UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 2 TO FACILITY OPERATING LICENSE NO. NPF-54

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR POWER STATION, UNIT NO. 2

DOCKET NO. 50-410

INTRODUCTION

By letter dated March 11, 1987, as supplemented March 16, 18 and 31, 1987 and April 2, 3, 7, 23, and 28, 1987, Niagara Mohawk Power Corporation (the licensee) requested an amendment to Facility Operating License No. NPF-54 for the Nine Mile Point Nuclear Station Unit 2. The amendment would revise the Technical Specifications related to main steam isolation valves (MSIV). The changes involve the MSIV closure setpoint and the valves' designation numbers. A License Condition, Section 2.C.(14), relating to special conditions appropriate only to the ball valves which have been removed is being addressed in a separate amendment. This amendment also deletes Items 1.a.(2), (3), and (4) of Attachment 1 to the license which relate only to the valves which have been removed.

As part of this amendment request, the licensee on March 18, 1987 requested that a Leakage Control System (LCS) not be required. The staff evaluated this request and issued a draft Safety Evaluation Report on April 14, 1987 which provided the staff's basis for not requiring an LCS. That Safety Evaluation Report is included in this Safety Evaluation as Attachment 1 and supports our conclusion that an LCS is not required. It should be noted that subsequent changes concerning the MSIVs or containment bypass leakage, such as changing the MSIV allowable leak rate in the Technical Specifications, or excessive leakage may require a reevaluation of the need for an MSIV LCS.

BACKGROUND

The MSIV's perform several functions such as Primary Containment isolation and Reactor Coolant pressure boundary. Industry experience described in NUREG-1169, "Technical Findings Related to Generic Issue C-8, Boiling Water Reactor Main Steam Isolation Valve Leakage Treatment Methods," indicates that MSIV leakage has been a concern. Ball valves were installed with the expectation that leakage would be reduced. However, experience with the ball valves has shown that they have not functioned as well as anticipated. Delamination of the tungsten carbide coating causes wearing between the seat and the ball which results in increased valve leakage. Packing leakage has also been a problem. Therefore, NMP-2 MSIVs were modified.

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The modification included cutting out the existing eight main steam isolation valves and replacing them with wye-pattern globe valves. The wye-pattern globe valves will meet all the same design criteria that the original design required. For example, the design will meet safety-related seismic and environmental qualifications; and IEEE 279 requirements. The globe valves were purchased from General Electric which normally supplies the valves as part of the NSSS contract.

This evaluation addresses the overpressurization protection analysis, LOCA analyses, transient and accident analyses, and actuation control system resulting from the change of the valves.

EVALUATION

Overpressurization Protection

The worst case overpressurization transient, MSIV closure with high flux scram, was not affected since failure of the MSIV direct position scram was assumed in the analysis. Therefore, the proposed MSIV closure trip setpoint change in the Technical Specifications, from "$\leq$6% closed" to "$\leq$8% closed" and allowable value change from "$\leq$7% closed" to "$\leq$12% closed" in RPS instrumentation setpoints, have no impact on the overpressurization protection analysis. The "$\leq$8% closed" setpoint corresponds to a "$\leq$12% closed" allowable value. This difference provides a margin for drift of the instruments. The "$\leq$12% closed" allowable value corresponds to a "$\leq$15% closed" analytical value (or $\geq$85% open). The difference here is a margin of conservatism.

Loss of Coolant Accident (LOCA)

The change in MSIV closure characteristics, resulting from the installation of the wye-pattern globe valves, has a negligible effect on the ECCS performance analyses as shown in Table 1. The change to wye-pattern globe valves would cause less than 1 degree F increase in the peak clad temperature (PCT) for the most limiting large break and less than 2 degrees F increase for small breaks. Therefore, the acceptance criteria for emergency core cooling systems for light water nuclear power reactors as contained in 10 CFR 50.46 are satisfied with the globe valves in operation. The modeling of steam flow during MSIV closure remains unchanged from that described on page B-9 of NEDO 10329, "Loss of Coolant Accident and Emergency Core Cooling Models for General Electric Boiling Water Reactors," and has been previously found to be acceptable by the staff.

