SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE

THREE MILE ISLAND UNIT 1

REPORT NO. 50-289/96-99

I. BACKGROUND

The Systematic Assessment of Licensee Performance (SALP) Board convened on August 15, 1996, to assess the nuclear safety performance of the Three Mile Island Unit 1 for the period of February 19, 1995, through August 3, 1996. The board was convened pursuant to U.S. Nuclear Regulatory Commission (NRC) Management Directive (MD) 8.6, "Systematic Assessment of Licensee Performance (SALP)" (see NRC Administrative Letter 93-02). The board members included Richard W. Cooper II, (Board Chairman), Director, Division of Reactor Projects, NRC Region I (RI); James T. Wiggins, Director, Division of Reactor Safety, NRC RI; and John F. Stolz, Director, Project Directorate I-2, NRC Office of Nuclear Reactor Regulation. The board developed this assessment for the approval by the Region I Administrator.

The performance category ratings and the assessment functional areas used below are defined and described in NRC MD 8.6.

II. PERFORMANCE ANALYSIS - OPERATIONS

Plant operations was rated Category 2 in the previous SALP period. Operations management continued to provide extensive oversight of control room activities, which resulted in a good level of safety performance. The decision-making process in response to emerging issues was not always conservative, and the implementation of corrective actions for improving auxiliary operator performance failed to prevent recurrent personnel errors. Licensed operator performance and training were strengths. Activities conducted during the refueling outage were generally well planned and coordinated, although some weaknesses were noted in the control of evolutions and risk management.

During this period, management oversight of emerging plant operational issues was excellent and was a significant improvement. Senior plant management shifted toward a very conservative decision-making process with the proper emphasis on plant and personnel safety. In part, the initiation of a formal on-line maintenance risk assessment program was instrumental in the reduction of plant operational risk. In addition to the on-line risk assessment program, management initiatives resulted in the implementation of a human performance evaluation process and an improved self-checking process. Human performance evaluation was made a high priority by senior management. Operations used self-assessments to improve performance related to the AOs' control and tagging of equipment and the coordination of significant refuel evolutions. Operations management continued to provide extensive oversight of control room activities and maintained a frequent control room presence. Operations management actively supported and participated in operator training and implemented higher-than-required standards for operator performance.

Although not significantly challenged over the SALP period by operational events, licensed operator performance in the control room was a strength, as evidenced by their excellent

performance during examinations, inspections and a few minor operational events. Operator command and control were excellent throughout the assessment period. In particular, the excellent response to a reactor coolant system leak early in the period contributed to maintaining the plant in a safe and stable condition, notwithstanding their initial lack of sensitivity to allowing the repair activity to proceed without fully understanding the potential consequences and having contingency plans in place. The operators performed very well during routine maneuvering of the plant, always operating the unit in a safe and reliable manner. Later in the period, operator response to a power runback during initial testing of turbine control valves following their modification, as well as to a reactor coolant system flow input failure associated with the integrated control system, was excellent.

Operations performance throughout the 11R refuel outage was excellent. Preparations for the 11R refueling outage and licensed operator requalification training were excellent and focused on outage lessons learned from the 10R outage. The operations shutdown risk management was excellent in part because of their improved Outage Fuel Protection Criteria (OFPC) and implementation of lessons learned from the 10R refueling outage. In addition, comprehensive and effective corrective actions were taken to address the problems noted in previous outages with regard to mid-loop operations, water transfer evolutions and electrical bus outage coordination.

The supervisory oversight and performance of auxiliary operators (AOs) was excellent. The plant shift foremen (SF) monitored the performance of the AOs on a routine basis and provided constructive feedback to the AOs when appropriate. During the 11R refueling outage, the AOs made no tagging errors that impacted the operability of safety related equipment. Examples of improved performance were also noted during surveillance testing.

Although in most cases senior reactor operators (SROs) properly evaluated and entered the technical specification (TS) limiting conditions for operation (LCO) when systems were degraded, late in the period examples were identified in which SROs were slow to fully evaluate degraded safety related equipment conditions and enter the appropriate TS allowed outage times. Examples included reduced auxiliary building and fuel handling building ventilation system flow rates, and a clogged strainer for the decay heat river pump. However, appropriate operability determinations were subsequently made and appropriate corrective actions were taken within the allowed outage times. Plant administrative procedures were upgraded to provide written guidance for initial operability determinations, but it is too early to determine the effectiveness of these changes.

