U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION

NRC Inspection Report: 50-220/96-201 and 50-410/96-201 License Nos. DPR-63 and NPF-69

Docket Nos.: 50-220 and 50-410

Licensee: Niagara Mohawk Power Corporation

Facility Name: Nine Mile Point, Units 1 and 2

Inspection Conducted: January 16 through 23, 1996

Inspection Team: S.K. Malur, Team Leader, Special Inspection Branch
D.M. Barss, Emergency Preparedness and Radiation Protection Branch
T.H. Boyce, Standardization Project Directorate
T.Foley, Special Inspection Branch
J.A. Isom, Special Inspection Branch
R.B. Manili, Safeguards Branch
R.K. Mathew, Special Inspection Branch
D.J. Nelson, Inspection Program Branch
H. Wang, Special Inspection Branch
J.E. Wigginton, Emergency Preparedness and Radiation Protection Branch

Prepared by: S.K. Malur, Team Leader, 2/14/96 Date
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Reviewed by: Donald P. Norkin, Section Chief, 2-16-96 Date
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Approved by: Michael R. Johnson, Acting Branch Chief, 2/16/96 Date
Special Inspection Branch
Division of Inspection and Support Programs
Office of Nuclear Reactor Regulation

Enclosure

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The in-office review phase of the integrated performance assessment of both units of the Nine Mile Point Nuclear Station was conducted by the Special Inspection Branch of the U.S. Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation during the weeks of January 16 and 22, 1996. The purpose of this in-office review was to develop an integrated perspective of performance strengths and weaknesses based upon a review of inspection reports, event reports, and other NRC and licensee generated information. The assessment covered a two year period from January 1994 to December 1995. A two week on-site assessment scheduled for the weeks of March 4 and March 18, 1996, will be conducted to validate the results from the in-office review.

In the area of Safety Assessment/Corrective Action, the licensee was effective in problem identification, but problem analysis and problem resolution were indeterminate. The deviation/event reports were utilized effectively in problem identification by all levels of the organization, as documented in several NRC inspection reports and licensee quality assurance audits. Root cause evaluations for significant issues appeared to be properly conducted, and the quality and depth vary appropriately with the significance of issues. Audits performed by the quality assurance branch were thorough. For example, the corrective action program audits required by the technical specifications, radioactive liquid and gaseous waste control program audits, maintenance program audits, and surveillance of the MOV program were broad in scope and good in technical depth. However, the trending and evaluation of data from the DER process appeared to be an area that needed to be improved, particularly in cause identification, trend code application, and identification of preventive actions. The disposition of issues in the DER process generally was thorough, although some examples of weaknesses were identified. Resolution of recurring problems with rod position indication at Unit 2, repeated repairs to the reactivity control system, and missed TS surveillances appeared to be not thorough. The licensee's performance in the analysis and evaluation of problems, implementation of recommendations from assessments, and the effectiveness of corrective actions, will be further assessed by the team during its on-site inspection.

The performance of the operations management and personnel in response to events was good, and the licensee displayed a conservative approach to operation of both units. Operations was generally attentive to degrading or unusual equipment conditions, but operators missed opportunities to identify abnormal conditions such as, valves not in their correct position, and an inoperable temperature recorder for the safety relief valve tail pipe. Procedural weaknesses and recurring personnel errors appeared to have not been completely addressed. Operator performance during normal operation was satisfactory, and operator responses during plant transients was excellent. Operations programs and procedures including adequacy and usage where indeterminate will be reviewed further during the site visit.

Generally, the engineering staff demonstrated proper safety perspective in thorough and technically accurate operability evaluations of plant issues. Engineering identified numerous plant problems and resolved them appropriately, although there were a few instances where problems were not noted and properly evaluated. For example, Unit 2 emergency diesel generators had operated outside their design basis since initial plant startup due to a design deficiency with the governor cooling water system, and pressure locking and thermal binding of risk significant motor operated valves (MOVs) in Unit 2 high pressure core spray system were not identified for resolution. Also, the NRC had identified weaknesses in the resolution of some of the plant issues such as the longstanding problem of electrical noise interference with neutron monitoring system and the corrective actions in response to operational experiences regarding Agastat relay failures at Unit 1. Plant modifications and calculations were technically sound, and were properly documented. However, design changes to the hydrogen and oxygen systems and installation of a check valve in the service water line to a room cooler required further work to make the equipment function acceptably. Engineering programs and procedures including adequacy and usage where indeterminate will be further reviewed during the site visit.

The performance of maintenance during the outages at both units indicated significant licensee management attention to the refueling and outage planning activities. Maintenance activities were generally well planned and executed. Pre-job briefings were generally satisfactory, but where repetitive work was being performed, briefings were not effective as evidenced by the unintentional reactor recirculation pump runback incident. Identification and resolution of problems, equipment performance and material condition, and programs and procedures will be reviewed further on site.

In the Plant Support areas of Radiological Controls and Security, the licensee demonstrated strong performance in safety focus, problem identification and resolution, and programs and procedures. Radiological exposure goals were met, thorough self-assessments were performed, and programs and procedures were effective. The licensee had thoroughly evaluated the security program, implemented corrective actions, and the security plan and procedures were in compliance with regulations. Performance in the area of Emergency Preparedness was weak as evidenced by deficiencies in the exercises conducted during the last two years. During the October 1995 exercise, the licensee staff did not properly evaluate plant conditions and did not recognize and properly classify the emergency event in a timely manner. Also, during the October 1994 exercise, the emergency event was incorrectly classified due to an error in the dose projection calculations.

OVERALL ASSESSMENT SCOPE AND OBJECTIVES

This Integrated Performance Assessment of both units of the Nine Mile Point Nuclear Station is being performed in accordance with NRC Inspection Procedure 93808 "Integrated Performance Assessment Process." The assessment is divided into: an in-office review performed at NRC headquarters; an on-site assessment to validate the observations from the in-office review; and a final analysis of the results of the assessments and development of inspection recommendations. The assessment is being conducted by the Special Inspection Branch of the Office of Nuclear Reactor Regulation. The in-office review was performed during the weeks of January 16 and January 22, 1996. The on-site assessment is scheduled to be performed during the weeks of March 4 and March 18, 1996.

