SUPPLEMENTAL REPORT ON THE OPERATION
OF THE NORTHERN STATES POWER COMPANY
MONTICELLO REACTOR FACILITY

Prepared By The
DIRECTORATE OF REGULATORY OPERATIONS

NORTHERN STATES POWER COMPANY
(MONTICELLO - DOCKET NO. 50-263)

IN CONNECTION WITH
FULL TERM OPERATING LICENSE APPLICATION

October 16, 1974

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Attachments:

SUPPLEMENTAL REPORT
BY THE
DIRECTORATE OF REGULATORY OPERATIONS

OPERATION OF THE MONTICELLO NUCLEAR GENERATING PLANT UNDER PROVISIONAL OPERATING LICENSE DPR-22

INTRODUCTION

The Directorate of Licensing issued a safety evaluation for full-term license review of the Monticello Nuclear Plant on February 5, 1973. Included as Appendix A to this safety evaluation was a special Summary report issued by the Directorate of Regulatory Operations on August 4, 1972, which described the activities of the Monticello Nuclear Plant through May 1972, as observed by the Regulatory Operations inspection program and discussed in various licensee reports. This supplemental report provides an updated summary of subsequent safety-related plant activities through June 1974.

SUMMARY

The Monticello Nuclear Generating Plant has completed an additional 25 months of commercial power operation since our initial summary report was issued. During this period the plant has generated an additional 7,022,020 Mw-hrs of electrical energy, raising the total energy output of the reactor since initial criticality to the equivalent of 16,771 hours of full power operation.

The most significant problems experienced since May 1972 have been associated with relief valve and main steam isolation valve operation, primary containment vacuum breaker and isolation valve leakage, high pressure coolant injection system operability, and several individual component failures as discussed later in this report. The overall performance of installed control and safety systems has been essentially as designed. The licensee's surveillance testing program has proven to be effective in that most operating problems experienced have been discovered by scheduled tests or inspections.

The management, operating, and engineering support organizations have remained stable since our initial report was issued, except for transfer from the plant staff of two supervisory engineers who were replaced by experienced engineers from the staff. A special inspection of management controls in May and June, 1972, identified several matters which prompted improvements in the licensee's management programs. We consider these improvements to have shown effective results. Review, investigation, and resolution of operating problems have shown improvement and are generally thorough as shown by the small number of recurrent failures. We judge the operation of the Monticello plant and the competence of the plant staff to be adequate to assure continued safe operation.

CONCLUSION

The findings of our inspection program since our initial special summary report was issued show that the Monticello Nuclear Generating Plant has been operated safely since initial startup in 1970. We find that the reactor and its control and safety systems have continued to operate as designed except for main steam isolation valve leakage (which is currently showing an improving trend) and individual component failures which have been corrected.

DISCUSSION

Review of operation of the Monticello Nuclear Generating Plant by the Directorate of Regulatory Operations has continued on a regular basis since the initial summary report was issued. This review was accomplished through a total of 22 inspections in addition to those listed in the initial report, representing an expenditure of approximately 97 man-days at the plant site or corporate offices. A listing of the additional inspection dates and general areas inspected are given in Table 1.

In addition to these inspections, frequent informal contact with the licensee's organization has continued along with regular review of operating, abnormal occurrence, and other reports submitted to the AEC by the licensee.

The significant findings of our inspection program are discussed and evaluated a follows:

I. Operating History

Operation of the Monticello Plant has continued with only brief interruptions since May 1972 except for scheduled refueling outages in the spring of 1973 and 1974. A chronology of significant events related to plant operation is given in Table II. The number of scrams which have occurred since the start of commercial operation (July 4, 1971) and other pertinent operating statistics are summarized below. The dates and associated causes of reactor scrams since May 1972 are listed in Table III.

Year	No. of Times Brought Critical	No. of Reactor Scrams	Equivalent Full Power Hours	Gross Electrical Mw-hours
1971 (beginning 7/4)	11	7	2131	1,241,080
1972	20	8	6537	3,717,750
1973	8	3	5999	3,412,160
1974 (thru June)	5	2	2104	1,196,780
TOTAL	44	20	16,771	9,567,770

II. Unusual Occurrences

This section summarizes the more significant occurrences associated with the operation of the reactor subsequent to May 1972.

A. Reactor and Auxiliary Systems

1. On July 10, 1972, with the plant operating at full power, a loss of generator excitation resulted in a reactor scram and isolation. The D relief valve did not lift as required, and the A relief valve lifted but did not reseat until reactor pressure had decreased to 600 psig. The operable relief valves maintained reactor pressure within prescribed limits. The A safety valve also opened briefly, and raised drywell pressure to 2 psig. Although subsequent investigation showed that two of the four instrument taps which sense drywell pressure were covered with tape, the two redundant instruments initiated emergency core cooling systems, which functioned as required. Following the event the plant was placed in a cold shutdown condition for investigation. Inspection by the licensee showed that

rust particles had prevented prompt reseating of the A relief valve. No reason for failure of the D relief valve to open could be determined. Review of the history of the A safety valve gave no reason to suspect its having operated improperly. After cleaning of A relief valve components, inspection of the B and C relief valves, and satisfactory testing of all relief valves the plant was returned to power. A report of the occurrence was submitted to the AEC by NSP on July 20, 1972.

2. On July 21, 1972, spurious initiation of the main transformer fire protection system resulted in a scram from full power, and the D relief valve again did not operate. All other systems functioned as required. The plant was placed in a cold shutdown condition for investigation. Further inspection of the D relief valve revealed a small leak in the bellows and a design deficiency which prevented the leak detection system from detecting a small leak. The leaking bellows was replaced, other relief valve bellows were inspected, and the leak detection system was modified to facilitate detection of small bellows leaks in the future. The occurrence was reported to the AEC by NSP in a letter dated July 28, 1972.

3. Scheduled leakage tests conducted during the 1973 refueling outage showed four of the eight main steam isolation valves (MSIV's) to be leaking in excess of Technical Specifications limits. A truing cut was made on the main discs, additional stellite material was added to one seat, and the seats on the four valves were lapped. Subsequent tests showed satisfactory leak test results. A report of the MSIV leakage was submitted to the AEC by NSP on June 28, 1973. Subsequently, during the 1974 refueling outage, one of the eight MSIV's was observed to leak in excess of the amount allowed by Technical Specifications. A truing cut was made on the main and pilot valve plugs and both seats were lapped. The leak rate during a subsequent test was satisfactory. This experience was reported to the AEC by the licensee in a letter dated May 20, 1974.

