U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No.: 50-220/89-18

Docket No.: 50-220

Licensee: Niagara Mohawk Power Corporation
301 Plainfield Road
Syracuse, New York 13212

Facility Name: Nine Mile Point Unit 1

Location: Oswego, New York

Dates: June 12-16, 1989

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Date

Inspection Summary:
Inspection on June 12, 1989 to June 16, 1989 (Inspection Report 50-220/89-18)

Areas Inspected: This inspection covers the ten unresolved issues raised in the SSFI 50-220/88-201 conducted at Nine Mile Point Unit 1 during the period of September 12, 1988 to October 7, 1988.

Results: Of the ten issues open at the start of this inspection, four issues remain. Resolution of these remaining issues requires testing on the part of the licensee and additional information submitted to NRR. One of the four issues, unresolved item 88-201-09, was considered closed at the conclusion of this inspection and presented to the licensee as such at the exit meeting.

However, subsequent review revealed that there still remained open concerns in that area. This concern was made known to the licensee by phone conversation between V. McCree of NRR and P. Francisco of NMPC. Thus that issue remains open pending additional information from the licensee. One new issue was raised as a result of this inspection dealing with the fact that the design of the core spray test line does not allow for testing of the core spray pumps in the high end of the flow range of interest. Resolution of these five issues is scheduled for completion by the licensee prior to restart of the facility.

DETAILS

1. INTRODUCTION AND SUMMARY

1.1 Introduction

During the period of September 12, 1988 to October 7, 1988, a Safety System Functional Inspection was conducted at the Nine Mile Point Unit 1 facility. The systems chosen for inspection were the core spray and high pressure coolant injection/feedwater systems. These systems were chosen because: (1) the core spray system is the safety related emergency core cooling system designed to inject water into the core and (2) the HPCI/FW system, although not safety related, is designed to provide a reliable source of high pressure injection to the reactor in the event of a small break LOCA.

The results of that inspection raised a number of safety concerns which questioned the ability of these two systems to perform their design function. As a result, Niagara Mohawk Power Corporation (NMPC) met with the NRC to discuss the SSFI findings on November 17, 1988. The licensee responded with subsequent submittals to the NRC on December 8, 1988, December 16, 1988, January 6, 1989, January 13, 1989, January 31, 1989, February 13, 1989, March 28, 1989, April 13, 1989, May 23, 1989, and June 7, 1989. This inspection was intended to review the licensee's progress in resolving these concerns.

1.2 Persons Contacted

During this inspection, the following individuals, among others, were contacted during this inspection:

* M. Boyle	NMPC
* A. Curran	NMPC
* K. Dahlberg	NMPC
* P. Francisco	NMPC
* L. Klosowski	NMPC
* M. Masuicca	NMPC
* T. McMahon	NMPC
* R. Shelton	NMPC
* K. Sweet	NMPC
* J. Willis	NMPC
* K. Yacker	NMPC

* Denotes individuals present at the exit meeting on June 16, 1989.

1.3 Summary

The results of this inspection concluded that six of the ten unresolved items from the SSFI inspection have been adequately corrected and are closed. Of the four remaining issues, system testing and additional submittals to the NRC are planned by the licensee to resolve these concerns. Additional information was also requested on June 12, 1989, by NRR concerning the operability of the core spray system. One of these four issues, unresolved item 88-201-09, was considered to be closed at the conclusion of this inspection; however, subsequent review determined that an outstanding concern remains in this area. Thus this issue remains open. In addition, one new issue arose as a result of this inspection (UNR 50-210/89-18-02) concerning the adequacy of the test line for the core spray system. Review of the remaining issues will be tracked by this report and reviewed prior to restart of Unit 1.

2.0 Resolution of Concerns from SSFI Report 88-201

2.1 (Closed) Unresolved Item (50-220/88-201-01) - 10 CFR 50.46 Technical Specification Amendment Regarding Core Spray System Operability.

Inspection 88-201 revealed that the licensee failed to adequately translate design inputs for the 10 CFR 50, Appendix K, Loss of Coolant Accident (LOCA) Analyses into the Technical Specification requirements for the core spray system. Technical Specification 3.1.4.d allowed continued plant operation for up to seven days with one core spray loop inoperable. This condition was not addressed by the 10 CFR 50, Appendix K, LOCA Analyses of record. The licensee submitted letter NMP1 10347 of January 13, 1989, requesting that the NRC delete the limiting condition for operation associated with one inoperable core spray loop and direct plant shutdown within 10 hours. Technical Specification Amendment 105 was issued on May 16, 1989, to incorporate these proposed changes to the Technical Specifications. This item is closed.

