recommendation, a Periodic Predetermined Activity Control (PPAC) will be initiated to have the service water pump intake bay inspected each refueling outage by divers for biofouling species. In addition to the above, a sample of the sediment will be sent to a laboratory for detailed analysis periodically. Periodic maintenance activities for the inspection of safety-related heat exchangers, will be revised to include a step for contacting plant chemistry so a sample for analysis can be taken and an inspection for biofouling species and Microbiologically Induced Corrosion (MIC) can be completed.

Enclosure 1 recommends the following control techniques for freshwater plants without clams to significantly reduce the incidence of flow blockage:

1. The Service Water System should be continuously (for example, during spawning) chlorinated (or equally effectively treated with another biocide) whenever the potential for a macroscopic biological fouling species exists (for example, blue mussels at marine plants, American oysters at estuarine plants, and Asiatic clams at freshwater plants). Chlorination or equally effective treatment is included for freshwater plants without clams because it can help prevent microbiologically influenced corrosion. However, the chlorination (or equally effective) treatment need not be as stringent for plants where the potential for macroscopic biological fouling species does not exist compared to those plants where it does. Precautions should be taken to obey Federal, State, and local environmental regulations regarding the use of biocides.

2. Redundant and infrequently used cooling loops should be flushed and flow tested periodically at the maximum design flow to ensure that they are not fouled or clogged. Other components in the Service Water System should be tested on a regular schedule to ensure that they are not fouled or clogged. Service water cooling loops should be filled with chlorinated or equivalently treated water before layup. Systems that use raw service water as a source, such as some fire protection systems, should also be chlorinated or equally effectively treated before layup to help prevent microbiologically influenced corrosion. Precautions should be taken to obey Federal, State, and local environmental regulation regarding the use of biocides.

Palisades meets the intent of control technique 1 via an established program to chlorinate the Service Water System to mitigate the effects of biological fouling. Chlorination method, frequency, application time and chemical concentration are defined in procedure COP-15 "Service Water System Chemistry". Chemical concentration depends on the time of year and conforms to the requirements set by the State's Department of Natural Resources. At the present time the method of chlorination and chemical concentration will not be changed since there is no evidence of macroscopic biological fouling in the Plant's Service Water System.

The recommendations of control technique 2 will be addressed in the following section by identifying sections of the Service Water System where possible pipe fouling could take place due to infrequent use, describing the actions to be taken to periodically flush the piping, defining the conditions that would necessitate chlorination of the Fire Protection System, and describing the method of assuring safety-related components receive required service water flow specified by the FSAR.

The following sections of critical service water and fire protection system piping have been identified as sections of pipe that could be susceptible to fouling since the lines are used infrequently or flow through the line is very low which could lead to sediment settling in the bottom of the pipe.

Cross-tie piping between the Service Water System and the Fire Protection System could experience fouling due to infrequent use. The Fire Protection system is tied into the 'A' and 'B' critical service water headers. The ability of the fire system to feed the Service Water System will be tested in the 1990 Refueling Outage by the performance of Special Test T-290. Thereafter, the performance of the test will allow the cross-tie piping between the Service Water System and Fire Protection System to be flushed each refueling outage.

Currently, the Palisades Fire Protection System is chlorinated since the fire pumps take suction from the service water pump bay, but there is not a program to chlorinate the system. If flushing the cross-tie between the Service Water System and the Fire Protection System indicates a fouling problem, a formal chlorination program will be initiated.

Cross-tie piping between the Service Water System and the Component Cooling Water System could experience fouling due to infrequent use. The Service Water System provides a backup to the Component Cooling Water System for providing cooling flow to the seals of the containment spray pumps, high pressure safety injection pumps and low pressure safety injection pumps. Special Test T-282 was written to test this function, as well as flush the piping. This test will be performed on a one-time basis in the 1990 Refueling Outage. A modification will be made to the piping to permit flushing the lines periodically without performing Special Test T-282 which requires approval from the State's Department of Natural Resources to allow chemically treated component cooling water to be discharged to the lake. The modification will be completed by the end of the 1992 refueling outage. The line will be periodically flushed thereafter.