In summary, operations management continued to provide extensive oversight of control room activities, which resulted in an excellent level of safety performance. The decision-making process in response to emerging issues was very conservative. The human performance evaluation program was made a high priority by senior management, and its implementation resulted in improved AO performance, as well as fewer errors that could impact safety related equipment operability. Operator response to transients and abnormal conditions was excellent. Operations activities conducted during the refueling outage were

excellent and the comprehensive corrective actions addressed the problems noted in the previous outage. The senior reactor operators exhibited mixed performance related to the timeliness of evaluation of degraded TS equipment.

The plant operations area is rated Category 1.

III. PERFORMANCE ANALYSIS - MAINTENANCE

Maintenance was rated Category 1 in the previous SALP period. Maintenance and surveillance activities were well planned, scheduled, and executed, and contributed to safe and reliable operation of the plant. The maintenance staff was experienced, well trained, and knowledgeable. All levels of management were appropriately involved in the day-to-day maintenance activities. The material condition of the plant was very good. Human errors continued to occur and the licensee initiated a program to improve human performance late in the assessment period; however, it was too early to assess the effectiveness of the program.

During this SALP period, the knowledge, skills, and experience level of the maintenance staff continued to be a strength. The performance of maintenance/surveillance activities effectively supported safe and reliable operation of the plant and was reflected by the low amount of rework required and good plant material condition. Good maintenance practices were observed during a number of tasks, including installation of the main turbine digital electro-hydraulic control system, emergency diesel generator maintenance, and motor operated valve (MOV) work for the decay heat removal system suction line. During the 11R refueling outage, activities were generally well controlled and performed right the first time as observed during the new fuel receipt operations. There were no plant trips and only a few minor errors related to maintenance activities. However, personnel errors that occurred early in the assessment period jeopardized the availability of safety-related equipment. Examples included incorrect MOV repairs and the scheduled oil change on the wrong safety related pump. These errors were due in part to poor self-checking by the workers involved. The implementation of the station human performance evaluation program and associated root cause analysis resulted in fewer work errors and improved corrective actions in the latter part of the assessment period.

The surveillance program continued to effectively demonstrate the capability of safety related equipment to perform its design function. Surveillance test scheduling was good with no missed surveillances. Technicians were very knowledgeable of the tests being performed and good supervisory oversight was evident. No significant challenges to the plant or operators occurred due to test performance.

Maintenance work scheduling was effective through the use of daily schedules, meetings held with high-level management involvement, and good coordination of actions to correct emergent and multi-disciplined issues. The corrective maintenance backlog was well managed and remained low. Some weaknesses in the adequacy of the job planning process were noted. In particular, the planning of certain work packages did not reference the need to inform the security department about maintenance activities impacting security and resulted in two breaches of the plant security boundary. These errors were also caused in part by poor self-checking by the job planners.

The Quality Verification (QV) group continued to provide independent and objective evaluations of maintenance activities and took a number of positive initiatives to ensure the proper maintenance of safety-related systems. In addition, the licensee had an excellent maintenance performance monitoring program for identifying and evaluating repetitive equipment problems that resulted in improvements to the preventive maintenance program.

In summary, maintenance and surveillance activities continued to be well planned, scheduled, and executed, and contributed to safe and reliable operation of the plant. The maintenance staff was experienced, well trained, and knowledgeable. All levels of management were appropriately involved in the day-to-day maintenance activities. The material condition of the plant was very good. Some personnel errors and weaknesses in the planning process occurred but improvement was noted toward the end of the assessment period. The implementation of the human performance evaluation program and associated root cause analysis resulted in fewer work errors and improved corrective actions. However, several of these errors may have been prevented through better self-checking.

The maintenance area is rated Category 1.

VI. PERFORMANCE ANALYSIS - ENGINEERING

Engineering was rated Category 1 in the previous SALP period. Strengths included strong support of site activities, effective communications, planning and implementation of engineering activities and comprehensive safety evaluations. Also, the engineering organizations made effective use of self assessments. However, the engineering organizations did not act effectively regarding the development of final corrective actions for the leaking pressurizer spray and safety valves.

Engineering management's oversight and involvement in plant operation and emerging engineering issues continued to be strong. Communications, coordination with the other departments and the control of emerging work also continued to be effective. The backlog of engineering work was well managed. Also, the engineering department showed good initiative in getting involved in safety issues with well thought out and timely corrective actions. For example, plant engineering highlighted the significance of the clogged strainer for the decay heat river pump; this assured a comprehensive operability determination, despite weaknesses in the approach provided by the operating organization. Engineering management continued to show a very good safety focus and was especially effective in its good engineering approach to larger issues. Examples included: effective oversight of fuel inspection and fuel reconditioning activities; and, the excellent reviews and corrective actions for temporary equipment storage.