2.2 (Open) Unresolved Item (50-220/88-201-02) - Core Spray System Design Deficiencies

(A) System Performance Curves (Open)

The core spray system performance analyses provided by the licensee during inspection 88-201 had a number of significant discrepancies that called into question the ability of the system to meet its performance requirements. The analyses did not account for the resistance of several components in the system: the piping from the torus to the core spray topping pump

discharge, the system flow orifice, the pump suction grating, the system strainer, and one of the system check valves. The analysis also did not account for the flow diverted from the reactor through the minimum flow relief valve and the core spray pump coolers. The NRC team was concerned that the resistance used for the portion of the system from the reactor nozzle to the reactor, which included the ring headers and spray nozzles, did not appear to correspond to the supporting documentation.

Subsequent to the initial inspection, the licensee performed extensive reanalyses of the system resistances in which all factors, including those described above, were reconsidered. These analyses showed that the system resistance was such that the required flows would be delivered to the reactor vessel if the pumps could indeed provide the flow shown on the pump manufacturer's performance curves. However, the following new questions were raised by the team during this inspection:

(1) Strainer Differential Pressure - The strainer differential pressures for various flow rates were calculated based on testing performed in February 1989. However, the validity of these differential pressures is a concern due to a deficiency in the design of the instrument piping as described in item D(3) of this paragraph.

(2) Core Spray Header Resistance - The licensee's analyses were for the core spray headers assumed that every other spray nozzle was removed, leaving open ended pipes at these locations. This was according to a design modification required for initial plant startup. However, data in the 1969 preoperational test of the system appeared to indicate a resistance corresponding to a core spray ring with all of the nozzles installed, raising the question of whether the modification had actually been performed. To resolve this question, the team reviewed videotape records of a recent ISI inspection of the headers. These records clearly revealed that the appropriate nozzles had been removed as required.

The licensee also performed an analysis assuming that the system resistance was increased by 25 percent (15 percent for uncertainties and 10 percent for potential pump degradation). The resultant reduced flows were then used as input to a revised 10 CFR 50, Appendix K, analysis from which a number of conservatisms were removed. With this new analysis, all critical parameters were shown to be within the Appendix K limits with the reduced flows.

At the conclusion of the inspection, the licensee committed to perform a special test of the system before plant restart to determine the actual system resistance from which the current calculations would be validated. This portion of item 88-201-02 remains open pending completion of this testing.

(B) Net Positive Suction Head Analysis (Open)

The core spray system net positive suction head (NPSH) calculation provided during the initial SSFI inspection contained two non-conservatisms:

(1) The pressure drop through the suction grating in a partially clogged condition was not considered.

(2) The minimum torus pressure was assumed to correspond to the saturation pressure of the torus water.

When both of these were considered in a revised analysis, it was determined that sufficient NPSH was unavailable and that the core spray pumps could be expected to cavitate for 6 hours during a large break LOCA accident scenario. The licensee's position was that this condition was acceptable. In a letter from NRR to the licensee dated June 12, 1989, the licensee was requested to substantiate this conclusion and to provide verification from the pump manufacturer that the pumps will be able to perform their safety function during and following six hours of cavitating operation. Furthermore, the licensee was requested to provide an analysis of the expected vibration effects on other equipment, expected operator actions during and following cavitation, and a discussion of the capability of other plant systems to cool the core following a design basis accident and loss of the core spray pumps. This item remains open pending resolution of these issues.

(C) Core Spray System Susceptibility to Water Hammer (Open)

During inspection 88-201, it was discovered that in the normal standby condition, the core spray system is only approximately one-third filled with water. The remaining two-thirds of the system, from the inboard injection valves back to the point in the system that corresponds to the torus level, is not filled. The licensee performed an analysis which purported to show that in spite of the system not being filled, a water hammer would not occur upon system actuation.

The team was concerned that this analysis did not address the accident scenario of most concern, that being a large break LOCA where the reactor vessel would depressurize very quickly. In such an event, the injection valve would start to open at about the same time as the core spray pumps would start. As the injection valve moved in the open direction, the water between the isolation check valve and the inboard isolation valve would move toward the reactor vessel. However, since the resistance of the slightly open inboard isolation valve would be high, the flow rate would still be low. When the air in the system then reaches the slightly open valve, the resistance at the valve would drop dramatically [since the viscosity of the air is significantly less than that of water]. The result would be a sudden acceleration of the water behind the air. Whenever the water front reached the partially open injection valve, it would suddenly be decelerated, producing a water hammer. This same concern exists whenever the air pocket passes through the core spray spargers.