In addition to reanalyzing the worst case breaks, the licensee assessed the impact of the change on other postulated breaks. For a recirculation line, feedwater line, or ECCS line break, MSIV closure is conservatively assumed to occur on Low-Low-Low water level (Level 1). A scram would be expected to have already occurred on Low water level (Level 3). Thus, changing the MSIV position scram setpoint has no effect on the ECCS performance analyses for these breaks since it was not utilized in these analyses.

For a steamline break inside the containment, the scram will occur on high drywell pressure before MSIV closure occurs. The MSIV position scram setpoint is not used for the ECCS system response. For steamline break outside the containment, the analysis conservatively starts with the water level at the scram trigger point, Low water level (Level 3). Realistically, a scram is likely to occur earlier due to MSIV closure on high steamline flow, but the scram input due to MSIV closure has been conservatively omitted in the analysis. Thus, the analysis is unaffected by the MSIV position scram setpoint change.

Anticipated Operation Occurrences

The proposed change to the MSIV closure setpoint necessitated by the valve change has been evaluated with respect to the transient and accident analyses contained in the FSAR. Loss of air or nitrogen, manual closure of all MSIVs, pressure regulator controller failure, and other transients and accidents were considered for any significant effect on the margin of safety.

The impact of a delayed scram signal due to the new MSIV closure-trip switch setpoint on transients has been evaluated. The new setpoint corresponds to an analytical limit of "85% MSIV open" instead of the previous "90% MSIV open." Two transients which take credit for this scram function are the manual closure of all main steam isolation valves (direct scram event) and the pressure regulator controller failure (open event). Of the two events, the manual closure is more limiting. The transient results are more sensitive (limiting) to the difference in the allowable range of the Technical Specifications (3 to 5 sec.) speed of MSIV closure (which is not being changed by this Technical Specification change) than due to a small scram delay resulting from the setpoint change. The proposed change to the Main Steam Isolation Valve-Closure setpoint was evaluated by reanalyzing the manual closure of all main steam isolation valves transient and there was no change in the critical power ratio (CPR) operating limit.

Another event affected by the setpoint change is load rejection without turbine bypass. This event was also reanalyzed. The change in Minimum Critical Power Ratio (MCPR), as shown in Table 1, is insignificant (much less than 0.01).

The remaining existing FSAR transient analyses are based upon an analytical model that bounds the closure characteristics (flow area versus time) of either the ball or globe valves. The wye-pattern globe valves have a 10 psi higher pressure differential when full open than the ball valves, due to frictional flow losses. Sensitivity studies performed by GE based upon information from a number of plants have shown that the larger differential pressure across the steamline volume produces milder transient response. Larger steamline differential pressure has a dampening effect on the pressure wave following a closure of turbine stop or control valves. Thus, since the previous analyses are based upon a model which conservatively simulates the wye-pattern valve characteristics, there is no significant impact on the other pressurization transients due to the MSIV change.

Actuation Control System

The Protection System signals that provide the trips for the wye-pattern MSIVs are the same signals utilized in the ball valve design. The power supplies are the same non-Class 1E 120VAC supplied by UPS3A (Trip System A) and UPS3B (Trip System B). The design utilizes the same electrical protection assemblies (EPA), distribution panels and the same cables.

The fail-safe de-energize to operate logic function, used for the ball valves, remains with the wye-pattern valves. This logic control circuitry utilizes relay logic (coil-to-contact) operation to assure that actuation of a single emergency trip sensor (i.e., one-out-of-two in trip system A or B) will not cause inadvertent closure of the MSIVs. This is consistent with the original design basis of NMP-2 whereby the logic is set up as a one-out-of-two taken twice logic (i.e., one-out-of-two in trip system A and B are required to close the MSIVs). For example, a tripped sensor (reactor low-low water level) provides open contacts to a logic function which causes the sensor relay in the associated trip channel to de-energize. The open contacts from the de-energized sensor relay are connected in logic functions which cause a trip relay to de-energize. Output from the de-energized trip relays are combined in one-out-of-two taken twice logic which generates closure signals for the main steam isolation valves.