The assessment objectives are to develop an integrated perspective of licensee performance and arrive at recommendations for future inspection focus in the areas of Safety Assessment/Corrective Action, Operations, Engineering, Maintenance, and Plant Support. The in-office review covers NRC inspection reports, licensee event reports (LERs), enforcement history, regional assessments, and licensee internal and external assessments. The results of the in-office review are included in this preliminary report. The references contained in the report are listed in Appendix A. The preliminary results are presented on the Preliminary Performance Assessment/Inspection Planning Tree in Appendix B.

Following the issuance of this report, the team will validate its observations via a performance based, on-site assessment. The results of the on-site assessment and in-office review will be used during the final analysis and development of inspection recommendations and will be documented in a final report to be issued after the conclusion of the on-site assessment. The final assessment report will include recommendations on where to focus future NRC inspection effort, and these recommendations will be depicted on a Final Performance Assessment/Inspection Planning Tree.

ASSESSMENT METHODOLOGY

During the in-office review, the team evaluated the Nine Mile Point inspection record and performance history for a two year period spanning January 1994 to December 1995. Available licensee quality assurance (QA) audit reports and other self-assessment documents were reviewed. The review results were utilized to assign performance ratings of either decreased, normal, or increased inspection to the individual elements in each assessment area. Where the team's review of inspection data and licensee information was inconclusive, or where sufficient information was not available to come to meaningful conclusions, individual elements were rated as being indeterminate.

Ratings for the <u>overall</u> performance in the areas of Safety Assessments/Corrective Action, Operations, Engineering, Maintenance, and Plant Support were not addressed during the in-office review phase.

The results obtained from the in-office review will be used by the assessment team to develop individual on-site assessment plans for each of the assessment areas. During the on-site review, the team will focus on those areas rated as indeterminate and those where the inspection or performance data record indicated potential performance weaknesses. The team will also validate the elements that were assigned decreased or normal inspection ratings. Following the on-site phase of assessment, the team will issue a final assessment report.

1.0 SAFETY ASSESSMENT AND CORRECTIVE ACTION

1.1 Problem Identification

The licensee's programs for identifying equipment, human performance, and plant program deficiencies are the deviation/event report (DER) process, the quality assurance (QA) audits, and self-assessments. These programs, in general, were effective in identifying problems at both units.

On the basis of evaluation of about 40 safety-significant deviation/event reports (DERs), an NRC team determined that the DER process was an effective tool for identifying significant issues, and the threshold for initiating DERs used by station shift supervisors and other parts of the organization was appropriate (ref. 1). Thousands of DERs were written at the facility each year by all levels of the licensee organization. In the first quarter of 1995, 945 DERs were written, of which about 13% were significant and about 2% required root cause evaluations to be performed (ref. 2).

Self-assessments by line organizations were effective in identifying problems. For example, in maintenance, a self-assessment on instrumentation and controls (I&C) post-job critiques identified that improvements in feedback on job performance and attention to detail were needed (ref. 2). Also, inspection reports noted that recent self-assessments of human errors conducted by each department were thorough and critical. Designated branches presented findings to other branch managers for peer review, identified predominant and secondary causes, and trended human errors (ref. 3).

Independent assessments by safety review groups, including the Independent Safety Engineering Group (ISEG)(for Unit 2 only), the Station Operations Review Committee (SORC), and the Safety Review and Audit Board (SRAB) were effective. They reviewed a considerable number of plant activities and reports such as DERs, licensee event reports (LERs), safety evaluations and proposed modifications, industry events, NRC generic correspondence, inspection reports, quality assurance audit reports, and other licensee generated reports. The review activities and final recommendations were well documented (refs. 1 and 5).

The QA audits performed by the Nuclear Quality Assurance Branch appeared to be of particularly good quality and of sufficient depth to identify both failures to comply with applicable requirements and areas for improvement in the licensee programs and management oversight of the facility. The QA audits for the following were broad in scope and good in technical depth: radioactive liquid and gaseous waste control programs (ref. 7); maintenance program (ref. 2); and surveillance of the MOV program (ref. 8).

A combined utility assessment group (CUAG) performed an independent assessment of the effectiveness of the licensee's QA program. The CUAG review appeared thorough, identifying weaknesses in follow-up of QA findings that resulted in changes to QA audit procedures for post-audit evaluation of findings by the audit team and tracking of recommendations by the QA branch (ref. 9).

The ISEG reports for 1994 and 1995 covered all the plant activities, and provided many useful observations and recommendations regarding analysis of plant activities and operating experience. For example, the ISEG performed periodic reviews of the maintenance activities at Unit 2 and made recommendations to correct long standing unresolved problems with the service water strainers (ref. 45).

Normal inspection in this area is recommended.

1.2 Problem Analysis and Evaluation

The licensee's performance in problem analysis and evaluation appeared to be satisfactory, though weaknesses in evaluating repetitive problems and DER evaluation were noted. Root cause evaluations for significant events or those directed by the plant management appeared to be properly conducted, and the quality and depth of the evaluation varied appropriately with the significance of the issue. In general, the analysis and disposition of DERs were effective. Examples of effective dispositions included an analysis to support the Unit 2 high pressure core spray unit cooler operability concern (ref. 15), and the review of the safety-related issues related to intergranular stress corrosion cracking of the reactor core shroud at Unit 1 (ref. 38). The DERs evaluated by the Unit 2 operations department were noted to be consistently excellent (ref. 1). However, several DERs documented repetitive problems which indicated that evaluation and resolution of problems were not always effective. Examples of these included loss of rod position indication at Unit 2 (ref. 15), repeated repairs to the redundant reactivity control system (ref. 14), missed Technical Specification surveillances for leak rate testing the personnel airlock and emergency airlock (ref. 32), and not identifying and replacing Unit 1 Agastat relays before they were severely degraded (ref. 3).

