U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 50-423/86-16

Docket No. 50-423

License No. NPF-49 Priority Category C

Licensee: Northeast Nuclear Energy Company
P. O. Box 270
Hartford, Connecticut

Facility Name: Millstone Nuclear Power Station-Unit 3

Inspection At: Waterford, Connecticut

Inspection Conducted: May 5-9, 1986

Inspector: H. J. Bicehouse May 28, 1986
H. Bicehouse, Radiation Specialist date

Approved by: W. J. Pasciak 5/29/86
W. Pasciak, Chief, Effluents Radiation Protection Section date

Inspection Summary: Inspection on May 5-9, 1986, (Inspection No. 50-423/86-16)

Areas Inspected: Routine, unannounced inspection of the licensee's Unit 3 Water Chemistry Control Program. Areas reviewed included organization; selection, training and qualification; self-identification/correction of deficiencies; plant water chemistry systems; sampling and measurement; and implementation of the water chemistry control program.

Results: Within the scope of the review, no violations or deviations were noted. However, several apparent weaknesses were noted and discussed with the licensee. The licensee's program was considered generally adequate in controlling water purity in the primary and secondary coolant loops.

DETAILS

1. Persons Contacted

   1.1 Licensee Personnel

   *J. Crockett, Unit 3 Superintendent
   E. Grondahl, Associate Engineer, Nuclear Materials & Chemistry
   *J. Kangley, Radiological Services Supervisor
   R. Langer, Assistant Chemistry Supervisor, Unit 3
   J. LaWare, Senior Engineering Technologist, Quality Assurance
   C. Mallory, Contract Chemistry Instructor
   A. Stengel, Senior Engineer, Unit 3
   *M. Tortora, Unit 3 Chemist
   *J. Waters, Chemistry Supervisor
   R. Wells, Manager, Nuclear Materials & Chemistry

   Other licensee personnel were contacted or interviewed during this inspection.

   1.2 NRC Personnel

   F. Casella, Resident Inspector, Unit 3
   *J. Shedlosky, Senior Resident Inspector, Unit 3

   *Attended the exit interview on May 9, 1986.

2. Purpose

   The purpose of this routine safety inspection was to review the Unit 3 Water Chemistry Control Program with respect to the following areas:

   •Organization;
   •Selection, Training and Qualification of Personnel;
   •Self Identification/Correction of Deficiencies;
   •Plant Water Chemistry Systems;
   •Sampling and Measurement; and
   •Implementation of the Water Chemistry Control Program.

   In response to NRC-NRR Generic Letter 85-02, ("Staff Recommended Actions Stemming From NRC Integrated Program For The Resolution Of Unresolved Safety Issues Regarding Steam Generator Tube Integrity," April 17, 1985), the licensee indicated that the secondary water chemistry program at Millstone Unit 3 was based on the guidelines in the Steam Generator Owner's Group, (SGOG) Special Report EPRI-NP-2704, Revision 1 and the vendor's (Westinghouse), recommendations. Special emphasis was placed on reviewing the secondary water chemistry program relative to those guidelines and recommendations. The licensee had declared that Unit 3 was in commercial operation on April 23, 1986.

3.0 Water Chemistry Control Program Organization

The inspector examined the program organization with regard to policies, goals/objectives, assignment of responsibilities and authorities, resources to implement the program and procedures controlling the water purity in the primary, secondary and balance of plant water systems. The program was reviewed relative to criteria in Technical Specifications 6.2, "Organization," and 6.8, "Procedures And Programs," and commitments provided in the Millstone Nuclear Power Station-Unit 3 Final Safety Analysis Report, (MNPS-3 FSAR), and the licensee's response to NRC-NRR Generic Letter No. 85-02, (i.e., the licensee's letter dated June 25, 1985, from J. F. Opeka, Northeast Nuclear Energy Company to H. L. Thompson, NRC-NRR and its attachment). The review was based on interviews with the Manager, Nuclear Materials & Chemistry and a member of his staff and Unit 3 Chemistry personnel, examination of ongoing operations and review of policies, procedures and applicable records.