Cross-tie piping between the Auxiliary Feedwater System and the Service Water System could experience fouling due to infrequent use. The Service Water System provides a backup water supply to Auxiliary Feedwater Pump P-8C. This function was tested by the one-time performance of Special Test T-190 in 1986. The piping was flushed during testing. A modification will be made to the piping to permit periodic flushing without performing Special Test T-190. The modification will be completed by the end of the 1992 refueling outage. The line will be periodically flushed thereafter.

Service water lines to the control room air conditioning units VC-10 and VC-11 could experience fouling due to low flow caused by throttling of the units outlet valves. A Periodic and Predetermined Activity Control (PPAC) will be written to flush the line by fully opening the outlet valves and verifying flow exceeds requirements. This activity will be performed before the end of the 1990 refueling outage and periodically thereafter.

To verify that components receive FSAR required flows, the Service Water System is balanced each refueling outage by performing Special Test T-216. The performance of the test assures that flows set during testing meet the requirements set by the Plant's FSAR for a Design Basis Accident. The testing also fulfills the recommended action that other components be tested on a regular schedule to assure that components are not fouled or clogged.

The performance of the actions described to flush piping, modify piping to permit periodic flushing and flow balancing the service water system fulfill the recommendation suggested by control technique 2 to assure that fouling sediment is flushed from piping.

Recommended Action II

Conduct a test program to verify the heat transfer capability of all safety-related heat exchangers cooled by service water. The total test program should consist of an initial test program and a periodic retest program. Both the initial test program and the periodic retest program should include heat exchangers connected to or cooled by one or more open-cycle systems as defined above. Operating experience and studies indicate that closed-cycle service water systems, such as Component Cooling Water Systems, have the potential for significant fouling as a consequence of aging-related in-leakage and erosion or corrosion. The need for testing of closed-cycle system heat exchangers has not been considered necessary because of the assumed high quality of existing chemistry control programs. If the adequacy of these chemistry control programs cannot be confirmed over the total operating history of the plant or if during the conduct of the total testing program any unexplained downward trend by maintenance of an open-cycle system, it may be necessary to selectively extend the test program and the routine inspection and maintenance program addressed in Action III, below, to the attached closed-cycle systems.

A program acceptable to the NRC for heat exchanger testing is described in "Program for Testing Heat Transfer Capability" (Enclosure 2). It should be noted that Enclosure 2 is provided as guidance for an acceptable program. An equally effective program to ensure satisfaction to the heat removal requirements of the service water system would also be acceptable.

Testing should be done with necessary and sufficient instrumentation, though the instrumentation need not be permanently installed. The relevant temperatures should be verified to be within design limits. If similar or equivalent tests have not been performed during the past year, the initial tests should be completed before plant startup following the first refueling outage beginning 9 months or more after the date of this letter.

As a part of the initial test program, a licensee or applicant may decide to take corrective action before testing. Tests should be performed for the heat exchangers after the corrective actions are taken to establish baseline data for future monitoring of heat exchanger performance. In the periodic retest program, a licensee or applicant should determine after three tests the best frequency for testing to provide assurance that the equipment will perform the intended safety functions during the intervals between tests. Therefore, in the periodic retest program, to assist that determination, tests should be performed for the heat exchangers before any corrective actions are taken. As in the initial test program, tests should be repeated after any corrective actions are taken to establish baseline data for future monitoring or heat exchanger performance.

An example of an alternative action that would be acceptable to the NRC is frequent regular maintenance of a heat exchanger in lieu of testing for degraded performance of the heat exchanger. This alternative might apply to small heat exchangers, such as lube oil coolers or pump bearing coolers or readily serviceable heat exchangers located in low radiation areas of the facility.