Trending and evaluation of the DER program appeared to be an area where improvements were necessary, based on issues identified by the licensee in QA Audits and ISEG reports. The DER program trends the conditions that led to the initiation of the DER using industry established causal factor codes. This information was periodically evaluated by the quality assurance department and presented to the branch managers to assess performance trends. The licensee identified errors in cause identification, trend code application, and identification of preventive actions in the DER system. The licensee also concluded that continued management attention was needed to assure that problem causes were fully identified and that preventive actions address these problems (ref. 9). An NRC team noted that the most prevalent causal factors continued to be work practice failures, i.e., documents not followed correctly and poor self-checking. Further, some QA assessments identified the need to improve the quality of apparent and root cause determinations because some DERs did not adequately account for human performance factors, and thus did not provide actions that would prevent recurrence of the events were not performed (ref. 1).

Overall performance in problem analyses and evaluation is indeterminate pending the team's on-site assessment.

1.3 Problem Resolution

The dispositioning of DERs was generally timely, and the DER backlog appeared to be satisfactorily managed at both units. For example, although thousands of DERs were issued each year, the backlog was decreasing. Prioritization and periodic review of the DER backlog was appropriate to ensure that significant safety issues were promptly dispositioned (ref. 1).

In general, the licensee's corrective actions to resolve issues were effective. However, corrective actions taken in response to poor human performance problems appeared to be not effective, as evidenced by continued personnel performance issues in the Unit 1 reactor recirculation pump runback event (ref. 22), Unit 2 reactor trip during swapping of battery chargers (ref. 12), failure to verify logic circuit for the auto transfer feature of the power board at Unit 1 (ref. 23), and other instances described in the other sections of this report. The information available to the team was not sufficient to assess the licensee's performance in the implementation of recommendations from assessments and the effectiveness of corrective actions.

Overall performance in this area is indeterminate.

2.0 OPERATIONS

2.1 Safety Focus

Generally, the operators and the operations department management made conservative operational decisions and displayed a conservative approach to operations of both Unit 1 and Unit 2. Shift supervisors directed and managed plant scrams and other plant transients well. For example, the Unit 2 shift supervisor displayed good command and control after the reactor recirculation pumps tripped when the redundant reactivity control system was de-energized for troubleshooting (ref. 14) and in response to a high main turbine vibration during a unit shutdown (ref. 15).

The licensee management provided good support to the operations staff during a forced shutdown at Unit 2 to address various operational issues (ref. 16). Senior station management provided direction during the recovery phase of a partial loss of offsite power event when Unit 2 was in cold shutdown (ref. 14). Effective and significant management involvement in the oversight of the licensed operator requalification training program was noted (ref. 17).

Although, in general, responses to events by both operators and operations department management were conservative, in a few instances the decisions were not. In one case, reviews performed by the senior reactor operator and operations planning personnel did not identify the potential Technical Specifications (TS) implications of the erroneous rod position indication system. This resulted in the Unit 1 remote shutdown panel being inoperable during power operation (ref. 18). In another instance, a division of service water system was placed in service at Unit 2 without an operable radioactivity monitor or appropriate compensatory action as required by the TS (ref. 19). Further, the licensee management decided to postpone repairing a valve, which was part of a reactor coolant system pressure boundary, during the Unit 2 third refueling outage. Subsequently, the unit was required to be shutdown due to increased reactor coolant system leakage from the valve (ref. 20).

Normal inspection is recommended in this area.

2.2 Problem Identification/Problem Resolution

Inspection reports indicated that operators were attentive to equipment conditions and identified problems. For example: during the performance of a monthly test on the liquid poison system, Unit 1 operators identified and corrected a problem with the test equipment (ref. 5); Unit 1 operators identified arcing on the exciter end of #13 reactor recirculation pump motor generator set while completing turbine rounds (ref. 21); and operators properly identified a plant process computer failure at Unit 1 (ref. 21). These issues were appropriately documented in DERs.

Though problem identification by operations personnel was generally good, a few instances were noted where the control room operators did not identify conspicuous deficiencies. Unit 2 control room operators failed to notice that the safety relief valve (SRV) tail pipe temperature recorder had been inoperable because of inadequate monitoring of the recorder by the operators (ref. 14). Also, the control room operators were not aware that the Unit 1 nitrogen tank low pressure alarm did not come on as designed when the tank remained empty (ref. 14) and that one of the shutdown cooling system temperature control valves was about 85% open instead of being shut during power operations. This condition was identified on the control board by an NRC inspector immediately following the operators' board walkdown during shift turnover. Subsequent followup by the licensee identified that several other valves were out of position (ref. 13).

Throughout the period of review, the licensee continued to experience problems attributed to operators' involvement with the work control process. During the inspection of a reactor recirculation pump (RRP) runback event, NRC identified deficiencies in operator review of the work order and oversight of the work (ref. 22). A licensed operator misinterpreted a procedure step which led to bearing damage on the #11 control rod drive pump (ref. 24). Unit 2 lost shutdown cooling for fifteen minutes due to an inadequate review of a markup (ref. 23). The licensee performance in problem resolution, and the effectiveness of corrective actions will be assessed further on site.

Overall performance in this area was indeterminate.

2.3 Quality of Operations

Numerous examples of appropriate operator responses to reactor scrams and other plant transients were noted. For instance, the operating crew at Unit 1 reacted promptly and properly to a reactor scram to minimize the transient on the plant (ref. 23). Following the Unit 1 RRP runback event the operators correctly assessed plant conditions, recognized the low reactor core flow conditions, and reduced reactor power level away from the restricted area of the power-to-flow operating map by inserting control rods (ref. 22).

The operators generally demonstrated adherence to procedures, displayed proper communication, followed effective self checking and peer verification techniques, and demonstrated a good questioning attitude. Also, management oversight created a professional, efficient, safety-oriented control room atmosphere. The operations staff demonstrated an excellent knowledge of the plant systems, operating procedures, and current plant status. Shift turnovers and briefs, with few exceptions, provided sufficient detail to maintain proper continuity during ongoing evolutions and to keep the operations crew knowledgeable of current plant issues/problems and upcoming evolutions. During special evolutions, systems engineering staff and/or operations staff provided a technical brief and senior plant management provided expectations for the conduct of the evolution (ref. 25).