4. During a routine surveillance test conducted on February 16, 1974, two of the eight main steam isolation valves did not close as required. A redundant MSIV in series with each of these two functioned properly. Investigation showed that the rubber seats in the solenoid valves associated with new MSIV operators installed during the 1973 refueling outage (see section IV.A) had deformed in

such a manner that normal operation of the solenoid valves did not occur. The seats were replaced with spring-loaded seats of an improved design to prevent recurrence. The occurrence was reported to the AEC by the licensee on February 25, 1974. In two other instances an MSIV required in excess of the allowed 5 seconds to close, due to misalignment of supporting rollers which ride against the yoke rods of the valve. The roller arrangement was modified during the 1974 refueling outage to prevent recurrence. These events were reported by the licensee in letters to the AEC dated August 10, 1973, and March 15, 1974.

B. Emergency Core Cooling System

1. Four failures of the high pressure coolant injection (HPCI) system have been experienced, from unrelated causes, since May 1972. During a test on July 17, 1972, the HPCI turbine tripped because of high steam exhaust pressure. Investigation showed that the disc in an exhaust line check valve had detached and was partially blocking the exhaust line to the torus. The disc was reinstalled using a sturdier disc pin. On July 31, 1972, the HPCI turbine control valve did not respond properly during a test. Investigation showed pieces of a plastic pipe cap in the governor oil system. The plastic fragments were removed, and portions of the governor system were disassembled and inspected. The licensee concluded that the pipe cap had been introduced into the system during plant construction. During a "quick start" surveillance test on May 18, 1973, the HPCI system isolated because of apparent high steam flow. Investigation by the licensee disclosed an intermittent electrical circuit in the control system, worn drive gears and a loose coupling associated with the electro-hydraulic acturator, and a loose gear associated with the turbine speed signal to the control system. The loose parts were secured with self-locking set screws, the worn gears were replaced, and a related oil passage was modified to provide more effective lubrication of the gears. During a post-maintenance test on May 21, 1974, the HPCI auxiliary oil pump did not start because of a misaligned contact assembly associated with the oil pump motor acceleration relay. A post-maintenance inspection of the relay was incorporated into the maintenance procedure to prevent recurrence. In each of the four cases a satisfactory postrepair test of the system was conducted and recurrence has not been experienced. The failures were reported to the AEC by the licensee in letters dated July 27 and August 3, 1972, May 24, 1973 and May 30, 1974, respectively.

2. A residual heat removal (RHR) pump motor developed a ground fault during operation on December 16, 1972. Investigation showed the failure to have resulted from insulation damage caused by cracking and movement of the lower air deflector. New air deflectors were installed in all four RHR pump motors using an improved method of attachment to prevent recurrence of the cracking. The occurrence was reported to the AEC by NSP in a letter dated December 22, 1972.

C. Containment

1. During a scheduled inspection of the torus-to-drywell vacuum breakers in December 1972, one of the ten vacuum breakers was found to be approximately 1 1/4 inch open, although it was indicated to be in the closed position. An operational test of the vacuum breakers was then performed, and four did not fully close. The shaft seal was modified on all ten vacuum breakers to allow free operation. During the 1973 refueling outage the associated position indicators were changed to be sensitive to movement of approximately 1/16" from the full closed position, and the manual actuating arms were relocated to provide a higher closing torque near the fully closed position. An annunciator system was subsequently installed to warn the operator when a vacuum breaker is not fully closed. The occurrence and followup actions were reported to the AEC by NSP in letters dated December 22, 1972, and March 12, 1973.

2. While performing an integrated primary containment leak rate test in May 1974, the licensee measured a leakage rate of approximately 3 percent per day. The operational limit is 1.2 percent per day. Investigation by the licensee showed that an air line to a torus-to-drywell vacuum breaker test operator (located inside the torus) had been left open when the vacuum breaker and its operator were removed in September 1973 for dynamic testing. This created a leakage path since the three-way solenoid valve installed in the line outside the primary containment is normally positioned to vent the air supply line to the reactor building. The air line was capped and to provide a positive isolation at the containment boundary, a manual block valve was installed in each air supply line. The occurrence was reported to the AEC by the licensee on May 24, 1974.

D. Effluent Systems

During startup testing of the newly installed off-gas holdup system recombiners in May 1974, a hydrogen detonation occurred in the recombiner inlet piping. A flow control valve in the recombiner was believed to have generated a spark which initiated the detonation, and the internals of four control valves were replaced with non-sparking materials. During subsequent startup testing in June 1974, a second detonation was experienced. The licensee made further modifications to the system to minimize the possibility of detonation and installed special instruments on the system piping to provide data which could assist in the evaluation of any subsequent detonation. Gaseous activity was released from the reactor building vent exhaust after each detonation, although the amounts were well within license limits. Additional details concerning the first two detonations were included in licensee reports to the Directorate of Licensing dated May 29 and June 20, 1974. Following restart of the recombiner system in July, 1974, a third detonation occurred. No release occurred, since the air ejector rupture discs had been removed following the second detonation. The system is designed to withstand the pressures generated by a hydrogen detonation, and inspection by the licensee after each of the three detonations showed no damage to have resulted. Data recorded by the special instrumentation enabled the licensee to determine the location of the detonation and led him to the conclusion that the detonations had occurred as a result of catalytic recombination of hydrogen and oxygen in the recombiner inlet piping. Activation analyses showed traces of recombiner catalyst to have been introduced into the inlet piping by a system flush performed during the spring of 1974. The licensee is evaluating methods of removing or poisoning the misplaced catalyst material.