The licensee was requested by NRR in a letter dated June 12, 1989, to provide a bounding water hammer analysis that would address the scenario described above. The licensee was also requested to discuss how an operator would detect water hammer during an accident and the action which the operator would be expected to take. This item remains open pending completion of these activities and subsequent review.

(D) Adequacy of Alarm Setpoints (Closed)

Inspection 88-201 revealed that the core spray system instrumentation alarm setpoints may not provide accurate information and may mislead the operator to stop portions of the core spray system when they are actually needed.

The licensee reviewed the core spray system setpoints to identify each of their bases. The review also included the associated alarm response procedures (ARP) to verify proper operator action upon receipt of an alarm. The following are the original alarm setpoint concerns and the respective licensee actions:

(1) The core spray low system discharge (e.g., 2 core spray pumps and 2 core spray topping pumps injecting into the vessel through a common discharge line) pressure alarm, as sensed by a pressure switch downstream of the flow element, was set at 225 psig decreasing. The intent of this alarm is to detect a core spray system piping failure. However,

this alarm would be expected during reactor pressure vessel (RPV) depressurization without a core spray pipe failure, thus negating its usefulness. Procedure OP-2, "Core Spray System," Revision 17, required securing the alarming system if the other system was operating normally. At the point where this alarm would be received in one system, it would be expected in the other system as well. Securing the affected system in this case was not warranted.

Upon reviewing the basis for this alarm, the licensee concluded that the low system pressure alarm should be reset to 150 ± 5 psig. This is below the expected value of system pressure after the RPV depressurizes, but high enough to detect a system break. A Design Change Request (DCR) was initiated to effect this change. In addition, changes to the ARP operator actions were initiated that discriminate between testing and actual accident operation.

(2) The core spray pump low suction pressure alarm was set at 2.5 psig, decreasing. Even though the function of the alarm is to warn operators of impending pump cavitation, this setpoint was determined to be so far above the net positive suction head (NPSH) for the entire range of pump flow conditions as to generate spurious alarms. Furthermore, it is likely that the cause of the low suction pressure in one subsystem (i.e., 1 core spray pump and its associated topping pump) may also cause a low suction pressure in the other subsystem, especially since the increased flow in the operating subsystem would tend to lower the suction pressure of the other subsystem. Procedure OP-2 directs the operator to secure the subsystem after ensuring that the other subsystem in that system was running. The effect of this action would be to decrease the flow of water to the reactor. This may not be prudent during an accident condition.

Upon reviewing the basis for this alarm, the licensee determined that the proper setpoint based on NPSH requirements should be -0.5 ± 0.2 psig. A DCR was generated to revise this setpoint. Changes to the ARP to differentiate between test and accident operation were initiated for the low suction pressure alarm.

(3) The core spray pump discharge strainer high differential pressure alarm was set for 5 psid increasing, to alert the operators of a clogged strainer. This differential pressure (dp) originally appeared to be too low to be effective based on the occurrence of several spurious alarms received during previous system testing. Work requests generated in response to these alarms to clean the strainers revealed that the strainers were clean.

The licensee performed calculations to determine the pressure differential expected across the strainers over the range of anticipated flow. These calculations show a range of blockage for a 5 psid alarm initiation from 18% at maximum strainer flow to 62% at test flow conditions. Because of this large range, the information provided by the alarm is of little value during system testing. As a result, the licensee committed to revise the surveillance procedure to require the strainers be cleaned when a differential pressure of 1 psid is reached during test conditions. This would ensure that the strainers were clean in the event of system initiation should an accident condition exist.

It was noted during this inspection that the system tubing configuration for the dp switches allows the sensing lines to partially drain back to the torus, via the core spray piping, after securing the system from operation. This causes air to be trapped in the sensing lines during system startup, leading to an erroneous indication or alarm. The team informed the licensee that the operators should be made aware of this condition and efforts should be made to vent the instruments prior to using the gages for dp readings.

Procedure OP-2 also directed the operators to secure the affected core spray subsystem in the event of a strainer alarm. This action would have caused a resultant increase in flow in the other subsystem, enhancing the probability of receiving the high dp alarm core spray for that subsystem as well. Again, a change in the ARP to differentiate between the required actions during test versus accident operation was also initiated by the licensee for this alarm.