However, there were instances of operator performance that were not satisfactory. Examples include: Unit 1 reactor operators had not performed required voltage checks across an auto transfer logic circuit in accordance with operating procedures which required additional operator actions to restore reactor pressure and water level following a reactor trip (ref. 23); Unit 1 reactor operator did not properly position the reactor mode switch after a reactor scram (ref. 23); suppression chamber spray mode of the residual heat removal system loop "A" at Unit 2 was disabled because the reactor operator did not review the field copy to verify that each individual valve had been returned to the correct position (ref. 14); and Unit 2 operator inadvertently de-energized an emergency DC bus, causing both reactor recirculation pumps to trip (ref. 12).

In addition, the following examples of weaknesses in operations involvement with the work control process were noted: inadequate work order review and control room communication which were partly responsible for Unit 1 recirculation pump runback and turbine trip (ref. 22); misinterpretation of a procedure step which led to bearing damage on the #11 control rod drive pump (ref. 24); lack of control room operations oversight at Unit 1 contributed to a reactor scram during performance of a surveillance procedure by maintenance (ref. 41); loss of shutdown cooling at Unit 2 for fifteen minutes due to an inadequate review of a markup (ref. 23); and maintenance was inappropriately authorized on two control rod hydraulic control units simultaneously instead of sequentially, resulting in operations failing to comply with a technical specification action statement at Unit 2 (ref. 26).

Normal inspection is recommended in this area.

2.4 Programs and Procedures

The licensee had established an effective operator training program. For example: the training of the on-shift licensed operators was effective in mitigating the consequences of the recirculation pumps runback event (ref. 22); senior reactor operator (SRO) and Unit 1 reactor operator applicants exhibited very good performance during all parts of the examination with few generic weaknesses (ref. 27); Unit 2 SRO applicant crew briefs were complete and concise, and command and control was strong (ref. 28).

There were examples of inadequate procedures or inadequate use of procedures which have led to some errors and operational events. These included: use of a procedure that did not incorporate the correct system configuration led to a resin spill at Unit 1 (ref. 6); loss of Unit 2 reactor recirculation pumps during a reactor startup and mispositioning Unit 2 suppression pool spray valve due to procedure weaknesses or inadequacies (ref. 14); and not performing TS surveillances on primary containment isolation valves because operations department surveillance procedure was not updated (ref. 15).

Overall performance in this area was indeterminate, pending further on-site review of procedure adequacy and usage.

3.0 ENGINEERING

3.1 Safety Focus

The licensee's engineering management and engineering staff had established a good safety perspective as demonstrated by the thorough and technically accurate operability evaluations of plant issues. Examples of conditions that were evaluated properly by engineering to determine that the plant could be safely operated included the following: core spray sparger rejectable crack indication at Unit 1 (ref. 12); incorrect fuse installation in Unit 2 reactor protection system (ref. 14); and elevated temperatures at the termination points and fuses inside control room panels at Unit 1 (ref. 29).

The successful implementation of the hardened wetwell vent modification at Unit 1 (ref. 30) and the station blackout (SBO) rule at Unit 2 (ref. 4) demonstrated management's involvement in engineering activities.

Although engineering activities were performed well, a few weaknesses as a result of inadequate review or inattention by management were noted. Examples of such weaknesses were: NRC identified programmatic weaknesses in the Unit 2 Appendix J program and Generic Letter (GL) 89-10 motor operated valve (MOV) program (refs. 8 and 23); and deletion of the licensee's commitment to install R.G. 1.97 Category 1 instrumentation for drywell water level at Unit 1 without proper review (ref. 32).

Normal inspection is recommended in this area.

3.2 Problem Identification/Problem Resolution

The engineering staff, in general, were effective in identifying problems. Specific examples included the following: the process computer indication of feedwater flow at Unit 1 was not consistent with design calculations resulting in operation at above the rated core thermal power limit (ref. 15); the reactor building integrity was not maintained at Unit 1 because a secondary containment bypass flow path was not accounted for (refs. 16 and 33); and part of the control rod drive flow was not included in the heat balance and core thermal power calculations resulting in operation above Unit 2 rated core thermal power limit (refs. 3 and 34).

However, there were a few examples where the engineering staff failed to identify plant issues on a proactive basis. Examples of these weaknesses included the following: Unit 2 emergency diesel generators (EDGs) had operated outside their design basis since initial plant startup as a result of the inadequate design of the governor cooling water system (ref. 12); and during the power ascension testing associated with the Unit 2 power uprate, the reactor had to be manually scrammed because of low flow to the stator cooling heat exchanger because of an inadequate design review (ref. 10).

The licensee implemented a self-assessment program to determine the performance of nuclear engineering and technical support groups and to identify strengths and weaknesses of these groups. A review of Unit 2 DER self-assessment trends for the period July-September 1995 indicated that the design configuration and analysis weaknesses were the most frequent. The NRC inspection reports noted that the licensee's self-assessments of the electrical distribution system and the SBO rule implementation program at Unit 2 were comprehensive and of high quality (ref. 4). The QA audits of the design control and configuration management program were thorough (refs. 11, 29 and 35). The ISEG performed adequate oversight activities of the licensee's design change process at Unit 2 (refs. 36 and 37).

In general, the licensee's engineering staff thoroughly evaluated the identified issues and provided adequate technical support for resolving them. For example: an analysis to resolve the Unit 2 high pressure core spray system switchgear unit cooler operability concern was performed promptly (ref. 15); safety-related issues related to intergranular stress corrosion cracking of the reactor core shroud at Unit 1 were thoroughly reviewed (ref. 38); steps were initiated to improve the performance of Unit 2 service water system and to resolve deficiencies identified in a self-assessment (ref. 15); and issues from the electrical distribution system functional inspection (EDSFI) were thoroughly evaluated and corrective actions were implemented (ref. 40).