III. Radioactive Waste Disposal

A. Gaseous Effluents

The licensee has installed an off-gas holdup system which is designed to reduce gaseous effluents from the plant by a factor of 100. This system is being tested and is expected to be placed in service during the fall of 1974. Gaseous effluents released to the environment during installation of the modified system have remained below the applicable AEC license limits, as shown by the following data:

Type Discharge	1972 Curies	1972 % of Limit	1973 Curies	1973 % of Limit	1974* Curies	1974* % of Limit
Noble Gases	751,000	8.8	869,000	10.2	747,000	17.6
Halogens	0.576	5.3	1.20	12.7	1.93	44.7
Particulates	0.0125		0.009		0.029	

* January through June

B. Liquid Effluents

The licensee has continued to place emphasis on liquid waste recycling to the extent that no radioactive liquids have been discharged from the Monticello plant since January 4, 1972.

C. Independent Measurement of Radioactive Effluents By Regulatory Operations

Our independent measurements of radioactive effluents continue to show results consistent with measurements reported by the licensee.

IV. Engineered Safeguards

A. Containment

Containment integrity was successfully demonstrated during integrated primary containment leak rate tests conducted at the end of the spring 1973 and spring 1974 refueling outages. Individual penetration leak rate tests conducted at the beginning of these outages identified several containment isolation valves to be leaking in excess of allowable amounts. These were all satisfactorily retested following maintenance. The number of valves found to be leaking decreased between 1973 and 1974, indicating an improving trend as a result of the maintenance performed. The leaking valves included four main steam isolation valves (MSIV's) in 1973 and one in 1974, as further discussed in Section II.A.3. Modifications were made to the MSIV's and their air operators during the 1973 refueling outage to correct operational problems experienced during previous months, as discussed in a letter from the licensee to the Directorate of Licensing dated January 22, 1973. This letter noted that except for one slow closure (discussed in Section II.A.6 of our initial Report of Plant Operation), the MSIV operator problems had not affected the

ability of the valves to close when required. The modifications performed during the 1973 outage resulted in improved MSIV operation, although two MSIV's subsequently failed to close during a surveillance test in February, 1974, as further discussed in Section II.A.4. Several licensee reports in late 1972 and early 1973 discussed leakage problems associated with primary containment atmospheric control valves which use a pressurized rubber seat. Design changes were made to these valves during the 1973 refueling outage and a surveillance program was established to monitor their performance. One of them leaked slightly in excess of the allowable amount during a 1974 local leak rate test because of a scale deposit on the seating surface, and a similar valve was found to have a linkage misalignment in November, 1973, but the rubber-seated valves have otherwise operated without reported failures since July, 1973. A problem with torus-to-drywell vacuum breaker operation and the discovery of a primary containment leak are discussed in Section II.C of this report. The pressure switch which operates one of two reactor building-to-torus vacuum breakers failed in November, 1972. A new bellows assembly was installed. We note that the containment-related problems discussed in this paragraph were all discovered as a result of inspection or surveillance performed by the licensee, and were reported to the Commission as required by Technical Specifications. In each case, prompt corrective action was initiated by the licensee to prevent recurrence.

B. Emergency Electrical Power System

Our inspection findings show the diesel generators to have been functionally tested as required since our initial report was issued except for one inadvertent omission which was detected and reported by the licensee. The licensee also reported three separate failures of an individual diesel-generator starting system, but because of the installed redundancy none of these events rendered a diesel generator inoperable. Except for planned maintenance or surveillance as authorized by the Technical Specifications, both diesel generators have been available for use at all times.

C. Emergency Core Cooling Systems (ECCS)

The inspection findings of our original report remain unchanged; that is, that the installed redundancy of ECCS subsystems has proven to be adequate in that ECCS operability has continued to meet or exceed Technical Specifications requirements. Principal problems experienced since our initial report was issued are discussed below:

1. Operability tests of the High Pressure Coolant Injection (HPCI) subsystem have continued at monthly intervals. Inoperability of the HPCI subsystem was reported on four occasions, as discussed in Section II.B.1 of this report. One other licensee report discussed an improper pressure switch setpoint which would have prevented operation of the HPCI subsystem as required between 150 and 167 psig reactor pressure. The redundant ECCS components were operable during each of these conditions, and prompt corrective actions were taken by the licensee in each case.

2. The licensee has continued to perform monthly operability tests of the low pressure coolant injection (LPCI) and core spray subsystems. During one of these monthly tests in April 1973, one LPCI injection valve could not be opened using the control room hand switch because of dirty auxiliary contacts. The valve operated properly after cleaning of the switch and no recurrence has been reported. Broken flow switch paddles were found on residual heat removal (RHR) pumps No. 11 and 13 in August, 1972 (the RHR pumps serve as LPCI pumps when LPCI subsystem operation is required). The paddles were modified and a safety analysis showed that the missing parts could present no hazard to the reactor. A ground fault on one RHR pump motor occurred during pump operation in December, 1972, as discussed in Section II.B.2. The licensee also reported in March, 1974, that one ECCS-initiating reactor vessel level switch failed to trip during a routine surveillance test, although three redundant switches would have initiated the ECCS if required. A new switch was installed and satisfactorily tested. In each of the circumstances described, redundant ECCS equipment would have provided proper core cooling if required. No failures related to core spray subsystem operation were reported or detected during the conduct of our inspection program.

V. Safety System Performance

A. Reactor Safety System

Our inspection findings show that the reactor safety system has continued to operate as designed. The licensee reported that (1) a small leak was found in one of four condenser vacu a scram switches (which introduced a conservative error) and (2) one of sixteen steam tunnel high temperature switches was found to have a setpoint slightly (4°F) above the Technical Specifications limit. No other safety system problems were reported and neither of these would have prevented a reactor scram if required.

B. Reactivity Control

The control rod system continues to perform satisfactorily in that a control rod has never failed to insert when required. The licensee reported in June, 1972, that insertion of one control rod stopped at the "02" position (six inches from fully inserted). This has since been observed on other occasions, although the licensee demonstrated in each case that scram insertion times were within Technical Specifications requirements. The licensee and reactor supplier attribute this behavior to normal wear of piston seals, and note that the reactivity effect of the last six inches of rod insertion is minimal. Special tests performed in 1973 on five control rods observed to have stopped at the "02" position verified the observed behavior not to be due to mechanical interaction with other core components. Our findings are that this behavior has had no effect on the ability of the control rods to safely shut down the reactor. During the initial startup following the 1973 and 1974 refueling outages, the licensee noted differences between predicted and actual critical rod pattern. In 1973 the difference was due to prediction inaccuracies. The difference in 1974 was due to underestimated reactivity worth of the gadolinium in the newly inserted fuel bundles. In each case the licensee followed appropriate precautions while determining the reasons for the difference and incorporated improvements into his prediction techniques. Testing during the 1974 refueling outage resulted in replacement of six control rods due to inverted neutron absorber tubes during manufacture, although shutdown margin tests conducted in August, 1973, had shown the control rods to provide a conservatively adequate shutdown capability.