In implementing the continuing program for periodic retesting of safety-related heat exchangers cooled by service water in open-cycle systems, the initial frequency of testing should be at least once each fuel cycle, but after three tests, licensees and applicants should determine the best frequency for testing to provide assurance that the equipment will perform the intended safety functions during the intervals between tests and meet the requirements of GDC 44, 45, and 46. The minimum final testing frequency should be once every 5 years. A summary of the program should be documented, including the schedule for tests, and all relevant documentation should be retained in appropriate plant records.

Response

The following actions will be taken to satisfy the requirements of Recommended Action II in accordance with the method described in Enclosure 2.

Testing will be completed to determine heat transfer capability of the following safety-related heat exchangers cooled by Service Water:

1. Component Cooling Water Heat Exchangers E-54A and E-54B
   (Shell to Tube Heat Exchangers)

2. Engineering Safeguard Room Cooler VHX-27B
   (Air to Water Heat Exchanger)

3. Containment Air Coolers VHX-1, VHX-2 and VHX-3
   (Air to Water Heat Exchanger)

Initial testing of the Component Cooling Water Heat Exchangers will be done in the 1990 refueling outage. A special test procedure will be written to determine the heat transfer ability of the heat exchangers. The procedure will also make it possible to gather baseline data to be used to compare future test results.

A second test will be conducted on Engineering Safeguard Room Cooler VHX-27B to compare to 1988 test results. Special Test T-266 will be performed in the 1990 refueling outage to determine if performance has degraded. Performance testing will be completed only on VHX-27B since the West Safeguards heat load is greater than the East Safeguards due to the shutdown heat exchangers and containment sump piping being located in the West Safeguards room. An inspection will be performed on VHX-27A which cools the East Safeguards room. The cooler tubes will be visually inspected for fouling. If necessary, the tubes will be cleaned. Condition of cooler tubes, and results of flow balancing will be used to determine VHX-27A's ability to transfer heat. The Engineering Safeguards Room Coolers VHX-27A and VHX-27B are inspected each refueling outage per PPAC VAS199. This includes a tube inspection and cleaning, if needed.

A Special Test to determine the Containment Air Cooler VHX-1, VHX-2 and VHX-3 ability to transfer heat will be developed after instrumentation is installed in the 1990 refueling outage. Testing will be completed in the 1992 refueling outage. A cooler tube inspection will be completed in the 1990 refueling outage. Containment air cooler VHX-4 will not be inspected since it is isolated during a Design Basis Accident. Initial testing is dependent on a modification to install permanent instrumentation so testing can be completed. Previous inspection of non-safety-related Containment Cooler VHX-4 showed no significant erosion of cooler tubes or fouling of tubes. All of the Containment Air Cooler tubes are inspected each refueling outage per PPAC CRS001 for VHX-1; PPAC CRS002 for VHX-2; PPAC CRS003 for VHX-3; and CRS004 for VHX-4.

At this time it is not known if testing can be completed with a high enough heat load to obtain meaningful data to determine if heat exchangers meet design specifications. In addition to developing a test program for the above heat exchangers, the following inspection of all safety-related heat exchangers cooled by Service Water are performed periodically and controlled by the Plant's Periodic Activity Control System.

The component cooling water heat exchanger tubes and tube sheets are inspected every refueling outage per PPAC CCS010. The tubes are rodded out followed by eddy current inspection of tubes.

The Control Room HVAC units VC-10 and VC-11 are inspected annually per PPAC VAS 200. This included an inspection of condenser tube sheet and condenser tubes.

The Emergency Diesel Generator K-6A and K-6B have inspections completed on the lube oil coolers and jacket water coolers. This inspection is completed each refueling outage per PPAC S-RM63-1 for K-6a and PPAC S-RM63-2 for K-6B.