However, weaknesses in the ability of the licensee's engineering staff to resolve plant problems effectively were noted. The engineering staff was slow in resolving the longstanding problem of electrical noise interference with the Unit 1 neutron monitoring system (ref. 11). The licensee's corrective actions in response to operational experiences regarding Agastat GP relay failures and potential problems in using commercial-grade 7000 series agastat relays at Unit 1 were inadequate (ref. 3).

Normal inspection is recommended in this area.

3.3 Quality of Engineering Work

Both the engineering and technical support personnel generally performed their functions well and adequately resolved plant problems. Plant modifications and calculations were technically sound and properly documented. The safety evaluations, design input, and technical reviews were thorough (refs. 10, 11 and 35). Good engineering performance was evident in the following: the battery capacity and effect of loss of ventilation calculations, and safety evaluations for Unit 2 SBO implementation (ref. 4); analysis for NRC supplemental information related to potential problems with the BWR water level instrumentation (ref. 32); and APRM alarm and rod block modification and post-modification testing for Unit 2 (ref. 24).

However, a few examples of less than adequate engineering support were noted. Examples of these weaknesses included the following: ineffective coordination of Unit 1 hydrogen and oxygen monitoring system modification that required a second modification to make the system functional (ref. 35); ineffective design change for Unit 2 service water check valve replacement that required a second valve design and replacement (ref. 3); and inadequate consideration of system interactions for the modification to correct the Unit 2 scram discharge volume (SDV) high-level alarm and control rod block signal that required another modification to correct the problem (ref. 14); and inadequate evaluation of pressure locking and thermal binding of MOVs resulting in not identifying two risk significant Unit 2 high pressure core spray system MOVs which were susceptible to pressure locking (ref. 18).

Normal inspection is recommended in this area.

3.4 Programs and Procedures

The licensee effectively implemented several engineering programs at both units. Examples included: a program to monitor the corrosion of the Unit 1 torus and the corrosion residue on containment and core spray components (ref. 11); an acceptable program for implementing the SBO rule at Unit 2 (ref. 4); a comprehensive design-basis reconstitution program at Unit 1 (ref. 29); a comprehensive and effective training program for the engineering and technical support staff at both units (ref. 35); a program to simplify and upgrade the engineering procedures at both units (ref. 29); and a good like-in-kind replacement program for component replacements (ref. 35). The plant modification procedures at both units provided detailed guidance to ensure that plant modifications were designed and implemented in a safe and controlled manner (ref. 35).

However, programmatic weaknesses were identified in a few engineering programs. For example, the NRC identified several weaknesses in the GL 89-10 motor operated valve (MOV) program at both units because of inadequate engineering justification and review (ref. 8). Weaknesses were also identified in the implementing procedures for the Appendix J program and in the surveillance procedures and their implementation for valves in the inservice testing (IST) program at Unit 2 (refs. 23 and 42).

Overall performance in this area is indeterminate, pending further review of engineering programs and procedures.

4.0 MAINTENANCE

4.1 Safety Focus

The performance of maintenance during the outages at both units indicated significant licensee management attention to the oversight of refueling and maintenance outage planning. Unplanned outage delays were minimized, backlog of work orders were reduced, and outage schedules were adhered to. The licensee met the pre-outage goals for outage duration, radiation exposure, industrial safety, and contamination control. The Unit 1 reactor core shroud modifications were completed without any major difficulties, and maintenance performance and licensee oversight of contractor activities were noted as satisfactory (ref. 12). Though the reactor fuel vendor for Unit 1 had not recommended additional inspections, the licensee was proactive in inspecting all new GE 11 fuel assembly lower tie plates for possible debris (machine shavings) because GE 9 fuel assemblies being fabricated for another utility were reported to have had debris problems (ref. 44).

Although the licensee management prioritized and completed work to ensure appropriate safety equipment performance and reliability (ref. 35), instances were noted where equipment problems were not effectively resolved. Repetitive and continuing control rod position indication problems at Unit 2 were not aggressively pursued (ref. 15). The redundant reactivity control system at Unit 2 failed and was declared operable each time after repair, because the root causes and long-term solution were not determined until numerous failures occurred (ref. 14). Pre-job briefings generally were adequate, however, for repetitive work that was successfully performed previously, briefings were not adequate as evidenced by the unintentional RRP runback incident at Unit 1 (ref. 22).

Normal inspection in this area is recommended.

4.2 Problem Identification/Problem Resolution

The licensee's maintenance department, the ISEG, and QA organizations identified maintenance related problems through the use of the DER process. For example, electricians at Unit 2 wrote DERs to correct environmental qualification discrepancies noted on solenoid operated containment isolation valves. Thorough followup by the licensee was evidenced by inspection of all similar valves, operability determinations, and consultation with the vendor (ref. 24). The licensee monitored an increasing trend in the Unit 2 emergency diesel generator start time, identified problems with the air starting system, and replaced the system components to correct the problems (ref. 3). The licensee management promptly resolved problems with the master power connecting rod on the Unit 2 emergency diesel generators after receipt of vendor notification of the defect (ref. 16).

During a review of a completed preventive maintenance activity, QA identified non safety-related electrical contacts being used in safety-related applications. This was promptly corrected (ref. 21). Also, QA audits identified and required the correction of deficiencies in the implementation and documentation of the TS snubber examinations, which were resolved by the licensee through a series of corrective actions (ref. 49). Periodic reviews of the maintenance activities at Unit 2 were performed by the ISEG, including review of maintenance related DERs, review of hardware problems, assessment of work packages, and observation of ongoing maintenance work. ISEG provided recommendations for resolving noted problems.

The licensee's performance in resolution of long standing and repetitive problems was less than adequate in the following examples: the loss of rod position indication at Unit 2 (ref. 15) and personnel errors resulting in missed TS surveillances (ref. 32). Resolution of identified problems, and comprehensiveness and tracking of corrective actions require further review.