C. Reactor Pressure Relief System

The pressure relief system has continued to demonstrate its ability to protect the reactor from overpressure, although problems with safety and relief valve operation were observed on two occasions in July, 1972 (see Section II.A.1 and II.A.2). One other case of relief valve sticking occurred during the initial test (at reduced reactor pressure) following the 1973 refueling outage. The licensee determined this problem to have resulted from a bent air operator stem. The condition was corrected and no subsequent relief valve problems have been reported. The four original safety valves (designed to relieve steam directly to the drywell) were removed during the 1974 refueling outage and four additional relief valves were installed with discharges piped to the bottom of the suppression pool. This provided additional margin for proper pressure relief capacity, since six of the eight installed relief valves will provide adequate relief capability.

VI. Primary System Integrity

Our inspection findings are unchanged from our original report; that is, that leakage from the primary system has been limited to leakage through valves, valve packings, and pump seals. Nineteen of twenty studs which secure the stuffing box holddown cover on the two recirculation pumps were discovered during the 1974 outage to have cracked, with one stud having sheared completely. No loss of primary system integrity resulted. Investigation by the licensee showed the cracking to be due to improper heat treatment. To prevent recurrence, the studs were modified to eliminate an internal cavity (which caused accelerated corrosion), monitoring of material properties was increased, and replacement studs were provided. Another complete set of studs with more rigid material specifications was also ordered for installation during the 1975 refueling outage. An inservice inspection program for the primary system boundary, as required by Technical Specifications, was initiated during the 1973 refueling outage and continued during the 1974 outage. No abnormal conditions have been reported by the licensee as a result of these inspection activities. The licensee has completed, at our request, a program to determine that valves important to nuclear safety have the required wall thicknesses. All valves examined during the conduct of this program were found to be acceptable. The licensee has also installed additional instruments to monitor and record primary system leakage. Using inputs to the process computer, the new system is designed to give an indication of instantaneous leak rate when desired and provides an alarm if a Technical Specification leak rate limit is reached.

VII. Radiation Protection

A. Staffing and Training

The radiation protection staff consists of trained and experienced supervisory personnel and health physics technicians. Staff turnover has been minimal and has not involved supervisory personnel. During outages, radiation protection staffing assistance has been obtained as necessary from another nuclear facility within the company and by contract from another organization.

All persons coming to the facility for work assignment are provided continuous escort in restricted areas of the facility until the individual has successfully completed the plant's indoctrination and training program. Out inspection findings have shown these training measures to be effective.

B. Procedures

The licensee has a written "Radiation Safety Manual", which defines responsibilities, training, radiation protection policies, and various procedures and practices. This manual is reviewed and updated on a continuing basis.

C. General Plant Cleanliness and Control

Our inspection findings show the licensee to be effectively maintaining plant cleanliness to facilitate control of radiation exposures. In addition to regular decontamination practices, the licensee uses plastic sheeting, access control, and other measures to prevent the spread of contamination. Individual whole body counts performed at the end of each refueling outage have not shown a significant intake of radioactive material and have detected little radioactivity of plant origin.

D. Personal Radiation Exposure Control

Personal exposure to external radiation is monitored by use of thermoluminescent dosimeters. In addition, when entering areas where significant radiation levels exist, personal monitoring is performed on a daily basis by issuance and daily reading of pocket dosimeters. No personal overexposures have occurred. Total whole-body exposure at Monticello in 1973 was 154 man-rems. The highest individual exposure for 1973 was 4.3 rems.

E. Monitoring and Counting Systems

Our inspection findings show that installed monitoring and counting systems have been effectively used and maintained by the licensee.

VIII. Environmental Monitoring/Emergency Planning

During an August, 1973, inspection it was noted that environmental sampling ommissions had occurred. The licensee responded to inspection findings by initiating program improvements and corrective actions to prevent further ommissions. The Monticello radiological environmental monitoring program complies with currect AEC regulatory requirements. The licensee's original Emergency Plan, issued in 1970, is soon to be revised to conform to the requirements of the subsequently issued Appendix E to 10 CFR 50. A draft revision was issued in 1973 for review and comment by State agencies and other offsite participating groups. The licensee plans to issue the revised Emergency Plan in final form in the near future, after comments from participating groups are resolved.

IX. Violations

Several violations of license or regulatory requirements (previously termed "noncompliance items") have occurred during the period covered by this supplemental report. Fifteen violations were identified during a special inspection of management systems conducted by a team of Regulatory Operations inspectors in May and June, 1972. Our regular inspection program has recorded twenty other violations (through June 1974), nine of which were discovered by the licensee and reported to the AEC. The twenty violations are categorized as follows:

Limiting Condition for Operation	6
Surveillance Test Requirements	8
Quality Assurance Program	3
Other	3

A listing of all violations identified during the period of this report and the related corrective actions is attached as Table IV.

X. Operating Organization

The basic organization of the plant staff remains as described in our initial report. Except for promotion of the Plant Engineer Technical and Plant Engineer Operations to offsite jobs, no management or supervisory personnel changes have occurred. These two vacancies were filled by experienced engineers previously assigned to the plant staff. The Monticello plant staff has demonstrated itself to be competent to assure safe plant operation. Organizational changes made in early 1972, improved management programs, and additional experienced gained in plant operation have further strengthened the licensee's technical support capabilities. Problem review and investigation have generally been observed to be thorough and effective. A special inspection of management systems conducted in May and June of 1972 identified several areas in which improvements in management control could be made (see Section IX). Some of the identified areas were noted to have been corrected by the early 1972 reorganization of the plant staff. Additional improvements in management systems prompted by the inspection findings are considered to have been effective in providing the required review and control of plant operation.

