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SUBJECT: Forwards info requested in NRC 960328 RAI re util 951116 response to NRC Bulletin 95-002, "Unexpected Clogging of RHR Pump Strainer While Operating in Suppression Pool Cooling Mode."

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CARL D. TERRY
Vice President
Nuclear Engineering

April 26, 1996
NMP1L 1063

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

RE: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Subject: ***NRC Bulletin 95-02, "Unexpected Clogging of a Residual Heat Removal (RHR) Pump Strainer While Operating in Suppression Pool Cooling Mode"***

Gentlemen:

By letter dated October 17, 1995, the Commission issued NRC Bulletin 95-02, "Unexpected Clogging of a Residual Heat Removal (RHR) Pump Strainer While Operating in Suppression Pool Cooling Mode." NRC Bulletin 95-02 was issued to alert licensees to an event involving clogging of a RHR pump suction strainer; to request actions be taken to assure operability of Emergency Core Cooling System (ECCS) and other pumps which draw suction from the suppression pool; and to report to the Commission whether and to what extent they have complied with the requested actions. Our letter dated November 16, 1995, provided a required report detailing programs and initiatives that were in place to address this issue and actions planned for the future.

On March 28, 1996, the Commission issued a Request for Additional Information (RAI) to request additional information concerning our response to NRC Bulletin 95-02. The attachment to this letter provides this information.

Sincerely,

C. D. Terry
Vice President - Nuclear Engineering

CDT/JMT/lmc
Attachment

xc: Regional Administrator, Region I
Mr. B. S. Norris, Senior Resident Inspector
Mr. D. S. Hood, Senior Project Manager, NNR
Records Management

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ATTACHMENT

BULLETIN 95-02

UNEXPECTED CLOGGING OF A RESIDUAL HEAT REMOVAL (RHR) PUMP STRAINER WHILE OPERATING IN SUPPRESSION POOL COOLING MODE

REQUEST FOR ADDITIONAL INFORMATION

1. Why did you not clean the Nine Mile Point Unit 1 (NMP1) suppression pool (torus) during the last outage? We note that the pool for NMP2 was cleaned during its last refueling outage which occurred just after the outage (i.e., about the same general time frame) for NMP1. In view of the heightened sensitivity to this RHR clogging potential and the numerous generic communications on this subject since the Barseback and Perry events, have you taken any other significant measures to protect the operability of the emergency core cooling system (ECCS)?

   A: In our response to NRC Bulletin 95-02, Niagara Mohawk committed to clean the NMP1 suppression pool (Torus-Mark I containment) at the next scheduled refuel outage (February 1997). This commitment was made given the information presented in Bulletin 95-02 and its focus on removal of original construction debris. Bulletin 95-02 and all previous Notices and Bulletins clearly defined the industrial events, and the known precursors to the events, i.e., Barseback-use of mineral wool insulation; Perry-ventilation filter elements; Limerick 1-leaking SRV with the presence of original construction debris. Issues associated with the combined effects of fibrous material and iron-oxide particles were confirmed by test after NMP1's last refuel outage (April 1995) by the BWROG. NMP2 cleaned their suppression pool in order to remove construction debris potentially dropped into the pool following initial startup.

   In contrast, in 1981, as part of our Mark I program enhancements, NMP1 took the significant initiative of draining the torus and giving it a "deep cleaning." That is, extraneous structural equipment was removed, e.g., "catwalk," the torus walls were hydrolazed, and at the completion of all construction work the torus was "squeegeed" clean prior to refilling with water. Therefore, after the Mark I containment upgrades, all original construction type debris was removed from the torus as indicated it should be by Bulletin 95-02. Since that construction project, it has been Niagara Mohawk's practice to exclude any foreign materials from the torus and retrieve any articles inadvertently dropped in the torus. Since 1985, torus cleanliness zones and requirements have been established and proceduralized.