Overall performance in this area is indeterminate

4.3 Equipment Performance/Material Condition

Equipment performance problems were identified such as, inadequate cooling of Unit 2 emergency diesel generator governor (ref. 12), inoperable hydrogen recombiners at Unit 2 due to obstruction in its flow path (ref. 46) and excessive wear of the backwash arm assembly of the service water self-cleaning strainer at Unit 2 (ref. 45). The licensee implemented corrective actions to resolve these problems.

Equipment performance and material condition problems had caused reactor trips, forced shutdowns, or plant transients at both units. Examples at Unit 1 included electrical noise in intermediate range monitors (ref. 47), steam leaks in reheater drain tank manway (ref. 23), and failure of generator protective relay (ref. 48). Examples at Unit 2 included nitrogen leak from a solenoid valve in drywell (ref. 25), a switch failure in the turbine generator electro hydraulic control system (ref. 25), and inoperability of both EDGs because of governor oil temperature concerns (ref. 12).

Overall performance in this area is indeterminate, pending the team's on-site review equipment performance and maintenance history.

4.4 Quality of Maintenance Work

Maintenance work practices, communications, direction and control, and personnel knowledge contributed to achieving pre-outage goals during the outages at both units (refs. 2 and 23). Examples of well planned and executed maintenance activities with good pre-job briefings, coordination, supervisory oversight, and ALARA considerations were: Unit 1 reactor core shroud modifications (ref. 38); repairs to Unit 1 main steam line break temperature switches (ref. 10); Unit 2 service water pump discharge check valve repairs (ref. 24); installation of spent fuel racks in Unit 1 (ref. 24); and replacement of the valve body of the solenoid-operated pilot air supply isolation valve at Unit 2 (ref. 21). Post-outage critiques identified such areas for improvement as, planning, implementation, and outage oversight to strengthen the outage process for future outages (ref. 23).

However, a few examples of poor work practices and inadequate self-checking and peer verification were identified. These included: catch containments under leaking valves in Unit 1 were allowed to remain in place without active work orders or assigned problem identification numbers (ref. 3); deficient pre-job briefing, not following work order, lack of independent verification, and deficient control room communication during reactor recirculation pump controller maintenance at Unit 1 that caused a plant transient (ref. 22); poor work practices that allowed metal filings, grinding wheel dust, and excessive lubricant to remain in tubing during replacement of flexible pneumatic supply lines to pilot solenoid valves on safety relief valves (ref. 39); and fasteners on environmentally qualified covers on solenoid valves were missing, loose, or of the wrong type (ref. 24).

Normal inspection is recommended in this area.

4.5 Programs and Procedures

In general, work orders, maintenance procedures, and surveillance procedures were noted to be adequate for the associated activities. Safety-related work packages appropriately documented the work including proper verifications and material control (ref. 15).

Weaknesses in procedure quality were noted in the inspection reports. The surveillance test procedure for reactor water level high/low level inputs to the reactor protection system at Unit 1 was poorly written and cumbersome to use (ref. 21). The program for Unit 2 emergency diesel generator governor oil changeout did not identify operating temperature limits and did not incorporate vendor recommendations (ref. 12 and 50). Personnel errors associated with Unit 1 reactor recirculation pump controller maintenance were caused, in part, by work order development process deficiencies in format, detail, direction, precautions, and sequence/order (ref. 22). The licensee's maintenance programs and procedures will be further examined during the on-site assessment.

The licensee performance in this area is indeterminate.

5.0 PLANT SUPPORT

5.1 Safety Focus

5.1.1 Radiological Controls

The licensee management consistently placed strong emphasis on improving the material condition of the plant by actively reducing contaminated areas. This enhanced the general working conditions for the plant staff and allowed easy access to plant areas (refs. 2, 5, 10, and 51). The performance in the radiological controls area continued to be generally strong and met the comprehensive site radiation goals. The radiological exposure goals at both units were met or exceeded (refs. 44 and 52). The recent outages in both units were well planned and managed, and were indicative of good communication and cooperation among the operations, crafts, and radiation controls staff (refs. 5 and 54).

Reduced inspection in this area is recommended.

5.1.2 Security

The licensee management continued to provide strong support to the physical security program at the site. A Commitment to Excellence Program (CEP) was implemented by the licensee to enhance security performance. Since February 1994, monthly management CEP audits were performed in which different aspects of the overall security program were evaluated and analyzed as to the adequacy of the program. Observations and recommendations were written and security work requests initiated. These monthly audits further look for adverse trends or repeat problems. Although no safety issues were identified in the licensee reports, NRC inspectors noted that the licensee should consider whether normal security measures or identified deviation reports had any impact on station or personnel safety (ref. 56).

Reduced inspection in this area is recommended.

5.1.3 Emergency Preparedness

The licensee performed the required emergency preparedness (EP) drills and exercises to demonstrate the ability to protect the health and safety of the public by taking appropriate actions to mitigate the effects of postulated emergency events on the surrounding population. The licensee management involvement and proper safety focus were observed as evidenced by management's involvement in EP drill critiques (ref. 15).

However, during an exercise in October 1994, the emergency event was incorrectly classified on the basis of an erroneous dose projection calculation (ref. 15). A failure to properly evaluate plant conditions and to recognize and properly classify the emergency event during the October 1995 exercise was cited by the NRC as a violation. This was a further indication of the need for additional licensee management attention to the EP program (ref. 3).

The licensee's emergency response facilities were found to be well equipped and consistent with facility descriptions in the site emergency plan. Overall these facilities were in very good operational condition. However, two portable air samplers in the emergency operational facility (EOF) were found to be out of calibration (ref. 57) This was corrected immediately and no repeat occurrences were observed (ref. 15).

Normal inspection in this area is recommended.

5.2 Problem Identification/Problem Resolution

5.2.1 Radiological Controls

The QA audit programs for all areas of the radiological controls program and self-assessments and surveillances were thorough, and incorporated proper technical focus and level of detail (refs. 7, 58, and 59). The licensee's refueling outage reports were good examples of the licensee's thorough and self-critical assessments. These reports describe successes, and note areas needing improvement in a comprehensive, detailed manner (ref. 59).