Table I - Summary of Regulatory Inspections

Dates of Inspection	Principal Activities Reviewed
6/7-8/72	Corporate Management Systems.
7/12/72	Reactor Scram, Failure of D relief valve to operate, and related events.
10/3-5/72	Plant operation and maintenance.
11/28-30/72	Plant operation and maintenance.
1/30/73 - 2/1/73	Plant operation, corrective actions related to May 72 management inspection.
2/20-22/73	Corrective actions from management inspection, outage plans, radiation protection.
2/27/73 - 3/1/73	Emergency planning.
3/27-29/73 and 4/4-5/73	Refueling and maintenance activities, in-service inspection, valve wall thickness verification program.
5/23-25/73	Refueling outage activities, plant operation and maintenance.
5/29-31/73	Radwaste systems.
6/27/73	Physical Security.
7/1[illegible] 73	Nuclear Material Safeguards.
7/[illegible]7-19/73	Plant operation and maintenance, corrective actions from management inspection, off-gas system testing.
8/30-31/73	Environmental monitoring program.
10/24-26/73	Plant operation and maintenance, corrective actions from management inspection.
12/18-20/73	Plant operation and maintenance.

Dates of Inspection	Principal Activities Reviewed
12/26-28/73	Emergency planning, environmental monitoring.
2/27/74 - 3/1/74	Radwaste Systems
3/5-8/74	Plant operation and maintenance, refueling preparations.
3/26-29/74	Quality assurance manual, plant maintenance and refueling activities, radiation protection, in-service inspection, relief valve installation.
5/9/74	Radwaste systems.
6/18/74	Relief valve installation.

Table II - Chronology of Operation

6/1/72	Operating at 100% power.
6/2/72	Scheduled outage to replace "A" safety valve and perform plant maintenance. Returned to operation 6/4/72.
6/5/72 to 7/9/72	Operated at 100% power except for brief reductions for valve exercising and brief turbine-generator outage on 6/1/72. During this period No. 11 and No. 13 RHR service water pumps failed to meet Technical Specifications head-flow requirements. Corrections were made to indications, and a Technical Specifications change was subsequently issued. Inspection of torus ring header during this period revealed damaged bolts and improperly cut holes.
7/10/72	Reactor scram caused by faulty connection in generator amplidyne control circut. "A" safety valve opened momentarily below its setpoint. "D" relief valve did not open and "A" relief valve did not reseat properly. Two drywell pressure sensing taps were found to be covered with tape, apparently from plant construction. Reactor remained in cold shutdown during repair and investigation. "A" and "D" relief valves were inspected and tested. All containment pressure sensing taps were verified to be clear. Work was done to eliminate improperly cut holes on torus ring header. Returned to operation at low power on 7/16/72.
7/17/72 to 7/20/72	Increased to and operated at 100% power. On 7/17 the HPCI turbine exhaust check valve disc pin failed; the disc blocked the exhaust line, causing the rupture discs to burst.
7/21/72	Reactor scram caused by spurious initiation of main transformer deluge system. "D" relief valve again did not open. Investigation showed small leak in pilot bellows. Bellows leakge monitoring system was modified to provide sensitivity to small leaks. Main transformer bushing was replaced.
7/31/72	During reactor heat-up, HPCI malfunctioned due to foreign material in hydraulic system. Foreign material was removed and HPCI was tested.

8/2/72 to 9/22/72	Returned to power operation, operated at 100% except for brief reductions for valve exercising. Broken flow switch paddles were found on No. 11 and 13 RHR pumps on 8/31. Paddles were modified to prevent further loss of material. On 9/15, one starting system on No. 12 diesel generator operated slowly due to a plugged air relay orifice. Air relay orifices for all starting systems were cleaned.
9/23/72	Scheduled shutdown to change control rod sequence. Satisfactorily test operated all relief valves while shut down.
9/24/72 to 11/22/72	Resumed power operation. Increased to and operated at 100% power except for brief reductions for valve exercising. On 10/11, No. 12 standby liquid control pump operated improperly due to air in suction piping. Procedure was modified to prevent recurrence.
11/23/72	Reactor power reduced to 85% due to ice blockage of circulating water intake. Normal deicing line not usable due to silting and inoperable discharge gate operators. Placed cooling towers into operation. Resumed operation at 100% power.
11/27/72	Reduced power to dredge river and repair discharge gate operators. Removed cooling towers from service.
11/28/72	Resumed operation at 100% power.
12/15/72 to 12/20/72	Scheduled outage to clean condenser and perform maintenance and inspections. Testing of torus-drywell vacuum breakers disclosed sticky operation. Stem seal was modified to provide proper operation. Ground fault occurred on No. 11 RHR pump motor due to failure of air deflector. Cracked air deflectors were also found in No. 12 and 13 RHR pump motors. Outage was extended to repair and modify all RHR pump motors. Several MSIV spool valve malfunctions occurred, necessitating cleaning or replacement of spool valve assemblies.
12/21/72 to 3/2/73	Continued operation at 100% power except for brief generator outage on 12/27 to correct failed lug bolts on A phase of main transformer. Brief power reductions also occurred for weekly valve exercising. During this period one diesel-generator starting system malfunctioned due to a dirty air motor. All other air motors were inspected.

Table III - Reactor Scrams

7/10/72	Caused by turbine lockout initiated by loss of field relay. Cause was a faulty connection in the generator amplidyne control circuit.
7/21/72	Water seepage into control box caused spurious initiation of the deluge system for the main transformer. The "A" phase transformer bushing failed, and the main transformer protective relay initiated a generator lockout and scram.
5/26/73	Error in valving the Mechanical Pressure Regulator (MPR) into service caused high reactor water level condition which initiated scram.
6/16/73	Reactor scrammed from control valve fast closure signal caused by a worn turbine speed governor drive gear.
11/6/72	Accidental jarring of a steam flow transmitter during a routine instrument surveillance test caused scram and Group I isolation.
6/10/74	A hydrogen detonation in the recombiner system caused isolation of the air ejectors. The reactor subsequently scrammed on low condenser vacuum.
6/19/74	A generator lockout and reactor scram occurred due to a failed insulator on the 345 KV transmission line leading to the switchyard.