   Niagara Mohawk believes that the debris in the torus is primarily iron-oxide and not fibrous material. This is supported by the above discussion; the fact that our station is primarily a Reflective Metal Insulation (RMI) plant with little to

no need to bring fibrous insulation into the drywell; as a Mark I containment (with debris deflectors over the downcomers), there is little opportunity to drop foreign materials down the downcomers; and multiple strainer inspections have yet to yield any significant debris. As a precaution, the entire length of each individual downcomer is physically walked down each refuel outage in order to inspect for anomalies such as unusual wear or debris. Finally, prior to resetting the containment, the drywell is visually inspected by the appropriate level of management, e.g., Plant, Operations or Outage Manager.

Based on the above, Niagara Mohawk maintains that the decision to schedule the torus pool cleaning during our next refuel outage will not adversely affect the ability of the NMP1 Core and Containment Spray Systems to perform their intended function.

NMP1 has taken aggressive actions considering our design to protect the operability of our Core and Containment Spray Systems. Because our strainers are outside the pool, and therefore accessible for inspection, we have implemented a program where a strainer basket is pulled during each system window and inspected for fibrous or other debris. Since 1994, 14 inspections have been completed with no significant debris having been found. Therefore, Niagara Mohawk has taken measures to detect strainer clogging and protect the operability of the Core and Containment Spray Systems. This method provides a more continuous assurance that the Core Spray and Containment Spray Systems are not affected by debris in the strainers.

2. Why have you not cleaned the NMP1 suppression pool since 1981? Did you ever evaluate the potential impact of not cleaning the pool for such a long time? If so, when, and what were your findings?

A: As stated in Response No. 1, since NMP1's 1981 Mark I program enhancements and subsequent "deep cleaning," controls have been in place to exclude foreign material from entering the torus. Niagara Mohawk firmly believes that the primary component of the debris in the torus is iron-oxide. Current industry events and testing have indicated that iron-oxide alone is of no consequence to the safe and reliable operation of the Emergency Core Cooling Systems (ECCS). Accordingly, Niagara Mohawk maintains that a pool cleaning to remove iron-oxide is not required to assure proper operation of those systems taking suction from the torus.

Industry and NRC communications on this subject have been associated with very specific material types and conditions which are not applicable to NMP1, e.g., mineral wool insulation, ventilation filters, original construction debris. NMP1 is primarily a RMI plant, with a Mark I containment. The Mark I design and its tortuous hydraulic path to the torus would limit any debris loads on our in-line strainers. Therefore, there has been no basis for us to question

the reliability of our Core Spray and Containment Spray Systems nor the condition of the associated strainers. Years of quarterly Technical Specification (TS) required surveillance tests as well as strainer inspections have proven this belief to be correct.

3. Please describe the considerations given to, and limitations associated with, performing a multi-pump test to verify the operability of the ECCS as requested in the bulletin. (Are you able to conduct a multiple pump test at power to demonstrate operability, and if not, why not? We understand that the strainers are accessible for inspection at power, and do not fully understand your limitations with respect to multiple pump tests). Given your plant limitations, is it possible to perform a multi-pump test using one train of core spray and one train of containment spray? If not, provide the basis for your conclusion that such a test is not needed to assure that the pool is sufficiently free of debris to allow continued operation until the torus pool cleaning scheduled for the next refueling outage.

   A: To operate the Core Spray System in "the surveillance test mode" the outboard injection valve, which is normally open with the power removed, must be closed. Operating both loops of the Core Spray System in this mode (i.e., with both outboard injection valves closed) is not allowed by our TSs. Niagara Mohawk previously had evaluated operating one Core Spray System and one Containment Spray System simultaneously and determined that this configuration would not result in significantly increased pool mixing when compared to the standard Core Spray System surveillance test. This evaluation was based on the layout of the core spray and containment spray piping (i.e., test return line discharges are approximately 100° apart with the discharge above the water line). However, because of the sensitivity of this issue, Niagara Mohawk did perform a multi-pump test using one train of Core Spray and one train of Containment Spray for over six hours during our April 1996 maintenance outage. The pressure drop across the strainers remained stable during the test. A subsequent inspection of the strainers showed no fibrous material and no significant debris. The debris was small pieces of tape that could fit into a petri dish and did not affect pump operability. The configuration of the torus suction and return lines for the Core Spray and Containment Spray System are shown in the attached figure. Note that the figure has been corrected from our original submittal. That letter did not show all of the containment spray suction locations.