In addition to the above core spray system alarm setpoints, the licensee undertook a review of all alarm setpoints within the engineered safeguard systems. This review identified the basis for each alarm and provided a determination of the adequacy of the current alarms and their respective setpoints.

The NRC team has reviewed the licensee's actions and considers them appropriate. Based on the intended implementation of the above changes prior to restart, this item is considered closed. The licensee plans to complete the review of the other engineered safeguard system alarms prior to unit restart.

(E) Control Room Flow Indication (Closed)

Inspection 88-201 identified the fact that the control room core spray system flow instrument covered a range from 0 to 5000 gpm. Expected flow rates, however, may range up to approximately 6400 gpm. Regulatory Guide 1.97 suggests a range for control room flow measuring instrumentation for ECCS systems of 0 to 110% of maximum flow. The current range does not meet this criteria.

Based on the limits of the installed flow devices, the licensee has committed to increase the range of the core spray system flow instrument from 5000 gpm to 7000 gpm. Modification number N1-88-107 has been prepared to make the change. This change is scheduled to be implemented prior to restart.

The team considers this change acceptable.

Summary of Item 2.2 (UNR 88-201-02)

As a result of this inspection, items 50-220/88-201-02 D and E are closed. Open issues A, B and C will be administratively tracked under unresolved item UNR 50-220/89-18-01.

(F) Inadequate Test Flow Rate (New Issue: UNR 50-220/89-18-02)

During this followup inspection, it was discovered that the design of the core spray system test bypass piping does not allow routine testing of the system at the upper ranges (greater than 3000 GPM) of its design flow rates. It was discovered that when the core spray system is operating in the test configuration at design flow rates, severe motion and vibration were experienced by the core spray test return line. Although the design point for each of the core spray pumps is 3400 gpm and the maximum flow upon which the Appendix K analyses was previously based was 4800 gpm (at approximately 0 discharge pressure), recent system testing limited flows to about 3000 gpm because of this problem.

A study performed by the licensee's consultant recommended that the flow be reduced to 2200 gpm, as measured by the core spray system flow meter, to eliminate most of the test line motion and vibration. However, this would place the test conditions even further from the relevant design flow range for the system. In addition, the consultant's analyses showed that in the range of about 2175 gpm to 2425 gpm, the core spray system minimum flow relief valve would be open. The flow through this device cannot be accurately estimated.

To address this concern, the licensee is planning to gag the core spray system minimum flow relief valve during quarterly system surveillance testing. The quarterly pump operability surveillance test on the core spray system, required by TS 4.1.1.6 will then be performed at 2200 gpm. The inspection team reviewed this testing method and determined it was permissible by TS and the licensee's IST program and was compatible with the Appendix K safety analysis. However, the licensee's resolution of this concern is not a practical, long-term solution and does not address the root cause of the problem-excessive head loss through the test bypass line. The licersee was made aware of this concern and stated that a permanent resolution to this problem is being pursued. This issue remains unresolved pending review of the licensee's long-term resolution of their core spray test line vibration problem, which necessitates system flow testing at lowered flow rates, and the review of their 10 CFR 50.59 safety evaluation regarding the acceptability of gagging the core spray relief during system testing while the plant is at power (UNR 50-220/89-18-02).

2.3 (Closed) Unresolved Item (50-220/88-201-03) - HPCI/FW System Design Deficiencies

Inspection 88-201 revealed that the licensee made unsupported assertions in the Technical Specification Bases about the performance characteristics of the high pressure core injection mode of the feedwater (HPCI/FW) system. By letter dated February 13, 1989, NMPC submitted a proposed change to the NMP 1 Technical Specification Bases for Sections 3.1.8 and 4.1.8. The inspection team reviewed the supporting calculations and found the new performance values for the HPCI/FW system acceptable. NRC letter of May 22, 1989, issued the revised Technical Specification Bases to the licensee. This item is closed.

2.4 (Closed) Unresolved Item (50-220/88-201-04) - Design Document Deficiencies

During the SSFI inspection, it was determined that the licensee failed to update design drawings, the FSAR and test procedures to reflect the system configuration of the core spray and HPCI/FW systems after modifications were made. The licensee took the following actions in response to the identified concerns:

(a) HPCI/FW system pump curves were revised to reflect the current configuration and the licensee committed to validate the pump curves by testing before the system was declared operable.