Table IV - Violations

A. Violations identified during special Management Inspection, May-June 1972:

Description	Corrective Actions
1. Reactor was operated with loop A of the RHR service water system inoperative between June 1 and September 21, 1971.	1-4. Surveillance test procedures were revised to more clearly indicate acceptance requirements and reasons for tests. The licensee initiated review of test results by the Shift Supervisor and a designated system engineer. A weekly status report of surveillance testing was also initiated.
2. The reactor was operated between March 1 and the end of September 1971 with one RHR Service water pump inoperable.	
3. Surveillance test procedure was deficient in that it did not require RHR service water pumps No. 13 and 14 to be individually tested as required.	
4. Redundant system components were not tested as required between September 23 and October 9, 1971, when RHR service water pump No. 12 was out of service.	
5. Temporary changes to operating procedures had not been reviewed and approved, and the Safety Audit Committee had not reviewed recommendations of the Operations Committee nor advised management of their recommendations.	5. Improved procedures governing the review and issue of procedure changes were provided. Technical Specifications were revised at the licensee's request to more clearly indicate review and approval requirements.
6. There was no evidence that the effectiveness of the retraining program had been evaluated as required, and all required subjects were not included.	6. These deficiencies were corrected by the establishment of a formal retraining program as required by 10 CFR 55.

7. The safety Audit Committee failed to take the required action on an item of noncompliance brought to its attention, that being the lack of a preventive maintenance program for instrumentation.	7. The licensee's response noted that the preventive maintenance program had been under development since late 1970. It was subsequently completed.
8. Operations Committee procedures lacked specific instructions describing the content and method of submission of presentations to the Committee.	8. Committee bylaws were revised to include the required instructions.
9. Several deficiencies were observed with respect to the development, review, and implementation of procedures. These involved: (a) operation of drywell leak rate monitoring equipment, (b) periodic review of operating procedures, (c) procedure distribution, (d) recording of test results, (e) filing of work request authorizations, (f) revisions to procedures to reflect design changes, (g) surveillance testing status report submission, (h) review of Operations Committee minutes by the Safety Audit Committee and (i) lack of operating procedures for abnormal leak rate.	9. Procedures were modified or issued in each case to satisfy pertinent requirements.
10. Written procedures had not been written or made available to all station personnel for the respiratory protection program.	10. Required procedures were issued in August, 1972.
11. Test procedures for calibration and preventive maintenance had not been developed for installed instruments used to verify proper operation of the RHR service water system.	11. The licensee's response noted the procedures to be available in vendor's manuals. Plant procedures were subsequently issued for specific instruments.

3/3/73 to 5/12/73	Scheduled outage for refueling, turbine overhaul, and miscellaneous plant modifications, inspections, and maintenance. Items accomplished included: (1) primary containment local and integrated leak tests, (2) installation of venturi in HPCI steam line, (3) replacement of MSIV operators and air accumulators, (4) modification of torus-drywell vacuum breakers, and (5) modification of relief valves. On 3/30 No. 12 standby gas treatment system malfunctioned due to improper racking in of the fan motor breaker. Both SGT systems were found to have improperly sized fuses. These conditions were corrected. Fuel sipping indicated 25 fuel bundles to be potentially leaking. These were replaced with new or reconstituted fuel bundles. An injection valve in the LPCI system failed to open on 4/5 due to dirty contacts which were subsequently cleaned. One starting system on No. 11 diesel generator malfunctioned due to a dirty air line lubricator. All lubricators were cleaned and placed on the six-month inspection schedule.
5/13/73	Established initial criticality for Cycle 2. Continued reactor heatup throughout the week and conducted HPCI, RCIC, and relief valve operability tests. Performed portions of main steam line transient test.
5/18/73	HPCI turbine control system malfunctioned due to a loose drive coupling, loose and worn gears, and a poor electrical connection. These problems were corrected and the HPCI system was returned to service within the allowed 7 days.
5/19/73	Generator on line. Gradually increased to 95% power by 5/24. Completed special steam line transient tests.
5/25/73	Scheduled shutdown to change control rod sequence. The sodium pentaborate tank was found to have a low concentration and chemicals were added.
5/26/73	Resumed power operation. At 30% power a high reactor water level scram occurred due to an error in valving the mechanical pressure regulator into service.
5/27/73 to 6/15/73	Resumed power operation at 90 to 100% except for weekly valve exercising and a reduction to 70% on 5/30 for control rod withdrawal.
6/16/73	Reactor scram from turbine control valve fast closure caused by worn governor drive gear. The drive gears were replaced and improvements were made to prevent recurrence.

6/20/73 to 7/30/73	Resumed operation at 100% power except for brief reductions to withdraw control rods and conduct valve exercising.
7/31/73 to 8/9/73	Scheduled shutdown to change control rod sequence, inspect hydraulic shock suppressors, and perform shutdown margin tests. Rebuilt 32 shock suppressors due to seal deterioration. MSIV 80A operated slowly during a surveillance test. The yoke guide rollers were adjusted, yoke guides were cleaned and lubricated, and dashpot oil level was corrected to provide proper operation.
8/10/73 to 9/7/73	Resumed power operation. During startup the outboard main steam line drain valve could not be closed and an interlock was adjusted. Operated at 100% power except for load reductions to withdraw control rods, perform valve exercises, and repair a leaking feedwater pump instrument tap.
9/8/73	Reduced power and fully inserted control rod 14-27 to allow repair of a leaking scram exhaust valve. Returned to 100% power 9/10/73.
9/13/73 to 9/23/73	Discontinued control rod withdrawals to maintain 100% power due to end-of-cycle reactivity limitations. Reactor power slowly decreased to 97%.
9/24/73	Inserted control rods to establish rod pattern at 93% power based upon revised reactivity calculations.
9/25/73	Reactor power further decreased to 92% while control rod inventory was held constant.
9/28/73 to 10/2/73	Scheduled shutdown to modify relief valves, increase safety valve setpoints, inspect hydraulic shock suppressors, and install connections to the modified off-gas system.
10/3/73 to 10/5/73	During functional testing of relief valves at low reactor pressure, the "A" relief valve failed to close. The air operator and second stage stems were found bent and corrected. Stems were also inspected in other relief valves.
10/6/73 to 10/8/73	Returned to power operation, performed operability tests on all relief valves. Increased to 92% of rated power after repairing leaking feedwater pump instrument tap.
10/9/73 to 10/17/73	Reactor power decreased slowly as control rod inventory was held constant. AEC authorized relaxation of rod inventory restriction on 10/18 based on revised transient analysis calculations.