The initiation of a continuing program to perform testing to determine heat transfer capability of the component cooling water heat exchangers, Containment Air Coolers and Engineering Safeguard Room Cooler VHX-27B coupled with the inspection of all safety-related heat exchangers cooled by service water fulfills the requirement of Recommended Action II to either test heat exchangers to determine heat transfer capability, or perform periodic maintenance to inspect the heat exchangers.

Recommended Action III

Ensure by establishing a routine inspection and maintenance program for open-cycle service water system piping and components that corrosion, erosion, protective coating failure, silting, and biofouling cannot degrade the performance of the safety-related systems supplied by service water. The maintenance program should have at least the following purposes:

A. To remove excessive accumulations of biofouling agents, corrosion products, and silt;

B. To repair defective protective coatings and corroded service water system piping and components that could adversely affect performance of their intended safety functions.

This program should be established before plant startup following the first refueling outage beginning 9 months after the date of this letter. A description of the program and the results of these maintenance inspections should be documented. All relevant documentation should be retained in appropriate plant records.

Response

The following actions will be completed to establish an inspection program for critical Service Water piping. Areas of the piping system will be identified that would be susceptible to fouling, erosion or corrosion. The areas will then be inspected with actions taken to either remove fouling or repair the eroded areas. The inspections will be performed periodically in accordance with the existing erosion/corrosion inspection program. The first inspection will be completed in the 1990 refueling outage.

Recommended Action IV

Confirm that the service water system will perform its intended function in accordance with the licensing basis for the plant. Reconstitution of the design basis of the system is not intended. This confirmation should include a review of the ability to perform required safety functions in the event of failure of a single active component. To ensure that the as-built system is in accordance with the appropriate licensing basis documentation, this confirmation should include recent (within the past 2 years) system walkdown inspections. This confirmation should be completed before plant startup following the first refueling outage beginning 9 months or more after the date of this letter. Results should be documented and retained in appropriate plant records.

Response

Verification that the Service Water System (SWS) will functionally meet the licensing basis will be performed by the Configuration Control Project (CCP) during the winter of 1990. The intent of this verification is to ensure that the SWS design basis functional requirements have been properly considered and incorporated in the design, operation and maintenance of the system. The intent of this verification is not to readdress general design requirements associated with the system (such as fire protection, equipment environmental qualification, seismic, and cable separation).

1. Walkdowns - Walkdowns have been conducted verifying that the system electrical wiring and connection diagrams for control panels, junction boxes, and power sources (motor control centers, switchgear, etc.) agree with installed equipment. An additional walkdown of the SWS will be performed to confirm that the mechanical installation of the system is accurately reflected on the P&IDs.

2. Design Basis Documents - Design Basis Documents (DBD) are being prepared for the SWS and other plant systems. A DBD is a controlled document which contains current configuration design basis information used to assist the user in making changes to the design, maintenance and operation of the system without violating its design basis requirements. Functional design basis requirements, as well as regulatory requirements and applicable codes and standards, are addressed in the DBD. The DBD is developed using system design and licensing documentation from the original plant design and subsequent modifications. System modifications are reviewed in the course of DBD development to assure that the changes did not violate the original design basis requirements as supplemented by later commitments. A failure analysis of the system is also performed.

3. Safety System Design Confirmation (SSDC) - Validation of the functional attributes of the DBD, including a review of significant modifications to the system design, will be performed in 1990 using the Safety System Design Confirmation (SSDC). The SSDC reviews the capability of the SWS to functionally perform as required by the DBD by overviewing operating practices, maintenance, training, and testing performance relative to the DBD requirements. The SSDC also performs an overall review of the DBD for system performance during single failure of an active component in the system.

Recommended Action 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. This confirmation should include recent (within the past 2 years) reviews of practices, procedures, and training modules.

Response

Confirmation of proper function of the SWS and adequacy of operator training is a part of the SSDC review discussed above. In addition to the reviews described, the SSDC reviews the ability of the operators to perform the actions required by the procedures with respect to required communications, instrumentation and other human factor considerations.