3.1 Program Policies, Authorities and Responsibilities

A documented corporate policy for an effective water chemistry control program was provided by Nuclear Engineering and Operations (NEO) Policy Statement No. 7, "Plant Water Chemistry Program," Revision 1, (March 10, 1982). NEO Policy Statement No. 7 provided a corporate management commitment to and support for an effective water chemistry control program.

Corporate and station authorities and responsibilities for secondary water chemistry control were presented in NEO Procedure No. 2.17, "Secondary Water Chemistry Program," Revision 0), (May 30, 1985). NEO Procedure No. 2.17 also provided corporate requirements for water chemistry specifications, corrective actions in the event of water impurities exceeding specifications, sampling and analysis of secondary water, in-line instrumentation, and data/records management and reporting.

The organizational structure of the Unit 3 chemistry group was clearly defined. The group was composed of ten Chemistry Technicians supervised by the Assistant Chemistry Supervisor, Unit 3. The Assistant Chemistry Supervisor, Unit 3 reports to the Chemistry Supervisor who in turn reports to the Radiological Services Supervisor. The Unit 3 chemistry group's authorities, responsibilities and interfaces with other plant and site organizations appeared to be clearly established and understood by the Unit 3 Chemistry staff.

3.2 Management Oversight

The inspector reviewed the communication of chemistry data and trends to plant, station and corporate management. Chemistry data and trends were discussed by plant management at daily staff meetings concerning plant status. The Unit 3 Superintendent and his staff discussed the sulphate concentration in the secondary system and the dissolved oxygen levels in the auxiliary feed water system resulting from air in-leakage to the Condensate Storage Tank at daily meetings during the inspection.

Corporate chemistry personnel were involved in review and recommendations for corrective actions concerning the sulphate levels in Unit 3's secondary system. An action plan to assess and correct the sulphate levels noted was prepared by the corporate chemistry staff and reviewed and approved for implementation by the Senior Vice President, Nuclear Engineering and Operations.

3.3 Resources

Unit 3 Chemistry group staffing was reviewed with regard to routine operational and special startup testing analytical and sampling responsibilities. The technician staff was augmented by contracted chemistry technicians, (in addition to the ten technicians normally assigned to Unit 3) to support increased sampling and analyses of plant water systems during startup testing. No backlogs of samples or analyses were noted indicating that adequate staffing had been provided.

The adequacy of sampling and on-line monitoring capabilities is discussed in Paragraph 7. Laboratory resources were reviewed during Inspection No. 50-423/86-13.

3.4 Procedures

Unit 3 procedures were selectively reviewed to determine if:

- critical chemical variables and limit/action levels for control of those variables had been identified;
- sampling schedules and locations for obtaining those samples had been provided;
- analytical methods and their basis had been identified;
- recording and trending of data and reporting requirements were present in the procedures; and
- investigative and corrective actions to be taken when critical chemical variables exceeded action levels were established.

Under Technical Specification 6.8, chemical control procedures are required to prescribe the nature and frequency of sampling and analyses, provide instructions for maintaining water quality within prescribed limits and to limit the concentrations of agents that could cause corrosive attack or fouling of heat-transfer surfaces or become sources of radiation hazard due to activation. Under Technical Specification 6.8.4c, a program for secondary water chemistry control is also required. The licensee's chemistry procedures were reviewed to determine if the requirements had been met.

The following procedures were reviewed in detail, discussed with the Chemistry staff and provided the basis for review of the implementation of the water chemistry control program:

- Chemistry Procedure (CP) 3802A, "Primary Chemistry Control," Revision 0 (April 5, 1985);
- CP 3802B, "Secondary Chemistry Control," Revision 0 (December 20, 1984);
- CP 3802C, "Balance Of Plant Chemistry Control," Revision 0 (April 5, 1985); and
- CP 3802D, "Secondary Chemistry Alarm Setpoints," Revision 0 (May 28, 1985).

The procedures were consistent with Technical Specification requirements and generally followed guidelines established by the SGOG and vendor's recommendations.