4. During anticipated transients (such as a stuck open safety relief valve) or other abnormal events, would the plant operators ever be required by procedure to run more than one loop of RHR in torus cooling mode?

A: NMP1 does not have a Residual Heat Removal (RHR) System. The NMP1 Containment Spray System, via a test return line, is capable of providing torus cooling without injecting water into the drywell. However, because there is only one return line to the torus capable of about 3000 gpm, NMP1 does not have the design capability to operate more than one loop of the Containment Spray System in the torus cooling mode.

5. Have you conducted any underwater inspections of the suppression pool floor or ECCS inlet piping since the last pool cleaning? If so, what were the findings? What were the results of your downcomer and ringheader inspections? You appear to be relying upon the results of three samples taken in March 1995 for your statement that there is no evidence of fibrous material in the torus. We are concerned that three random samples might miss fibrous material lying on the pool floor or located in an area other than that where the sample was taken. What is the possibility that other non-fibrous is present in the pool that would not likely be detected by a sample (e.g., plastic bags, duct tape, etc.)?

A. As indicated in Response No. 1, the torus was drained and given a "deep cleaning" in 1981. During a maintenance activity in 1983, CBI was contracted to remove some supports and utilized divers to perform a 360° inspection and retrieval. This inspection found some tools from the maintenance activity which were subsequently retrieved. In addition, in 1990 and 1992, divers were used to retrieve small hand held tools that fell off of personnel lanyards during the normal refuel torus preventative maintenance. All tools were retrieved by the divers. NMP1 inspects and cleans the downcomers, vent header junction and ringheader prior to startup from each refuel outage. Recent inspections of the ringheader have not indicated any significant debris. In addition, the design of the vent header junction is such that any debris entering the downcomers will be confined within them.

The possibility does exist that non-fibrous material would not be detected by the three random samples. However, during torus work activities in each of the last two outages, 1993 and 1995, no significant material was found. Foreign material controls as described in Response No. 1, have been in place since the last torus cleaning and subsequent torus work scopes have not generated debris. It is also possible that the samples would not detect fibrous material lying on the torus floor. However, if any neutral buoyant fibers were in the pool after multiple surveillance tests, it is reasonable to expect that they should have been caught on the strainers. To date, no fibrous material has been detected on any strainers that could be attributed to debris in the torus.

6. You indicate your belief that operation of more than one loop of low-pressure core spray would not significantly increase turbulence and mixing in the pool. Would the turbulence created by such operation be representative of turbulence expected during an abnormal operating condition or transient? In what direction are the return lines from

low-pressure coolant injection to the suppression pool oriented (e.g., do they discharge directly towards the center of the torus, or do they direct flow axially around the torus)?

A: As previously noted, operating both loops (systems) of the Core Spray System in the surveillance test mode is not allowed by TS. Operation of one Core Spray subsystem (about 3000 gpm) would provide a reasonable representation of most abnormal operating conditions and transients. The operation of both subsystems (on one loop) of a Core Spray System is physically limited to a flow of approximately 3,000 gpm through the return line. Therefore, operating both subsystems (versus one) of a Core Spray System in the surveillance mode will not result in any significant increased mixing. NMPC did perform a multi-pump test using one train of Core Spray and one train of Containment Spray for over six hours during our April 1996 maintenance outage. The pressure drop across the strainers remained stable during the test and a subsequent inspection showed no fibrous material and no significant debris. The debris was small pieces of tape that could fit into a petri dish and did not affect pump operability.