Each wye-pattern MSIV contains two electrically operated solenoid valves, a three way pilot solenoid valve with two coils and a test solenoid valve. The two pilot solenoid coils on a MSIV are fed from different trip systems. Since the two (2) trip pilot solenoid coils are supplied power from two (2) different trip systems and both trip systems must de-energize to operate, a transfer and isolation scheme (ball valve) is not required on the wye-pattern valves. This change and the standard General Electric control scheme have reduced the number of field cables.

The new wye-pattern globe valves will use a three position selection switch (close-auto-test) and a pushbutton switch for each valve. These switches are located in the control room and are similar to the ball valve design. The staff concludes that the latest design modifications made to the MSIVs did not change the actuation control system logic or power supplies and is consistent with the original design basis for NMP-2. The MSIV limit switch inputs to the Reactor Trip System logic remain unchanged from the ball valve design. However, the trip setpoint from the ball valve has been changed from 94% open to 92% open for the wye-pattern valve. We reviewed this 2% difference in setpoint and the supporting analysis and find the trip setpoint of 8% acceptable.

Technical Specification Change

The licensee has requested that a revision be made to the NMP-2 Technical Specification Tables 2.2.1-1, 3.6.1.2-1 and 3.6.3-1 to address the installation of the new MSIVs. Table 2.2.1-1 has been changed to account for

differences in the physical configuration of the position indicating switches between the ball valves and the new wye-pattern globe valves. Industry experience has indicated that the current Nominal Trip Setpoint of less than or equal to 6% closed cannot be met with the mounting brackets on the globe valves. The licensee has proposed that the MSIV-closure setpoint be less than or equal to 8% closed to allow margin for field adjustment. A corresponding allowable value of less than or equal to 12% closed has also been proposed to account for drift (allowable value). Tables 3.6.1.2-1 and 3.6.3-1 have been changed to alter the valve designations to provide consistent notation for the type of valve installed.

Wye-pattern globe valves are used at the Perry Nuclear Power Plant in the same application and have been approved with setpoints identical to those requested for NMP-2. The staff has found that the change of setpoints is appropriate for wye-pattern globe MSIVs, and that changing of the valve designations is also appropriate.

License Change

Items 1.a.(2), (3), and (4) of Attachment 1 of the License are being deleted. These items are (1) cracked MSIV roller bearings, (2) failure of the MSIVs to close in the required time and (3) failure of the MSIVs to meet local leak rate test requirements. These changes are no longer applicable since they pertain to the ball valves only and these valves have been replaced.

SUMMARY

The proposed change to the MSIV-closure setpoint in Technical Specification Table 2.2.1-1 necessitated by the MSIV change was evaluated against affected transient and accident analyses and the proposed change has been shown not to involve a significant increase in the probability or consequences of an accident previously evaluated. Table 3.6.1.2-1 has been changed to alter the valve designation to provide consistent notation for the type of valve installed, e.g., an air-operated (AOV) valve. The change results from the use of air-operated valves instead of hydraulic-operated valves. Table 3.6.3-1 has also been changed to alter the valve designation to provide consistent notation. For the reasons discussed in this evaluation, we find the proposed changes in Technical Specification Tables 2.2.1-1, 3.6.1.2-1, and 3.6.3-1 are acceptable.

ENVIRONMENTAL CONSIDERATION

This amendment involves a change in the installation or use of the facility components located within the restricted areas as defined in 10 CFR 20. The staff has determined that this amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously

issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR Sec 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Dated: May 15, 1987

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TABLE 1

COMPARISON OF LOCA ANALYSIS

	BALL	WYE
Large Break PCT (°F)	1921	1922
Small Break PCT (°F)	1522	1524
Allowable PCT (°F)	2200	2200

COMPARISON OF TRANSIENT ANALYSIS

	BALL	WYE
Operating Limit CPR	1.28	1.28
Safety Limit MCPR	1.06	1.06
Limiting Transient ΔCPR (Load Rejection Without Bypass)(1)(2)	0.22	<0.22
MSIV Closure Event ΔCPR	0.01	<0.01
Peak Vessel Pressure (psi)	1268	1271
Allowable Pressure (psi)	1375	1375

(1) Load rejection without bypass Section 15.2 of the FSAR using ODYN Option A
(2) No change in Limiting Transient