4. Personnel Selection, Training and Qualification

The licensee utilizes chemistry technicians in roles which require skills as analysts, instrument technicians and system operators. The licensee's program to select, train and qualify chemistry technicians in those roles was reviewed relative to Technical Specifications 6.3, "Unit Staff Qualifications," and 6.4, "Training". Performance relative to the criteria was determined by interviews of the chemistry staff and the Contract Chemistry Instructor and examination of procedures, lesson plans and other records related to training.

The licensee's training center was developing a chemistry technician training program to meet Institute of Nuclear Power Operations (INPO) accreditation requirements. Plant-specific systems and procedural training and qualification programs were in place. The licensee appeared to have an adequate selection, training and qualification program under development. No violations relative to Technical Specification requirements were noted.

5. Self-Identification/Correction of Deficiencies

The licensee's program to identify and correct water chemistry control deficiencies was reviewed to determine if a program to identify, investigate, document, report, track, close and trend discrepancies in water chemistry control parameters had been established and implemented. The licensee's program was reviewed relative to criteria in 10 CFR 50, Appendix B and Technical Specifications 6.5, "Review And Audit," and 6.8, "Procedures And Programs."

5.1 Audits

Under the licensee's Quality Assurance Program Topical Report (QAPTR) implementing 10 CFR 50, Appendix B requirements and Technical Specification 6.5, the licensee's Quality Assurance organization audits the plant's water chemistry control program. The Senior Engineering Technologist was interviewed to determine the licensee's plans for audits of the water chemistry control program. The licensee plans audits of the chemistry program in June, 1986 and November, 1987, under the cognizance of the Nuclear Review Board.

5.2 Surveillance Activities

Under the QAPTR, surveillance of ongoing programs for procedural adherence are conducted. However, specific surveillance of adherence to water chemistry control program procedures had not been conducted.

5.3 Preoperational/Startup Tests

The initial test program, (as it related to identifying and correcting water chemistry control deficiencies), was reviewed against commitments in the MNPS-3 FSAR, Volume 13, Chapter 14, "Initial Test Program," NRC Regulatory Guide 1.37, "Quality Assurance Requirements For Cleaning Of Fluid Systems And Associated Components of Water-Cooled Nuclear Power Plants," and NRC Regulatory Guide 1.68, "Initial Test Programs For Water-Cooled Nuclear Power Plants." Preoperational Test No. 14, "Reactor Plant Sampling," Acceptance Test No. 78, "Turbine Plant Sampling," and Startup Test No. 15, "Water Chemistry Control," were reviewed and the dispositioning of test exceptions, (i.e., "unsatisfactories" in the licensee's nomenclature) was examined. Appendices (containing chemistry data) to two integrated plant test programs were also reviewed:

- Appendix 3029 to 3-INT-3000, "Precore Hot Functional Test"; and
- Appendix 8009 to 3-INT-8000, "Power Ascension Test".

Within the scope of this review, the licensee appeared to have conducted an adequate test program to identify and correct water chemistry control deficiencies.

6. Plant Water Chemistry Systems

The licensee's primary, secondary and auxiliary water systems were reviewed for familiarization and conformance to the descriptions in the NMPS-3 FSAR. Unit 3 is a four-loop Westinghouse PWR utilizing Westinghouse Model J Steam Generators for steam, a Chemical and Volume Control System for primary water chemistry control and a condensate polishing system to maintain feedwater purity. The licensee uses all-volatile treatment (AVT) for secondary water treatment. The licensee's feedwater reheaters contain copper necessitating operation in the 8.5 to 9.2 pH range to minimize the presence of reducible copper species in the feedwater. The presence of reducible copper species in the feedwater has been shown to increase the denting rate in steam generator tubes. The circulating water in the steam condensers is salt water taken from Long Island Sound. Nitrogen blanketing is used to control oxygen ingress to the Condensate Storage Tank (i.e., auxiliary feedwater system).