Mixed results were noted in the area of detailed analyses and resolution of technical issues. In general, the technical quality of engineering activities in support of operability determinations was typically very good. The quality of engineering to support design change development and implementation varied. Examples of very good performance included: technically correct analyses in support of maintaining the licensing bases for spent pool fuel storage and handling activities; and a comprehensive operability determination for the emergency feedwater system after a failed surveillance test.

Examples of weak performance included: poor past and recent handling of a condition adverse to quality regarding a reactor coolant system (RCS) drain line support; weak technical analyses in support of the motor-operated valve testing program; and weak design review during the planning process for a modification involving replacement of an emergency safeguards actuation system relay. The example involving the RCS drain line support also highlighted a noteworthy failure in the licensee's design verification process.

Engineering performance in program implementation varied significantly. The root cause analysis program and its use of self-assessment activities were strengths. The on-line maintenance risk management program was also considered a strength. Other positive examples of performance included the programs for design basis documentation and for updating the UFSAR. Also, one noteworthy example showed the effective and proactive use of industry experience. Specifically, the licensee had already implemented the necessary engineering and procedural changes using precursor information from two prior industry events to preclude the cause of a steam generator dryout event that occurred recently in another B&W plant. However there were significant examples of weak control and oversight of several other programs. Significant problems were noted in the motor-operated valve testing program governed by NRC Generic Letter 89-10. Particularly significant weaknesses were noted in the documentation that supported the selection of the design bases and the critical valve performance parameters for certain valves for which dynamic test results were unavailable.

The qualifications of the engineering staff and the training provided to them continued to be generally effective. However, the RCS drain line issue suggests a need for more detailed training in the design verification process.

In summary, engineering's communications and planning, have remained strengths. The quality of design change activities and engineering's response to technical issues declined from the last SALP in that it varied significantly. Engineering performance in programmatic activities also declined. While performance in the design basis documentation and UFSAR updating programs was very good and performance in oversight of the motor-operated valve testing program exhibited significant weaknesses. In the training area, problems with the handling of the RCS drain line pipe support issue suggested the need for more training in design verification principles and their implementation.

The engineering area is rated Category 2.

V. PERFORMANCE ANALYSIS - PLANT SUPPORT

Plant Support was rated Category 1 in the previous SALP period. Previous radiation protection program strengths included a strong ALARA program with excellent results, effective internal and external exposure controls, good radwaste program, program improvements through self-identification and correction programs, and improvements in radiological housekeeping. The radioactive waste, effluent and environmental programs continued to be implemented well. The security program benefitted from continued strong management attention and support and from effective maintenance support for security

equipment. The emergency preparedness program was generally well implemented but problems with timely event classification were noted in an annual exercise. Also, the fire protection program was effectively implemented.

This period, the radiation protection program was effective overall. The licensee was particularly successful in implementing ALARA initiatives that substantially lowered radiation exposure to workers. A very good program for radioactive waste management was established and implemented. Also, the licensee continued to implement effective effluent and environmental monitoring programs. Radiation Protection staff members were highly qualified and received very good initial and periodic refresher training. The problem identification and corrective action system continued to improve the quality of the program. However, weaknesses existed in the plant staff's failure to follow procedures, a previous SALP concern, particularly in the area of High Radiation Area (HRA) controls and contamination monitoring. Examples involved radiation worker performance issues such as movement of HRA barriers and unauthorized entry into a posted HRA in which radiography was planned. Other examples involved the inadvertent release of contaminated equipment and personnel to outside the radiologically controlled area of the plant.

The security program was effectively implemented, except for the weaknesses associated with uncompensated protected area breaches. The program for identifying, resolving, and preventing performance problems was generally effective as evidenced by minimal personnel errors. Management support continued to be strong as indicated by ongoing programmatic enhancements and equipment upgrades, timely repair of security equipment, and minimal use of overtime or compensatory measures. Also, the licensee implemented an access authorization program that provided high assurance that individuals granted unescorted access were trustworthy and reliable. However, lack of sensitivity by the operations, maintenance, and planning departments contributed to two recurring problems involving protected area barriers; weak sensitivity of the security organization also influenced the latter event. After the first issue, the licensee decided to implement the appropriate corrective actions. However, the licensee did not monitor the interim corrective actions put in place; those interim measures were not fully effective and a second similar event resulted. The two events also represent failures in the licensee's self-checking program intended to prevent human performance errors.