10/19/73 to 11/5/73	Increased to and operated at full power except for brief reductions to withdraw control rods and perform valve exercising.
11/6/73	Reactor scram due to inadvertent trip of main steam line high flow sensor during surveillance test. Resumed power operation.
11/7/73 to 11/13/73	Resumed power operation at 100% except for a brief reduction to reduce off-gas release rate below 100,000 uCi/sec. During this period a reactor building-to-torus vacuum breaker did not operate freely. Shaft clearances were increased to provide proper operation.
11/14/73 to 11/17/73	Scheduled outage to rebuild hydraulic shock suppressors, install piping connections and perform preoperational testing of the off-gas holdup system, and repair a leaking feedwater check valve.
11/18/73 to 12/17/73	Resumed power operation at 100% except for brief reductions to withdraw control rods and control off-gas release rate.
12/8/73 to 1/13/74	Discontinued control rod movement due to end-of-cycle scram reactivity considerations. Reactor power slowly decreased to 91% on 1/1/74, remained at 91% until 1/13/74.
1/14/74 to 2/14/74	Power operation continued with power level reduced to 83-90% to maintain off-gas release rate below 100,000 uCi/sec.
2/15/74 to 2/18/74	Reduced power to 60% for valve exercising. Two MSIV's failed to close on 2/16 during surveillance test. The reactor was placed in hot standby with steam lines isolated while MSIV AC solenoid valves were modified and cleaned.
2/19/74 to 3/14/74	Resumed power operation. Reactor power was gradually reduced from 77% to 74% to maintain off-gas release rate below 100,000 uCi/sec.
3/15/74 to 5/16/74	Scheduled outage to refuel the reactor and perform modifications, maintenance, and testing. Items accomplished included: (1) primary containment local and integrated leak tests, (2) removal for the four originally installed safety valves, (3) installation of four additional relief valves with associated discharge piping to the torus, (4) in-service inspection (5) installation of discharge spargers and vacuum breakers in HPCI and RCIC turbine exhaust lines (to prevent water hammer and vibration during turbine operation), (6) modification of relief valves, (7) connection of the off-gas hold-up system, and (8)

	inspection of control rod blades for possible inverted neutron absorber tubes. Fuel sipping activities showed 83 fuel assemblies to be leaking. These and others were replaced with 116 new 8 x 8 assemblies during the outage.
5/17/74 to 5/19/74	Established initial criticality for Cycle 3. Tested HPCI, RCIC, and relief valves, and commenced operational testing of the off-gas holdup system.
5/20/74	A hydrogen detonation occurred in the off-gas recombiner system, rupturing air ejector rupture discs. Plant operation was resumed with the recombiner system bypassed.
5/21/74 to 6/5/74	Placed generator on line and gradually increased power to 97% of rated. Power reductions occurred for control rod scram timing tests and control rod withdrawal. During the period the HPCI auxiliary oil pump failed to operate because of a dislocated contact assembly. The contact was aligned and other similar contacts were inspected.
6/6/74 to 6/7/74	Scheduled shutdown to return the off-gas holdup system to service after modifying certain valves to eliminate sparking.
6/8/74 to 6/9/74	Operated at low power for off-gas system testing.
6/10/74	A hydrogen detonation occurred in the recombiner system at 25% reactor power. Air ejector rupture discs ruptured. The reactor subsequently scrammed on low condenser vacuum.
6/11/74 to 6/18/74	Resumed power operation with recombiner system bypassed. Increased to and operated at 93% rated power except for a brief shutdown to repair a leak on a feedwater pump warmup line.
6/19/74	Reactor scrammed due to generator lockout caused by a failed insulator on the 345 KV transmission line leading to the main switchyard. Resumed power operation.
6/20/74 to 6/30/74	Continued operation at 92% of rated power. Reduced to 88% on 6/23 to reduce off-gas release rate.

Table III - Reactor Scrams

7/10/72	Caused by turbine lockout initiated by loss of field relay. Cause was a faulty connection in the generator amplidyne control circuit.
7/21/72	Water seepage into control box caused spurious initiation of the deluge system for the main transformer. The "A" phase transformer bushing failed, and the main transformer protective relay initiated a generator lock-out and scram.
5/26/73	Error in valving the Mechanical Pressure Regulator (MPR) into service caused high reactor water level condition which initiated scram.
6/16/73	Reactor scrammed from control valve fast closure signal caused by a worn turbine speed governor drive gear.
11/6/72	Accidental jarring of a steam flow transmitter during a routine instrument surveillance test caused scram and Group 1 isolation.
6/10/74	A hydrogen detonation in the recombiner system caused isolation of the air ejectors. The reactor subsequently scrammed on low condenser vacuum.
6/19/74	A generator lockout and reactor scram occurred due to a failed insulator on the 345 KV transmission line leading to the switchyard.

7. The safety Audit Committee failed to take the required action on an item of noncompliance brought to its attention, that being the lack of a preventive maintenance program for instrumentation.

7. The licensee's response noted that the preventive maintenance program had been under development since late 1970. It was subsequently completed.

8. Operations Committee procedures lacked specific instructions describing the content and method of submission of presentations to the Committee.

8. Committee bylaws were revised to include the required instructions.

9. Several deficiencies were observed with respect to the development, review, and implementation of procedures. These involved: (a) operation of drywell leak rate monitoring equipment, (b) periodic review of operating procedures, (c) procedure distribution, (d) recording of test results, (e) filing of work request authorizations, (f) revisions to procedures to reflect design changes, (g) surveillance testing status report submission, (h) review of Operations Committee minutes by the Safety Audit Committee and (i) lack of operating procedures for abnormal leak rate.

9. Procedures were modified or issued in each case to satisfy pertinent requirements.

10. Written procedures had not been written or made available to all station personnel for the respiratory protection program.