The as-built design was briefly reviewed for potential pathways of impurity ingress including:

- feedwater and auxiliary feedwater exposure to air;
- condenser tube failure;
- air inleakage through the condensate pump seals or turbine gland seals;
- bypass of the condensate polishers;
- chemical addition/regeneration of the demineralizers;
- contribution of copper from the feedwater reheaters;
- contamination of the Condensate Storage Tank with air; and
- leakage through heat exchangers.

Within the scope of this review, the following items were noted:

- During 1985, inleakage of circulating water was noted from the condenser and the licensee repaired the condenser.
- The dissolved oxygen levels in the Condensate Storage Tank increased from 250 to 2940 parts per billion (ppb) from May 6, 1986, through May 9, 1986, due to shutdown of the nitrogen blanketing system during safety upgrades of the liquid nitrogen storage tank area.
- Steam generator sulphate levels during startup exceeded the 20 ppb, (i.e., Action Level 1 in the SGOG's Guidelines), control value. The licensee surmised that the source of the sulfate was turbine coatings/paint and developed an action plan which is discussed in Paragraph 8.
- Silica (as SiO_2) exceeded the 200 ppb control value during hydrostatic and hot functional testing of the Reactor Coolant System in October, 1985. The 200 ppb control value was established by the licensee. The specification for Reactor Coolant Chemistry established by the vendor was 1000 ppb (which was not exceeded).

- During startup of the Condensate Demineralizers, a high differential pressure was noted on the strainer (i.e., effluent) from the 1E Demineralizer and the unit's flow recorder indicated a flow rate less than the other demineralizers. Examination of the strainer indicated demineralizer resin had accumulated in the strainer due to a tear in the hemming material in the resin retention filter, ("sock"). The licensee replaced the resin retention filters on the other seven demineralizers as well as the damaged filter. The inspector noted that a similar problem had occurred at Unit 2 prior to this event.

7. Sampling And Measurement

The licensee's water chemistry control sampling and measurement program was reviewed relative to criteria in the Technical Specifications, commitments in the MNPS-3 FSAR and the licensee's response to NRC-NRR Generic Letter No. 85-02, and guidance/recommendations of the Nuclear Steam Supply System (NSSS) vendor, (i.e., Westinghouse), and SGOG PWR Secondary Water Chemistry Guidelines. The licensee's program was examined by interviews and discussions with Chemistry personnel, examination of drawings, sampling records and other documents and direct observations during plant tours. Laboratory analyses of various chemical parameters were reviewed during Inspection No. 50-423/86-13.

7.1 Reactor Plant Sampling

The inspector reviewed sampling locations in the Reactor Plant against commitments in Section 9.3.2 "Processing Sampling" of the MNPS-3 FSAR. The Reactor Plant Sample Sink, (i.e., 3-SSR-SAS 1) was observed. This sample sink and the associated Reactor Plant Sample System permits grab sampling of the primary water at normal operating temperatures and reduces pressure and temperature to conditions for analysis. During the review of this sampling location, the following items were noted:

- Reactor coolant samples taken at the sampling location at full power with no failed fuel measured up to 900 millirems per hour (mrem/hr). Licensee personnel indicated that this radiation level resulted from insufficient delay of the sample to allow for decay of Nitrogen-16 prior to arrival at the sampling sink. The inspector noted that the access to the sample sink area was controlled as a locked and posted high radiation area and a survey meter was required for entry. The inspector discussed with the licensee control of reactor coolant sampling in the event of 1% failed fuel (per the design basis of the plant). The licensee stated that administrative controls to limit exposure to personnel would be enhanced in the event of evidence of failed fuel. This item will be reviewed during a subsequent inspection. 50-423/86-16-01.

The inspector reviewed the use of approved sampling procedures and valve line-ups by the Chemistry Technicians. General design and operation of the sample sink was reviewed relative to standards in American Society For Testing And Materials (ASTM) Standard D-3370-82, "Standard Practices For Sampling Water." Within the scope of this review, no additional items were identified.