Concerning the orientation of the return lines, they enter the torus approximately 60° apart, perpendicular to the torus (i.e., directing flow towards the center of the torus). Accordingly, they do not direct flow in a circular motion around the torus. The configuration of the torus suction and return lines for the Core Spray and Containment Spray System are shown in the attached figure.

7. What is the basis for your confidence that the Unit 1 pool is sufficiently clean? (We note that the Perry staff also thought their pool was clean, but found otherwise during a later test of the pumps. Limerick staff also found additional debris accumulation when they conducted a test after cleaning.)

A: Our confidence is based on our previous torus cleanings and inspections, foreign material controls, and the 25 years of successful quarterly surveillance tests. We have yet to find any significant debris in the strainers after many years of pump runs and strainer inspections. Before our current rotation scheme of inspecting one strainer each system window, we would inspect all 8 strainers during our refueling outage. Over that considerable time frame, no significant debris has been found. The refueling outage inspections are equivalent to inspections now performed at Limerick and Perry. Further, in April 1996 we performed the 6-hour multi-pump test and found no problem with debris.

8. Have there been any significant changes to your Foreign Material Exclusion program since the pool was cleaned in 1981? What was the potential for debris introduction into the torus prior to any changes that were made?

A: Although program enhancements have been made since 1981, the program in place since the pool was cleaned in 1981 should have been adequate to preclude introduction of debris into the pool. In addition, no significant torus activities have taken place since the maintenance activities conducted in 1983 (i.e., the last 360° diver torus inspection). Since that construction project, it has been Niagara Mohawk's practice to exclude foreign material from the torus and retrieve any articles inadvertently dropped in the torus. In 1985, torus cleanliness zones and requirements were incorporated into the procedure. In addition, divers were used in 1990 and 1992 to retrieve small hand tools that had inadvertently fell off personnel lanyards into the torus during maintenance. All tools were retrieved. Also, as indicated in Response No. 5, inspections and cleanings of the downcomers, vent header junction and ringheader limit the potential for debris introduction.

9. To what extent were the RHR pumps operated in the torus cooling mode during the last operating cycle? Have you had occasion to run more than one pump at a time?

A: The containment spray pumps were not operated in the torus cooling mode during the last operating cycle (except for ERV testing conducted at the beginning of the cycle and the recent multi-pump test in April 1996). The containment spray pumps have been operated during TS required surveillance testing which is essentially the torus cooling mode configuration. NMP1 does not have the design capability to run more than one containment spray loop at a time as discussed in Response No. 4.