The emergency preparedness (EP) program was effectively implemented. Training administration and response organization knowledge level were very good. Management support of EP continued to be strong. The licensee had good mechanisms for the identification and resolution of problems. Performance during the full-participation exercise was mixed, with excellent facility command and control, but weak evaluation of dose consequences out to 10 miles, especially after potential fuel damage. It appeared that the licensee relied too heavily on evacuation time estimates and expected release duration to develop proposed protective action recommendations. In addition, EP audits were generally good.

The licensee established and implemented an effective fire protection and prevention program. Procedures were well written and sufficiently detailed, excellent administrative controls were established and implemented, and corrective actions taken for identified deficiencies were effective in preventing recurrence. In addition, quality assurance

activities were noteworthy in assessing the program. Training provided to fire brigade and firewatch personnel appropriately prepared them to combat fires. Plant housekeeping improved through the period.

In summary, the radiation protection program was in general, effectively implemented, with particular successful performance noted in review of ALARA program results. Also, the licensee continued to show very good performance in the radwaste, effluent and environmental program areas. However, some weaknesses were noted regarding radiation worker performance, specifically adherence to high radiation area controls and conduct of contamination monitoring. Also, performance problems were noted in the release of contaminated equipment and personnel to outside the radiologically controlled area. Security performance declined as indicated by two occurrences involving problems with maintaining the integrity of protected area barriers; the latter event strongly suggested that any interim measures put in place by plant management after the first event were not fully effective. The emergency preparedness program performance was good; however, performance during the last full-participation exercise was mixed. The licensee continued strong performance in the fire protection and prevention program. Plant housekeeping improved through the period.

The plant support area was rated Category 2

ENCLOSURE 2

12 MONTH INSPECTION PLAN FOR THREE MILE ISLAND UNIT 1

IP - Inspection Procedure
TI - Temporary Instruction
CO - Core Inspection (Minimum NRC Inspection Program (mandatory all plants))
SI - Safety Issue Inspection
RI - Regional Initiative Inspection

INSPECTION	TITLE/PROGRAM AREA	INSPECTION START DATES	TYPE OF INSPECTION/COMMENTS
IP 71707	Plant Operations	8/4/96	CO, Focus on the work control process with emphasis on emergent work and the initial operability review. (Based on noted weakness in the initial operability determinations for degraded equipment)
IP 62703	Maintenance Observation	8/4/96	CO, Focus on the work planning process and how applicable TS LCOs are reviewed and incorporated into job packages.
IP 81700	Physical Security Program, Visit #1	10/7/96	CO, Focus on compensatory measures taken for maintenance activities.
IP 38701	Procurement Program	10/21/96	RI, Review procurement and commercial dedication processes.
TI 2515/133	Implementation of Revised 49 CFR Parts 100-179 and 10 CFR Part 71	12/9/96	SI

ENCLOSURE 2

INSPECTION	TITLE/PROGRAM AREA	INSPECTION START DATES	TYPE OF INSPECTION/COMMENTS
IP 82302	Review EP Exercise Objectives and Scenario	12/9/96	CO
IP 86750	Solid Radwaste Management & Transportation	12/9/96	CO
IP 37550	Engineering, Visit #1	12/9/96	CO, Focus on Engineering department reorganization, program oversight, and effectiveness of corrective actions taken for the RCS drain line modification.
IP 82301	EP Exercise, Full Participation	3/3/97	CO, Focus on previously noted areas of weakness.
IP 83750	Occupational Radiation Exposure	3/10/97	CO, Focus on previously noted areas of weakness and the effectiveness of licensee corrective actions.
IP 37550	Engineering, Visit #2	5/5/97	CO
IP 84750	Radwaste Treatment & Effluents & Environmental Monitoring (Environmental Monitoring)	6/23/97	CO
IP 82701	Operational Status of the EP Program	8/18/97	CO, Focus on previously noted EP program weaknesses.
IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems	9/8/97	CO
IP 81700	Physical Security Program, Visit #2	9/8/97	CO
IP 83750	Occupational Radiation Exposure, Outage	9/15/97	CO
IP 73753	Inservice Inspection Program	10/06/97	CO