7.2 Reactor Plant On-Line Instrumentation

Reactor Plant On-Line instrumentation for monitoring dissolved oxygen, pH and conductivity were reviewed for calibration, verification of monitor accuracy by laboratory analyses and control of sample temperatures: The following standards provided the basis for the review:

- ASTM Standard D 1125-82, "Standard Test Methods For Electrical Conductivity And Resistivity Of Water";
- ASTM Standard D 3864-79, "Standard Guide For Continual On-Line Monitoring Systems For Water Analysis,"
- ASTM Standard D 888-81, "Standard Test Methods For Dissolved Oxygen In Water;" and
- ASTM Standard D 1293-78, "Standard Test Methods For pH Of Water."

Within the scope of this review, no items were noted.

7.3 Turbine Plant Sampling

The inspector reviewed sampling locations in the Turbine Plant relative to commitments in Section 9.3.2, "Process Sampling Systems," of the MNPS-3 FSAR. The Turbine Plant Sampling Sink, (i.e. 3-SST-SAS 1) was observed. This sample sink and its associated Turbine Plant Sampling System permits grab sampling of the secondary water at normal operating temperatures and reduces pressure and temperature to conditions for analysis. The sample locations were reviewed relative to guidance in Figure 2-1 of the SGOG's "PWR Secondary Water Chemistry Guidelines, "Revision 1 (June 1984). The inspector noted that the sampling locations were in general agreement with the SGOG's guidelines. However, the following items were noted:

- The licensee's feedwater system did not contain continuous integrating samplers for iron and copper. Total iron should be monitored to quantify the transport and build up of sludge in the steam generators and to monitor feed train corrosion. Total copper should be monitored for similar reasons. In addition, laboratory tests have shown that the presence of reducible copper species in the feedwater increases the denting rate in steam generator tubes. The SGOG's guidelines recommend the application of continuous integrating sampling procedures for iron and copper analysis. Measurements of iron and copper based on grab samples may not provide satisfactory results due to difficulties in obtaining representative samples, plant transients and the stochastic nature of the particulate transport process. Procedures recommended by the SGOG concentrate filterable species on Millipore 0.45 micron membranes and colloidal soluble/nonfilterable species on cation resin impregnated membranes. Subsequently, the membranes are dissolved in a mixture of acids and analyses for iron and copper performed employing conventional flame atomic absorption procedures. SGOG's guidelines recommend that concentrations of iron exceeding 20 ppb and copper exceeding 2 ppb in the feedwater be investigated to identify and correct the cause.

This item was discussed with the licensee. The inspector noted that a Plant Modification Request, (PMR) had been submitted by Chemistry personnel on April 17, 1986 to install corrosion product samplers and that samplers had been purchased. The capability to sample iron and copper in the feedwater will be reviewed during a subsequent inspection. 50-423/86-16-02

- The licensee's steam condensers cascading hotwell sampling system was not in service. The licensee's design for the sampling system allowed selection of the hotwell to be sampled, provided a grab sample capability and permitted cation conductivity and sodium concentrations to be continously monitored for the hotwell selected. The sampling system provided diagnostic capability for the rapid detection of steam condenser tube leaks and ingress of circulating water into the feedwater train. The licensee was in the process of correcting this deficiency in the sampling program. The licensee's capability to sample the condenser hotwells will be reviewed in a subsequent inspection. 50-423/86-16-03

7.4 Turbine Plant On-Line Instrumentation

On-line instrumentation for continuously monitoring secondary water chemistry was reviewed relative to the guidelines provided in Table 4-1 of the SGOG's guidelines. Capabilities for continuous monitoring of specific conductivity, cation conductivity, pH, dissolved oxygen, chloride, sodium and hydrazine were noted and appeared to be in general agreement with the recommendations of the SGOG. The ASTM standards in paragraph 7.2 and the following additional standards provided the basis for the review:

- ASTM Standard D 2791-77, "Standard Methods For Continous Determination Of Sodium In Water," and
- ASTM Standard D 512-81, "Standard Test Methods For Chloride Ion In Water."

Calibration, verification of monitor accuracy by laboratory analyses and control of sample temperatures were also reviewed. Within the scope of this review, the following item was noted:

- The feedwater hydrazine continuous monitor was out of service. Hydrazine residual in the feedwater should be maintained equivalent to three times the stoichiometric oxygen content to aid in oxygen scavenging and passivate metal surfaces in the condensate/feedwater system. The licensee was substituting grab sampling and laboratory analyses for the measurement of hydrazine residual in the feedwater.

