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SUBJECT: Forwards addl info re effectiveness of core spray sys water seal for small break LOCA,in response to NRC review of util 940630 proposed license amend that would revise TS 3.2.7.1, "Primary Coolant Sys Pressure Isolation Valves."

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NIAGARA MOHAWK

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March 7, 1995
NMP1L 0913

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: *Shutdown Cooling Isolation Valves*

Gentlemen:

In a letter to the Nuclear Regulatory Commission (NRC) dated June 30, 1994 (NMP1L 0832), Niagara Mohawk Power Corporation (NMPC) proposed a license amendment that would revise Technical Specification 3.2.7.1, "Primary Coolant System Pressure Isolation Valves." This amendment would allow utilization of the Core Spray System as a seal water system for Shutdown Cooling System isolation valves 38-01, 02, 12 and 13 in accordance with Section III.C.3 of 10 CFR 50 Appendix J.

During the course of the Staff's review of this proposed license amendment, the NRC has determined that additional information is required regarding the effectiveness of the Core Spray System water seal for a small break loss-of-coolant accident (LOCA) to complete its review of this matter. In addition, the Staff has requested a cost benefit analysis. Attached to this letter is the requested additional information.

Niagara Mohawk has provided a copy of this response to the appropriate state representative.

Very truly yours,

R. B. Abbott

R. B. Abbott
Plant Manager NMP1

RBA/KWK/lmc
Attachment

A001
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ATTACHMENT

As discussed in our proposed license amendment dated June 30, 1994 (NMP1L 0832), it is Niagara Mohawk's intention to install a seal water system that will meet Section III.C.3 of 10 CFR 50 Appendix J. This seal water system is in lieu of a replacement plan which would require removing the existing Shutdown Cooling System isolation valves and installing new valves that are Type C air testable.

The seal water system is the preferred approach for the following reasons:

1. The seal water system provides an effective means of eliminating airborne leakage through the Shutdown Cooling System isolation valves during a small break LOCA. The basis for this conclusion is provided below.

   The water seal design for the Shutdown Cooling System isolation valves is provided by the Core Spray System by injecting water between the inboard and outboard isolation valves. The design of this water seal requires the addition of a Core Spray System throttling capability during small break LOCA conditions to maintain a continuous water seal between the two isolation valves at 1.1 Pa. The Core Spray System throttling capability is provided by the modification of the Core Spray System test return valve control logic and safety related qualification of the test return valves to allow remote manual operation of the valves with the core spray injection valves.

   The Core Spray System test return valves opening ability is subject to a common mode failure of power board 167; however, as discussed in our proposed license amendment, the probability of this failure is very remote. The loss of positioning capability from the control room for the Core Spray System test return line valves would occur due to the failure of power board 167. However, the loss of this power board is considered a very unlikely event since this power board is safety related, seismically supported and can be powered off either of the two onsite emergency diesel generators. Upon loss of the diesel generator which is supplying power to power board 167, automatic transfer of power board 167 will occur to the operating diesel. Power board 167 supplies both control power and power to the red and green indicating lights in the control room for approximately 45 valves in various systems such as Core Spray, Containment Spray, Emergency Condenser, etc. Although there is no direct indication in the control room for loss of this power board, a loss of power board 167 would be detected by loss of indicating lights for these valves. In addition, loss of control power would result in actuation of various alarms and annunciators in the control room for the systems mentioned above.

   Moreover, in the very unlikely scenario of a small break LOCA concurrent with a failure of power board 167, the Core Spray System test return line valves can be manually operated as these valves are physically and radiologically accessible during a small break LOCA assuming the entire core remains covered at all times. The probability of a small break LOCA combined with the failure of power board 167 is 2.79×10^{-7}. However, this will not result in a damage event. If valves 40-05 and

40-06 can be manually operated then the water seal is maintained for 30 days. Therefore, during this scenario, there will be no airborne leakage from the primary containment through the Shutdown Cooling System isolation valves.

Even if the seal water system were to fail (i.e., multiple single failures) then airborne leakage through these isolation valves would be limited since these valves are water tested to a Technical Specification acceptance criteria of 5 gpm per valve. This leakage would also be confined to the Shutdown Cooling System since this system is a closed loop system and has a design rating of 1250 psig. The leaktightness of this system is confirmed every refueling outage by a system walkdown. The Shutdown Cooling System is totally enclosed within secondary containment and is seismically supported. Therefore, in the event of leakage from this system which becomes airborne any radioactivity would be filtered, if needed, by the operation of the Emergency Ventilation System.

For the above scenario, if credit was not taken for local manual operation of the test return lines, the Core Spray System water seal for the Shutdown Cooling System isolation valves would be maintained by alternate means. Two methods exist as described below.

<u>Method 1</u>

The isolation valves' water seal (i.e., head of water in the reactor vessel) can be maintained for 30 days by keeping the reactor level within the emergency operating procedure (EOP) range of 53 to 95 inches by throttling the injection valves and cycling of the core spray pumps for flows less than 2200 gpm (long term minimum core spray pump flow requirement) for a small break LOCA. For LOCAs requiring a core spray flow of greater than 2200 gpm, the core spray pump set would run continuously (injection valve throttled) and the Core Spray System water seal between the Shutdown Cooling System isolation valves would be continuously maintained.