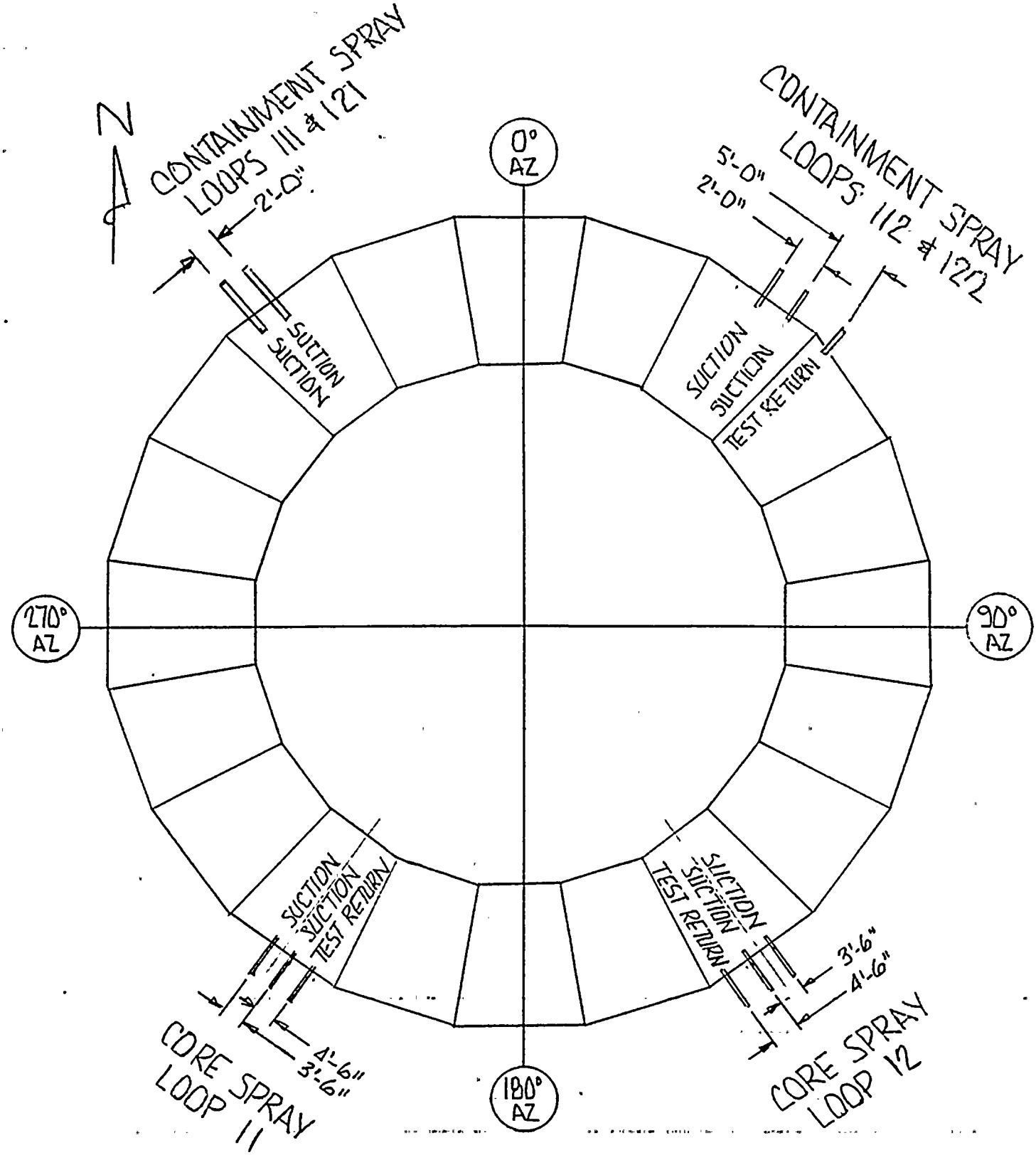
10. Describe the instrumentation that alarms in the control room upon high differential pressure. How does the operator know what the actual pressure differential is? What actions would the operator take upon receiving an indication that the strainers were clogging, and at what point would the operator take these actions? Can the strainers be cleaned during an abnormal event or transient?

A: Annunciators for the Core Spray and Containment Spray System and the associated computer points alarm when their respective strainers' differential pressure reaches 5 psid. Accordingly, the Control Room operator will be cognizant that 5 psid across the strainer has been reached. Actual differential pressure is provided at the strainer. If the operator had indication of strainer clogging, he could select a redundant pump system to perform the function or an alternate water source. Accordingly, NMP1 has the capability of supplying condensate or raw water through safety-related diesel powered pumps and equipment directly to the Core Spray System and raw water through safety-related diesel powered pumps to the Containment Spray System. Note that injection is downstream of the in-line strainers in both the Core Spray and Containment Spray System. The strainers can be cleaned during an abnormal event or transient as long as there are no radiological concerns.

11. Please provide a clear statement of your intention to clean the pool during the next available outage (planned or unplanned) of sufficient duration. This statement should include your definition of sufficient duration.

A: NMP1 has evaluated the torus cleaning evolution and schedule with a cleaning vendor. Based on the evaluation to date, NMP1 estimates that the cleaning evolution will take approximately 17 days. Therefore, an outage of "sufficient duration" will be an outage with a projected duration of 17 days. Accordingly, it is our intent to clean the pool during an outage with a projected duration of 17 days.

FIGURE



CORE & CONTAINMENT SPRAY PLAN

AT SUPPRESSION CHAMBER