(b) The conclusions of GE Study NEDE 30241, "Performance Evaluation of the Nine Mile Point Unit 1 Core Spray Sparger," were verified to be the same for the new core spray system flow rates used in the revised 10 CFR 50 Appendix K Analyses.

(c) Drawings C-35843-C (Revision 3) and C-18015-C (Revision 18) were revised to reflect the correct value for the Reactor Pressure Vessel LO-LO-LO Level Alarm (296 feet-6 inches).

(d) Figures IX-1 of the FSAR and Procedure N1-ST-R2, "Loss of Coolant and Emergency Diesel Generator Simulated Automatic Initiation Test," Revision 13, were modified to show that one core spray pump motor on each bus did not trip on undervoltage conditions. This reflected current plant configuration.

The inspection team concluded that these actions were adequate to correct the specific deficiencies identified during the inspection. Additionally, the licensee has developed a Configuration Management System to identify and resolve future design documentation problems. This item is closed.

2.5 (Closed) Unresolved Item 88-201-05 : Emergency Operating Procedure (EOP) deficiencies

During inspection 88-201, the inspection team determined that EOP-4 directed the operators to add water to the torus per Operating Procedure OP-2 using the core spray keep-fill system when torus level dropped below an acceptable level. The team determined that while this was acceptable for normal operating circumstances, it was unacceptable in the post-LOCA condition when both core spray loops may be running and the keep-fill system is unavailable. To correct

this deficiency, the licensee revised the EOP-4 flow chart as well as OP-2 and OP-14 to direct the operator to fill the torus using the core spray keep-fill system if it is available or to refill the torus using the containment spray system via an installed crosstie with the raw water system. The inspector reviewed OP-2, Rev. 19 and Op-14, Rev. 30 as well as the P & ID's for the core spray and containment spray systems. No problems were noted with this method of torus filling.

In addition to this finding, the SSFI inspection noted that EOP-1, Item 6, "General Instructions," was deficient in that no warning was provided concerning the inherent errors of low-low-low Reactor vessel level instruments LI 36-19 and LI 36-20, which share a reactor vessel tap with the core spray system, when the core spray system was injecting into the vessel. To correct this deficiency, the licensee revised EOP-1, Item 6 to state that the low-low-low vessel level instruments should not be used if its associated core spray loop is injecting into the vessel. The inspector confirmed that EOP-1 was corrected as stated.

The remaining deficiency noted in the EOPs by the team was that Figures 2.1 and 2.2 regarding minimum NPSH limitations for individual core spray pump operation did not alert the operator to the fact that the flow indication available to the control room operator provides only combined pump flow. As a result, the licensee modified Figures 2.1 and 2.2 to indicate to the operator the maximum core spray system flow rates, with one and two core spray subsystems operating per loop, to ensure that core spray pump NPSH limits are maintained. The inspector verified that these changes were implemented by the licensee.

2.6 (Closed) Unresolved Item 50-220/88-201-06 - Deficiencies in the Licensee's Operating Procedures

During review of Operating Procedures OP-2, "Core Spray System," and OP-16, "Feedwater System Booster Pump to Reactor", the SSFI team noted numerous typographical errors, differences between control room indication labels and procedure descriptions, and differences between system drawings and procedure valve lineup sheets. The inspection team reviewed OP-2, Rev. 19 and OP-16, Rev. 17 and determined that the noted deficiencies had been corrected.

During review of the condenser hotwell level alarm setpoints provided in Procedure OP-15A, "Condensate System", the SSFI team noted that the setpoints listed in the procedure were inconsistent with Technical Specification requirements and actual plant setpoints. The inspection confirmed that the procedural errors had been corrected and that the actual plant setpoints agreed with the Technical Specifications.

In response to the findings identified in the above area, the licensee initiated a program to have an independent contractor review the annunciator response procedures for 12 safety-related systems as well as have operations personnel review all of the annunciator response procedures. The review identified additional errors which the licensee is in the process of correcting. In addition, the licensee is in the process of conducting their biennial review of all Operations Department procedures. The inspector reviewed a selected sample of the 1) findings of the licensee's contractor review of their alarm response procedures as well as 2) the findings of their reactor operator's review of these procedures for the core spray system. He noted that these findings had already been incorporated into a recent revision of the operating procedure for the core spray system. No problems were noted with the licensee's actions in resolving these procedural deficiencies or their actions with respect to the generic application of these procedures.