For the single failure of power board 167, four loops of core spray are considered available. The single failure of power board 167 does not impact the ability of the operator to throttle the core spray inboard injection valves. If the small break is 1700 gpm or greater then the operator can throttle the injection valves and maintain total pump flow greater than the 2200 gpm long term minimum flow requirement (1700 gpm break flow plus 500 gpm through the minimum flow line). The failure of power board 167 does not affect the availability of the minimum flow line. Therefore, no cycling of a core spray pump is required under these conditions.

Core spray pump cycling would be required if the small break is less than 1700 gpm. Cycling is required because the pump minimum flow lines are sized for 500 gpm. At 500 gpm, operation of the pumps is restricted to less than 15 minutes with no restrictions on frequency provided the pump is secured or flow is increased to above 2200 gpm. The limiting condition for pump cycling is then defined by a small break of less than 1700 gpm. The operator would throttle flow to maintain level within the required band of 53 to 95 inches with the restriction to not operate on minimum flow

less than 2200 gpm for longer than 15 minutes. In this case the minimum time between pump starts is approximately 80 minutes per pump based on the following conservative estimate:

- Volume between 95 and 53 inches vessel level is ~8000 gallons.
- Minimum pump idle time based on drain down time of RPV = 8000 gal/1700 gpm = five minutes.
- Pump run time is limited to 15 minutes. Therefore, time between pump starts is 15 minutes plus five minutes = 20 minutes.
- Four core spray pumps are available for single failure of power board 167. Therefore, the maximum time period between starts is 20 minutes * 4 = 80 minutes per pump.

No restriction on core spray pump motor starts exists provided the motor is allowed to run for 30 minutes or 60 minutes of idle time have elapsed. The maximum number of pump starts would allow each pump motor to be idle for 80 minutes which satisfies the condition for which no adverse affect on motor life or operability exists. This condition is assumed to exist for approximately 24 hours. In this time period it is expected that an alternate feedwater lineup using high pressure coolant injection, containment spray raw water, or the diesel driven fire pumps can be established to maintain level within the 53 to 95 inches operating band. Therefore, using the above means the hydrostatic head in the reactor can be maintained for 30 days.

<u>Method 2</u>

In the event a decision is made to floodup the primary containment following a LOCA, the water seal would be maintained. Floodup is achieved by operation of the raw water pumps.

The core spray pump minimum flow relief line capability is 500 gpm. Each pump can be operated for four hours at 500 gpm up to four times with a four hour idle time between starts without impact on the pump operability. This provides a total of 16 hours of operation for each core spray pump. The four pumps would provide a total available run time of 64 hours.

Containment floodup to above top of active fuel can be completed in less than 14 hours. The water seal provided between the two Shutdown Cooling System isolation valves by core spray can be maintained for a minimum of 16 hours and a maximum of 64 hours with the pumps on minimum flow by using the four available core spray pumps four hours each, four times.

After containment floodup is completed, the water seal of the Shutdown Cooling System inboard isolation valves is established for 30 days by the hydrostatic head. In

addition, a core spray pump set is maintained in operation to provide circulation at greater than 2200 gpm and the water seal between the isolation valves is maintained.

2. The radiological exposure for the replacement plan is significantly higher than the radiological exposure for the installation of the seal water system. The anticipated exposures are approximately:

   a. 55 manrem for the replacement of the Shutdown Cooling System isolation valves and

   b. 5 manrem for installation of the seal water system.

3. As is the case with the performance of any complex activity, there are risks to plant personnel and equipment associated with the installation of the seal water system or replacement of the Shutdown Cooling System isolation valves.

   a. The replacement plan involves breaching of the reactor coolant pressure boundary both inside and outside of primary containment. This plan requires the removal of four large valves, two of which are within primary containment. Movement of the existing inboard isolation valves and their replacements would require using various rigging techniques within the tight confines of the primary containment.

   b. The installation of the seal water system, on the other hand, requires no work within the primary containment. Therefore, the risks associated with these rigging activities is eliminated by installation of the water seal system.

4. The installation of the seal water system requires significantly less time and resources to implement than the replacement plan. The anticipated time duration and costs are approximately:

   a. the replacement plan - 14 critical path days are added to the refueling outage and a direct cost of approximately four million dollars and

   b. the installation of the water seal system - no critical path time added to the refueling outage and a direct cost of approximately one million dollars.

   The costs of either the replacement plan or the installation of the water seal system do not include the replacement power costs which are estimated at 200,000 dollars per day.

5. Elimination of the single failure of power board 167 would require design, purchase and installation of safety related power board. Safety related cabling and conduit would also have to be installed as well as modification work in the control room. Elimination of this single failure would cost approximately one million dollars. Considering the effectiveness of the Core Spray System water seal as described above, NMPC has concluded that elimination of this single failure is unnecessary.

In summary, it is NMPC's firm belief the water seal system provides an effective method of eliminating airborne leakage through the Shutdown Cooling System isolation valves and that the replacement of these isolation valves is unnecessary and would be an ill-advised commitment of time and resources.