Licensee self-assessment results documented in the DER process, continued to report events where contract, craft, and operations personnel had not adhered to site radiological work controls procedures and practices. Examples included failure to comply with radiation work permit (RWP) requirements and failure to communicate properly and fully with the assigned health physics technicians (ref. 51). In addition, the licensee had identified minor issues involving the performance of the radiation protection department (ref. 60).

In response to the above repetitive personnel problems, the licensee had increased worker training, audits, and surveillances. The licensee had taken appropriate short-term corrective actions to resolve access control problems, and long-term corrective actions were in progress (ref. 51).

Reduced inspection in this area is recommended.

5.2.2 Security

The licensee QA audits were conducted within the time frame required by commitments, and covered the security program, fitness-for-duty program, and safeguards information controls. The audit reports identified a number of inconsistencies in the security plan and procedures, security systems, training of security staff, fitness for duty program and access authorization program concerning adequacy, and implementation of plan or procedure commitments. However, the security, fitness-for-duty, and access authorization programs were determined by the NRC to be effectively implemented and in compliance with regulatory requirements. None of the findings appeared to be programmatic weaknesses (ref. 56).

The licensee issued DERs for weaknesses identified by audits and took prompt corrective actions that prevented repetition of these problems. Several security personnel were formally trained in root-cause analysis, and the licensee planned to use them to conduct analysis of security issues (ref. 56).

Reduced inspection is recommended in this area.

5.2.3 Emergency Preparedness

The licensee's critique process, observation and evaluation of performance during an EP drill in August 1995, and assessment of the October 1995 exercise were determined to be thorough and critical (refs. 3 and 15). The licensee's quality assurance organization audited the emergency preparedness program. These audits were thorough and identified such concerns as, weaknesses in the training program, failure to follow administrative procedure guidance, out of date procedures, and missed or incomplete documentation of surveillances (ref. 61).

Emergency preparedness drill or exercise weaknesses were prioritized and assigned to individuals for resolution, and were tracked. These items were generally completed within the prescribed time period (refs. 15 and 57). Most of the open findings from previous NRC inspections were resolved by the licensee and were closed in subsequent inspections (ref. 13, 15 , and 57).

Normal inspection in this area is recommended.

5.3 Quality of Plant Support

5.3.1 Radiological Controls

The radiological protection program provided effective job coverage and support during normal operation as well as during plant outages. The licensee initiated a new, user friendly, radiation work permit (RWP) process (ref. 2). Especially noteworthy was the highly effective radiological support for the Unit 1 reactor core shroud inspection and repair work (ref. 53). The external and internal dose control programs were strong. Some examples included: reducing the number of respirators used from greater than 3000 in 1993 to 54 in 1994 as a result of the implementation of the revised 10 CFR Part 20; and the installation of closed circuit television cameras throughout the site to remotely view high radiation areas (ref. 44). The use of local, close-capture portable HEPA filtration units was another good example of the high quality support provided to minimize workers' intakes by maintaining work area airborne radioactivity levels ALARA (ref. 60). The licensee supported radiation protection technician continuing training program and provided continued professional development for the health physics management staff.

One instance of a failure to properly survey and evaluate the need for posting and controlling a high radiation area in the Unit 1 old radwaste building resulted in a violation (ref. 54). No recurrences were noted during the assessment period.

Normal inspection effort in this area is recommended

5.3.2 Security

The licensee was properly implementing the physical security plan and procedures. The protected area and vital area barriers were well maintained, access control for protected and vital areas were in accordance with procedures, security posts were adequately staffed and equipped, fitness-for-duty program was being implemented properly, intrusion detection systems were tested without deficiencies, and personnel were complying with the security plan and procedures (refs. 32 and 56).

The NRC conducted an Operational Safeguards Response Evaluation (OSRE) during October 1995, to determine the licensee's ability to respond to an external threat. The OSRE team determined that the licensee security force demonstrated effective contingency response capabilities based on observations during drills at site.

An NRC special inspection was conducted to verify corrective actions for previously identified weaknesses in the areas of maintenance of security equipment, compensatory measures, training and qualification, and access control. Malfunctioning equipment was corrected in a timely manner, and no deficiencies in compensatory measures were noted. Examination of a random selection of records indicated that all training and qualification information was properly documented. The NRC noted that the licensee needed to improve on the consistency and frequency of contingency drills. In addition, performance testing of protected area access control equipment and intrusion detection systems were conducted, and assessment capabilities and contingency responses were evaluated for their effectiveness. The testing detected no vulnerabilities except in contingency drills (ref. 63).

Weaknesses in the performance of security functions, such as unintentional disclosure of safeguards information in a public document (ref. 63 and 64) and a third instance since August 1993 of a visitor entering the protected area without a proper escort (ref. 24), were identified. The licensee implemented appropriate corrective actions (ref. 16).

Normal inspection is recommended in this area.

5.3.3 Emergency Preparedness

During the October 1995 exercise, the licensee's staff did not properly evaluate plant conditions and did not recognize and properly classify the emergency event. NRC issued a notice of violation for licensee's performance during this exercise. Also, problems noted during the previous exercise in October 1994 indicated a weakness in the ability to accurately classify emergency events. A communications aide did not activate the pager system when the exercise event escalated to the alert level (ref. 13). The control of secondary responder training, the adequacy of emergency director training on dose assessment and protective action recommendations, and the practice of considering drill observation as equivalent to drill participation as a training event were assessed as potential weaknesses (ref. 57).

Increased inspection in this area is recommended.

5.4 Programs and Procedures

5.4.1 Radiological Controls

The licensee had established effluent and environmental controls programs, with detailed, well written procedures and supported by a comprehensive site laboratory QA/QC program (ref. 7, 62, 65, and 66). The offsite dose calculation manual was well written and very detailed (ref. 66). The radwaste and transportation programs at both units were judged to be well implemented, and contained effective training programs (ref. 69). The licensee properly and effectively implemented and integrated the revised 10 CFR Part 20 requirements into the site health physics programs (ref. 67).