During a review of OP-46, "High Pressure Coolant Injection", SSFI the team noted that the procedure did not provide guidance to the operators to start the RBCLC and emergency service water systems following limited restoration of the 115 KV grid after a loss-of-offsite power event. The team discussed this finding with the licensee who stated that if the operator was in the situation noted by the inspection team, he would be directed to follow SOP-5 which instructs him to start an RBCLC pump and to verify that an emergency service water pump was running. Therefore, the licensee felt that no changes to OP-46 were necessary. The inspection team, after reviewing SOP-5, agreed with their conclusion.

During a review of Operating Procedure OP-2, Section 1.24, the inspectors noted that the response procedure for annunciator K2-4-7 did not specify that the core spray system should be reinitiated following shutdown of the system on high discharge pressure and subsequent depressurization of the system below 365 psig. The team reviewed OP-2, Rev. 19, Section 1.24 and noted that the procedure now calls for the reactivation of the core spray system once reactor pressure drops below 365 psig and the system isolation valves open.

A review of procedure S-SUP-Q6, "Control of Operator Aids' by the SSFI team revealed an excessive number of active operator aids, found that copies of outstanding operator aids were not maintained in the log and found that a number of the outstanding aids were of poor quality (e.g., Reactor Pressure Vessel level graph in the control room). The inspection team determined that the licensee has made adequate progress in reducing the number of outstanding operator aids, maintains copies of outstanding aids and has improved the quality of the operator aid for RPV level which was of concern to the inspection team.

In summary, the licensee has adequately addressed the noted deficiencies and the team considers this issue closed.

2.7 (Open) Unresolved Item (50-220/88-201-07) Core Spray System Testing

(A) Control of Pump Curves (Open)

Inspection 88-201 determined that the licensee failed to 1) maintain the core spray pump curves used in the LOCA analysis in a controlled manner, 2) validate the curves over the full range of expected core spray flows and 3) effectively translate the curve into surveillance test acceptance values to determine core spray system operability. Additionally, previous test values indicated that the core spray pumps might not deliver the flow assumed in the LOCA analysis. The licensee took the following actions in response to the identified issues:

(a) Developed MDC-11, "NMP-1 Pump Curve Acceptance Criteria," to ensure the control of all pump performance curves. Updates to the pump curves contained in MDC-11 will be administered and controlled through the NMP-1 Configuration Management System.

(b) Developed SEI-708, "Administration and Determination of NMP1 Testing Acceptance Criteria", to establish pump baseline reference values and apply ASME Code Section XI acceptance criteria.

(c) Validated the individual and combined performance of core spray system pumps prior to plant startup and HPCI/FW system pumps during plant startup.

(d) Revised their Appendix K LOCA analysis and applied previous core spray pump test values on the corrected curve. The data plotted above the new curve so that the flow assumed in the LOCA Analysis was adequately demonstrated by the surveillance tests.

The inspection team concluded that the proposed actions were adequate to correct the specific deficiencies identified during the inspection. In addition, the licensee plans to validate the performance of the Technical Specification required pumps listed in Appendix A to MDC-11 prior to plant startup. This concern will remain open pending NRC evaluation of the validated pump curves and acceptance criteria.

(B) Pump Testing Practices (Closed)

The SSFI inspection found that NMP1 pump testing practices were ineffective for evaluating pump performance and inconsistent with an NRC Safety Evaluation Report (SER) dated July 24, 1985, for core spray effectiveness in a steam environment. The SER required the surveillance test procedures for core spray operability to verify core spray pump and core spray topping pump performance characteristics over the full range of pressure and flow rates. By letters dated December 16, 1988, and March 28, 1989, NMPC committed to performing a one-time test of each core spray pump combination to validate pump combinations at several flow rates prior to plant startup. Subsequent surveillance testing is planned to be conducted at a single point (reference value) to demonstrate satisfactory performance.

The inspection team concluded that the licensee's actions adequately addressed the identified issues. The team also reviewed SEI-708 which formally established the licensee's methodology for evaluating pump performance and found it to be acceptable. This concern is closed.

(C) Core Spray Isolation Valves (Closed)

This issue pertains to the inconsistent surveillance test acceptance values for opening times for core spray system containment isolation valves (IVs) 40-02 and 40-12, and core spray test line IVs 40-05 and 40-06. By letter dated March 28, 1989, NMPC committed to revising the surveillance test acceptance values for core spray system IVs 40-02 and 40-12 to 20 seconds. The acceptance values for 40-05 and 40-06 will remain 25 seconds. The inspection team reviewed the core spray flow actuation sequence and found that the revised surveillance test acceptance values for 40-02, 40-12, 40-05 and 40-06 were consistent with their design safety analysis. This concern is closed.