7.5 Balance of Plant Sampling

The licensee's grab sampling program for monitoring the water chemistry of the primary grade water storage tanks, Condensate Storage Tank, Condensate Surge Tank and Demineralized Water Storage Tank was briefly reviewed. Emphasis was placed on analysis of dissolved oxygen in the storage tanks. Within the scope of the review, no items were noted.

8.0 Implementation

The implementation of the licensee's water chemistry control program was reviewed relative to criteria in Technical Specifications, commitments in the MNPS-3 FSAR and the licensee's response to NRC-NRR Generic Letter No. 85-02, concensus guidelines and standards provided by the ASTM and SGOG, and recommendations of the NSSS vendor. Laboratory analytical procedures were reviewed during Inspection No. 50-423/86-13.

8.1 Primary Water Chemistry

Technical Specification 3/4.4.7, "Chemistry", requires surveillance of the Reactor Coolant System chemistry at least every 72 hours for dissolved oxygen (if the average Reactor Coolant temperature exceeds 250°F), fluorides and chlorides. The recommendations of the NSSS vendor suggest sampling for lithium, boron, pH, specific conductivity, dissolved hydrogen, total suspended solids, silica, aluminum, calcium and magnesium. The licensee controls the lithium concentration in a continuously falling band (over core cycle) with the boron concentration to maintain a constant pH operational scheme. Industry consensus guidelines suggest general corrosion and stress corrosion cracking processes in reactor coolant systems and fuel materials are controlled by maintaining a basic pH and minimizing dissolved oxygen, chloride, fluoride and sulfur.

Licensee Surveillance Procedure (SP) 3853, "Reactor Coolant Analysis For Dissolved Oxygen, Chloride and Fluoride, "Revision 0 (October 10, 1985) was reviewed for consistency with Technical

Specification 3/4.4.7. CP 3802A, "Primary Chemistry Control", was reviewed for consistency with recommendations of the NSSS vendor. Records of chemical analyses under SP 3853 and CP 3802A from January 1 to May 8, 1986 were reviewed and discussed with chemistry personnel.

Within the scope of this review, no violations were noted. The licensee appeared to have established and implemented a primary water chemistry sampling and analysis program meeting the criteria and recommendations referenced.

8.2 Secondary Water Chemistry

The licensee's secondary water control and monitoring program was reviewed relative to commitments made by the licensee in response to NRC-NRR Generic Letter No. 85-02 and recommendations and guidelines in the SGOG PWR Secondary Water Chemistry Guidelines, Revision 1 and the NSSS vendor recommendaitons. Control parameters and actions to be taken of those control parameters exceeded action levels were reviewed. CP 3802B, "Secondary Chemistry Control," Revision 0 (December 20, 1984) provides the licensee's secondary water control and monitoring program and appeared to be generally consistent with recommendations and guidelines. Records of chemical analyses under CP 3802B from January 1 to May 7, 1986 were reviewed and discussed with the licensee. Chemistry personnel were interviewed to determine their understanding of corrective actions to be taken in the event a control parameter exceeded its action value. The inspector noted that the following parameters were monitored at the frequencies specified in CP 3802B:

- pH
- hydrazine
- sodium
- chloride
- sulfate
- Dissolved Oxgen
- Specific conductivity
- Cation conductivity
- silica
- suspended solids
- Total organic Carbon
- Ammonia

As noted in Paragraph 7.3, the licensee was not monitoring total iron and copper in the feedwater.