Reduced inspection in this area is recommended.

5.4.2 Security

The licensee's security plan and procedures were in compliance with regulatory requirements. The licensee security staff were trained in accordance with training and qualification plans and implemented security procedures appropriately (ref. 55 and 56). The fitness-for-duty program met the established policies and procedures (ref. 56).

Reduced inspection in this area is recommended.

5.4.3 Emergency Preparedness

The emergency plan and implementing procedures were, in general, being effectively implemented (ref. 57). Procedures have been revised to eliminate redundant or unnecessary information and steps (ref. 57). The licensee revised the emergency action levels (EALs) to incorporate the methodology specified in NUMARC/NESP-007, "Methodology for Development of Emergency Action Levels." Training on the new EALs including table top exercises was considered useful (ref. 10). Due to an oversight, the licensee's quality assurance audit for 1994 was not made available to state and local officials as required. It was later provided to them, and administrative procedures were changed to correct this oversight (ref. 57).

Normal inspection in this area is recommended.

APPENDIX A

List of References

1. NRC Inspection Reports 50-220/94-23 and 50-410/94-27
2. NRC Inspection Reports 50-220/95-13 and 50-410/95-13
3. NRC Inspection Reports 50-220/95-24 and 50-410/95-24
4. NRC Inspection Report 50-410/95-07
5. NRC Inspection Reports 50-220/95-12 and 50-410/95-12
6. NRC Inspection Reports 50-220/94-13 and 50-410/94-15
7. NRC Inspection Reports 50-220/95-22 and 50-410/95-22
8. NRC Inspection Reports 50-220/95-11 and 50-410/95-11
9. NMPC NQA Audit No. 94017
10. NRC Inspection Reports 50-220/95-16 and 50-410/95-16
11. NRC SALP Report No. 50-220/93/99 and 50-410/93-99
12. NRC Inspection Reports 50-220/95-01 and 50-410/95-01
13. NRC Inspection Reports 50-220/94-21 and 50-410/94-23
14. NRC Inspection Reports 50-220/95-23 and 50-410/95-23
15. NRC Inspection Reports 50-220/95-18 and 50-410/95-18
16. NRC Inspection Reports 50-220/94-26 and 50-410/94-29
17. NRC Inspection Report 50-410/94-26
18. Unit 1 Licensee Event Report 95-001
19. Unit 2 Licensee Event Report 95-004
20. Unit 2 Licensee Event Report 94-007
21. NRC Inspection Reports 50-220/94-09 and 50-410/94-11
22. NRC Inspection Reports 50-220/95-80 and 50-410/95-80
23. NRC Inspection Reports 50-220/95-03 and 50-410/95-03
24. NRC Inspection Reports 50-220/94-16 and 50-410/94-18
25. NRC Inspection Reports 50-220/94-05 and 50-410/94-05
26. Unit 2 Licensee Event Report 94-006
27. NRC Inspection Report 50-220/94-25
28. NRC Inspection Report 50-410/94-10
29. NRC Inspection Reports 50-220/94-06 and 50-410/94-06
30. NRC Inspection Reports 50-220/95-02 and 50-410/95-02
31. NRC Inspection Reports 50-220/94-28 and 50-410/94-31
32. NRC Inspection Reports 50-220/94-07 and 50-410/94-07
33. Unit 1 Licensee Event Report 94-006
34. Unit 2 Licensee Event Report 95-011
35. NRC Inspection Reports 50-220/94-18 and 50-410/94-20
36. NMPC ISEG Report No. 89461
37. NMPC ISEG Report No. 89479
38. NRC Inspection Report 50-220/95-09
39. NRC Inspection Reports 50-220/94-05 and 50-410/94-05
40. NRC Inspection Reports 50-220/94-20 and 50-410/94-22
41. Unit 1 LER 94-007
42. NRC Inspection Reports 50-220/94-12 and 50-410/94/14
43. Unit 2 Licensee Event Report 94-003
44. NRC Inspection Reports 50-220/94-29 and 50-410/94-32
45. NMPC ISEG Report No. 89476

46. Unit 2 Licensee Event Report 95-009
47. Unit 1 Licensee Event Report 94-004
48. Unit 1 Licensee Event Report 95-002
49. NRC Inspection Report 50-410/94-09
50. Unit 2 Licensee Event Report 95-002
51. NRC Inspection Reports 50-220/95-10 and 50-410/95-10
52. NRC Inspection Reports 50-220/95-04 and 50-410/95-04
53. NRC Inspection Reports 50-220/95-08 and 50-410/95-08
54. NRC Inspection Reports 50-220/94-11 and 50-410/94-13
55. NRC Inspection Reports 50-220/94-01 and 50-410/94-01
56. NRC Inspection Reports 50-220/95-14 and 50-410/95-14
57. NRC Inspection Reports 50-220/94-15 and 50-410/94-17
58. NRC Inspection Reports 50-220/95-20 and 50-410/95-20
59. NRC Inspection Reports 50-220/94-04 and 50-410/94-04
60. NRC Inspection Reports 50-220/94-19 and 50-410/94-21
61. NMPC NQA Audit No.95010
62. NRC Inspection Reports 50-220/94-17 and 50-410/94-19
63. NRC Inspection Reports 50-220/94-27 and 50-410/94-30
64. Licensee Event Report 94-S01
65. NRC Inspection Reports 50-220/95-17 and 50-410/95-17
66. NRC Inspection Reports 50-220/94-08 and 50-410/94-08
67. NRC Inspection Reports 50-220/94-24 and 50-410/94-28
68. NMPC NQA Audit No. 95017
69. NRC Inspection Reports 50-220/94-16 and 50-410/94-18

NINE MILE POINT UNITS 1 AND 2

PRELIMINARY PERFORMANCE ASSESSMENT/INSPECTION PLANNING TREE