(D) Core Spray Hydrostatic Testing (Closed)

This issue pertains to the hydrostatic testing of several sections of the NMP1 Core spray System at insufficient pressures. The licensee revised procedure N1-ISI-HYD-424, "Reactor Core Spray System," to meet the hydrostatic test pressure requirements of ASME Code Section XI. Additionally, by letter dated March 28, 1989, NMPC committed to performing hydrostatic tests of the core spray system at the revised pressures during the current outage. The team verified that the hydrostatic test pressures identified in N1-ISI-HYD-424 were consistent with ASME Code Section XI requirements. This concern is closed.

(E) Lack of FW Check Valve Testing (Open)

The SSFI Team was concerned with the licensee's lack of surveillance or inspection planned for the FW and FW Booster pump discharge check valves. The licensee evaluated incorporating HPCI/FW check valves into the IST program and concluded that this action would be unduly restrictive since the HPCI/FW system is not safety-related. The team reviewed the following actions proposed by the licensee to address the identified concerns and found them to be acceptable:

(1) Prepare surveillance procedures to reverse-flow test the FW and FW Booster pump check valves prior to startup.

(2) Conduct quarterly reverse-flow testing of the check valves for the HPCI/FW motor-driven feedwater pumps.

(3) Incorporate testing of the check valves in the shaft-driven feedwater pump train into the proposed Balance of Plant inspection plan.

This concern is open pending NRC review of the proposed surveillance procedures.

(F) ASME Section XI Testing on the Core Spray MOVs and Pumps (Open)

The SSFI team determined that the licensee was unable to implement meaningful ASME Code Section XI trending of the core spray system motor operated valves (MOV) and pumps because of insufficient margin between the design limits and the Technical Specification operability requirements. The licensee took the following actions in response to this concern:

(a) Revised the Appendix K (LOCA) analyses to reflect lower core spray sparger flow rates which should provide margin for pump degradation.

(b) By letter dated March 28, 1989, NMPC committed to evaluate MOV design and analytical changes to allow additional margin on MOV stroke times for trending purposes.

Since validated IST surveillance curves and reference values had not been developed for the core spray system, the team was unable to validate the licensee's ability to trend pump performance. The team noted limited design margin in other Technical Specification systems, such as the containment spray pumps. and reiterated as a generic concern that the existence of limited design margin may preclude the detection of degraded pump or valve performance prior to reaching Technical Specification limits. This concern is open pending NRC evaluation of the licensee's ability to implement ASME Code Section XI acceptance criteria for pumps and valves in their IST program.

(G) Core Spray NPSH (Closed)

This issue pertains to the licensee's failure to specify the minimum required inlet pressure for core spray pumps in procedure N1-ST-Q1, "Core Spray Pumps and Motor Operated Valves Operability Test," Rev. 2, as required by ASME Code Section XI. The inspection team's review determined that the licensee has revised procedure N1-ST-Q1 to include the minimum required inlet pressure for core spray pumps. This concern is closed.

(H) Inconsistent Core Spray Pump Pressure and Flow Data (Closed)

This issue pertains to the inconsistent pump discharge pressure and flow rate data obtained by the licensee during quarterly testing of the core spray system. The team reviewed the following actions taken by the licensee and concluded that they were adequate to address the identified concern:

(a) Tested the core spray system and determined that the pump discharge relief valves were the most likely cause of inconsistent test data. The test confirmed that the relief valves were lifting, causing flow diversion back to the torus via the recirculation line.

(b) Stated that the diversion of flow through the relief valves will either be accounted for in the pump performance analysis or halted by installing a blank flange or modifying the relief valves to allow gagging.

(c) Revised procedure N1-ST-Q1 to require the test line valve be throttled to maintain 2200 gpm for consistent flow rates during testing.

This item is considered closed. However, concerns relative to this area remain and will be tracked under UNR 50-220/89-18-02 (see Paragraph 2.2 (F))

Summary of Item 2.7 (UNR 50-220/88-201-07)

As a result this inspection, items B, C, D, G, and H of unresolved item 88-201-07 were closed. Items A, E and F remain open and will be administratively tracked as unresolved item (UNR 50-220/89-18-03).