10. Required procedures were issued in August, 1972.

11. Test procedures for calibration and preventive maintenance had not been developed for installed instruments used to verify proper operation of the RHR service water system.

11. The licensee's response noted the procedures to be available in vendor's manuals. Plant procedures were subsequently issued for specific instruments.

12.	A surveillance test and changes to it had not been reviewed by the Operations Committee.	12.	The surveillance test procedure was later determined to have been approved, although the changes had not. Revised instructions for the writing, approval, and handling of surveillance procedures were issued.
13.	Certain operating and maintenance records were not kept in a manner convenient for review.	13.	Record storage techniques were improved to provide convenient record retrieval through cross-references and extensive use of microfilm techniques.
14.	Facility changes made prior to March 1971 had not been reported to the Commission.	14.	These changes were reported as part of the semiannual operating report for July-December 1972.
15.	No formal quality assurance program had been implemented.	15.	A program has been developed and placed into use. Regulatory operations review of the QA manual procedures was conducted in March 1974. Inspection of program implementation and resolution of RO comments is pending.

B. Other Violations:

	Date and Description		Corrective Actions
1.	*July 1972: Two of four drywell pressure sensing taps were found to be covered with tape.	1.	All drywell and torus pressure sensing and sampling lines were inspected for restrictions. Signs were attached to sensing taps to warn against obstruction.
2.	*October 1972: Prompt action was not taken to restore stack sample flow after failure of a sample pump.	2.	A loose connection in the low flow annunciator circuit was corrected. A new surveillance test of the pumps and annunciator was established. Design changes were subsequently made to increase the reliability of the sampling system.

3.	*March 1973: A torus manway cover was removed when primary containment integrity was required.	3.	Administrative instructions were issued to preclude recurrence. A warning was painted on both manway covers requiring the Shift Supervisor's approval to remove them.
4.	*May 1973: Sodium pentaborate solution in the standby liquid control tank was inadvertently diluted to a concentration less than allowed by Technical Specifications.	4.	Procedures for additions to the standby liquid control tank were modified to require (1) sampling before and after each addition and (2) written approval of all additions by the Operations Supervisor and Plant Chemist.
5.	May 1973: Changes made to a surveillance test procedure were approved by only one licensed senior operator.	5.	The violation was discussed with the individuals involved and a memo was issued to the technical staff and licensed personnel reminding them of approval requirements for temporary changes.
6.	July 1973: The approved procedure was not followed during an MSIV leak test.	6.	Local leak rate test procedures were revised to more clearly indicate requirements. Evaluation showed the test results obtained to be valid.
7.	August 1973: Fish, aquatic vegetation, and other environmental samples were not on all occasions collected and analyzed as required.	7-8.	The licensee developed a laboratory quality control program and an administrative procedure for following sample progress. A consultant was to be retained to evaluate the overall program and develop audit procedures. Reinspection of corrective action is pending.
8.	August 1973: Records did not show several milk, precipitation, and vegetation samples to have been analyzed as required.		
9.	*October 1973: The stack effluent monitor was inadvertently rendered inoperable between August 7 and 10, 1973.	9.	The local purge valve control switch (which had been left in the "purge" position to cause the inoperability) was removed. This permits operation only from the control room where a red indicator light indicates that the monitor is in the purge mode.

10. *October 1973: Surveillance testing of ECCS components was inadvertently omitted prior to removing a diesel generator from service for maintenance.	10. The maintenance procedure was revised to indicate the specific surveillance requirements. A memo was also issued to remind shift Supervisors of the requirements.
11. *December 1973: The volume of sodium pentaborate solution was less than the required amount between August 28 and September 4, 1973.	11. The violation resulted from an indicator reference error. Additions were made to bring the tank volume within requirements. The indicator was recalibrated for the new reference. Similar indicators were checked and found satisfactory.
12. *December 1973: Daily linear heat generation rate determinations were not performed on November 9, 1973.	12. The Daily Log was modified to incorporate all daily test requirements.
13. January 1974: Counting frequency for reactor building vent filter cartridges was not increased to daily as required when the gross beta-gamma release rate increased above 25% of the Technical Specifications annual average limit.	13. The licensee's response stated that all cartridges would be counted daily until a clarifying Technical Specifications change could be obtained. Regulatory Operations review of corrective actions is pending.
14. *January 1974: The licensee possessed approximately 3.4 millicuries of cobalt 60 on June 6, 1973 which was not authorized by the facility license.	14. Procedures for receiving radioactive materials were revised to prevent receipt of quantities in excess of those allowed by the license. The licensee also requested and obtained an amendment to the facility license authorizing possession of the cobalt 60.
15. March 1974: The reactor coolant was not analyzed for gross beta-gamma during the period February 14-21, 1974 (required every 96 hours). A	15-16. All chemistry surveillance procedures required by Technical Specifications were revised to include the purpose and requirements of each analysis. Memoranda

monthly isotopic analysis of the coolant was not performed during November 1973.	were also issued to the chemistry group defining testing requirements. A table included with the memoranda specified which tests were required for each plant condition.
16. March 1974: Reactor coolant chloride and conductivity analyses were not performed every four hours as required during the period February 16-18, 1974, while operating at low steam flow.	
17. March 1974: Four instances were noted of failure to follow quality assurance procedures related to the installation of additional relief valves. The instances involved (a) weld rod storage, (b) handling of non-conformance reports, (c) processing of purchase orders, and (d) receipt inspections.	17. Procedures were revised and/or personnel instructed as necessary to prevent recurrence. More frequent audits were scheduled by the licensee.
18. March 1974: Planned audits had had not been performed by the licensee or one of his contractors to determine the effectivness of their portions of the Quality Assurance Program.	18. An audit was performed and all open items were resolved.
19. March 1974: Audits were performed by a contractor without the use of checklists, and audit results were not distributed as required by procedures.	19. Checklists were prepared and used during a subsequent audit. Auditors were instructed in the required distribution of audit reports.
20. May 1974: The liquid effluent monitor was not being calibrated monthly as required.	20. The licensee's response stated that the surveillance being performed was believed to satisfy Tecnnical Specifications.

*Indicates violations discovered and reported by the licensee.