8.3 Balance of Plant Chemistry

The licensee's program for monitoring and control of plant water systems which were not covered by CP 3802A and CP 3802B, (i.e. "balance of the plant") was reviewed. CP 3802C, "Balance Of Plant

Chemistry Control," Revision 0 (April 5, 1985) was reviewed to determine the plant systems being monitored and parameters being measured. The licensee monitors the following plant system under CP 3802C:

- Makeup water including city water, makeup demineralizer effluents, and deoxygenator system effluent
- Condensate Storage Tank
- Condensate Surge Tank
- Primary Grade Water Storage Tank
- Demineralized Water Storage Tank
- Closed Cooling Secondary System
- Closed Cooling Primary System
- Diesel Jacket Cooling
- Control Building Chilled Water System
- Reactor Plant Chilled Water System
- Accumulator
- Boric Acid Storage Tanks
- Refueling Water Storage Tank
- Spent Fuel Pool
- Volume Control Tank
- Reactor Coolant
- Auxiliary Boiler

Records of weekly analyses from January 1, through May 5, 1986 for selected plant systems were reviewed. Emphasis was placed on systems which could provide a source of contaminant ingress to the secondary system. Within the scope of this review, the licensee appeared to be implementing CP 3802C adequately to monitor potential contaminant ingress sources.

8.4 Data Management/Trending

The inspector discussed the analysis of chemistry data and the trending of chemical parameters with the licensee. The following aspects of the licensee's data management and trending program were discussed:

- performance of data consistency checks including "expected" or normal range values;
- performance of trending and trend analysis;
- review of the data by the technician, his supervisor and plant management; and
- treatment of data outside the "expected" range.

Within the scope of the discussion, the licensee appeared to have established a clearly understood data management and trending program. The licensee plans to establish a computer-based data management and trending program to replace the current manual methods.

8.5 Sulphate Problem

Sulphate and cation conductivity levels in the licensee's steam generators secondary side were found to be in excess of Action Level 1 values (as provided in the SGOG's guidelines and Unit 3 procedures) during startup testing. Maintaining parameter values below Action Level 1 is recommended by the SGOG to provide a high degree of assurance that corrosive conditions will be avoided in the steam generators. The Licensee's actions following discovery of the sulphate problem were reviewed. The licensee's plant and corporate chemistry staffs reviewed the steam generator blowdown sulfate levels and observed the trend of those levels as power levels were increased. The licensee discussed the problem with the NSSS vendor, Turbine vendor and other utilities and sampled the secondary water system for analyses inhouse and by contracted offsite laboratories. The licensee concluded that the sulfate contamination source was coatings on the low pressure turbines and associated piping and developed an action plan. Initially, the licensee proceeded with the startup program but periodically stopped and cooled down to below 375°F to reduce sulphate levels in the steam generators to less than 20 ppb (i.e. Action Level 1 value). During the period when sulphate levels were above 20 ppb, the licensee used a cation conductivity value of 2 micro Siemens per centimeter (µS/cm) as the limiting cation conductivity control parameter. Cation Conductivities exceeding 2 µS/cm would caused reduction in power to 30% and increased steam generator blowdown. Shutdowns for cleanup of the steam generators were recommended at either 16,800 ppb-hours of sulfate or every two weeks of operation at or above 30% power. Sulphate ppb-hours were based on average blowdown concentrations.

The licensee continued to monitor the problem and noted a decrease in cation conductivity and sulphate in April 1986 when compared to

March 1986 levels. Plant shutdowns to reduce sulphate levels were discontinued at that point following a corporate management review. The licensee was continuing under the revised action plan during the inspection.

The inspector noted that resins from the 1E Demineralizer had been found in the strainer of that unit and questioned the licensee concerning possible resin fines intrusion as the source of the increased cation conductivity and sulphate levels noted. The licensee stated that the analysis of the data indicated that resin intrusion had not occurred. The inspector was unable to substantiate the licensee's conclusion that the sulphate originated in turbine coatings since chemical analyses of the coating samples were not available for review. The licensee's actions regarding the sulphate levels in the four steam generators will be reviewed in a subsequent inspection. 50-423/86-16-04

9.0 Exit Interview

The inspector met with the licensee representative (denoted in Paragraph 1) at the conclusion of the inspection in May 9, 1986. The inspector summarized the scope of the inspection and findings as described in this report. At no time during the inspection was written material provided to the licensee by the inspector. No information exempt from disclosure under 10 CFR 2.709 is discussed in this report.