2.8 (Open) Unresolved Item (50-220/88-201-08) - HPCI/FW System Testing

The SSFI inspection 88-201 identified that the licensee failed to adequately control HPCI/FW pump curves, accurately apply pump acceptance values to determine system performance, and conduct surveillance or inspection of FW booster pumps and FW condensate pumps to evaluate their performance. The inspection team reviewed the following licensee actions to address the identified concerns and found them to be acceptable:

(a) Incorporated all system pump curves including HPCI/FW pump curves into MDC-11 to ensure that they are maintained in a controlled manner.

(b) Proposed to develop and validate the individual pump performance curves for FW pumps, FW booster pumps and FW condensate pumps at several flow rates during plant startup, consistent with SEI-708. ASME Code Section XI acceptance criteria will be applied to the revised pump performance curves.

This item is open pending NRC evaluation of the validated pump performance curves. This item will be administratively tracked as unresolved item UNR (50-220/89-18-04).

2.9 (Open) Unresolved Item (50-220/88-201-09) - Corrective Actions and NRC Reportability

(A) NRC Reporting (Open)

This issue pertains to the licensee's failure to revise its Technical Specifications relative to core spray system operability to conform with the LOCA analyses specified in 10 CFR 50, Appendix K, as required by 10 CFR 50.46. The licensee failed to take adequate corrective action relative to 10 CFR 50.72 and 50.73 reports to the NRC and to address how they would identify unanalyzed safety conditions in the future. The licensee had not submitted a response to concerns at the time of this inspection. This concern is open pending NRC evaluation of the licensee's response to the identified issues.

(B) Core Spray/HPCI/FW MOV Stroke Times (Closed)

The SSFI inspection team raised a concern that the stroke times for Core Spray and HPCI/FW MOVs were in excess of ASME Section XI IST stroke time requirements. The inspection team evaluated the results of MOVATS tests performed on the suspect valves and concluded that their stroke times did not exceed specified limits. This concern is closed.

In summary, item A of unresolved item 50-220/88-201-09 remains open while item B is closed. This issue will be administratively tracked as unresolved item UNR 50-220/89-18-05.

2.10 Unresolved Item (50-220/88-201-10) - Operational Experience Assessment Program

The SSFI team was concerned about the licensee's large backlog of open and poorly responded to NRC and industry information items. Shortly before the start of Inspection 88-201, the licensee had initiated a program for review and evaluation of industry information items that pertained to NMP 1. Since the SSFI, the licensee has increased the manpower dedicated to reducing the backlog of open industry information and reevaluated the concerns addressed by the team. This inspection team reviewed the licensee's program and considered it adequate. The backlog of open NRC and industry information items was reduced from 336 to 218 items. The licensee developed a prioritization system to review and classify those remaining items for completion prior to restart.

This issue is also addressed in the NRR Special Team Inspection 50-220/89-80.

This item is closed.

3.0 Discussion of Licensed Operator Attitudes

An assessment was made of licensed operator attitudes at Unit 1 during this inspection. In dealings with licensed senior reactor operators (SROs) during the conduct of this inspection, the inspectors noted cooperative and consciencious efforts on the part of the SROs to resolve open NRC concerns and in resolving day-to-day plant problems. The SROs displayed good motivation and clearly expressed a desire to achieve improvements. Cooperation on the part of the operations staff was excellent and professionalism was evident.

4.0 Unresolved Items

Unresolved items are matters about which additional information is necessary in order to determine whether the condition is acceptable or a violation of NRC requirements. Four of the original SSFI team inspection items, 88-201-02, 88-201-07, 88-201-08 and 88-201-09 remain open, as described in paragraphs 2.2, 2.7, 2.8 and 2.9 of this report. These items will be administratively tracked as items 89-18-01, 89-18-03, 89-18-04 and 89-18-05, respectively. A new unresolved item 89-18-02, was identified during this inspection and is described under paragraph 2.2(F) of this report. Table 1, attached to this report, cross references each of these findings for tracking conveniences.

5.0 Exit Interview

At periodic intervals during the course of this inspection, meetings were held with senior facility management to discuss the inspection scope and findings. An exit interview was held on June 16, 1989, to discuss the findings and conclusions of this report period. During the discussion, the licensee did not identify any 10 CFR 2.790 material.

TABLE 1

Status of SSFI Findings and Administrative Tracking

SSFI (88-201) Concerns	SSFI Followup Inspection (89-18) Concern
88-201-01	Closed
88-201-02	89-18-01
88-201-03	Closed
88-201-04	Closed
88-201-05	Closed
88-201-06	Closed
88-201-07	89-18-03
88-201-08	89-18-04
88-201-09	89-18-05
88-201-10	Closed
New issue described under concern 88-201-02	89-18-02