APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-313/92-04
50-368/92-04

Operating Licenses: DPR-51
NPF-6

Dockets: 50-313
50-368

Licensee: Entergy Operations, Inc.
Route 3, Box 137G
Russellville, Arkansas 72801

Facility Name: Arkansas Nuclear One (ANO)

Inspection At: ANO Site, Russellville, Arkansas

Inspection Conducted: January 27-31, 1992

Inspectors: J. B. Nicholas, Senior Radiation Specialist
R. E. Baer, Senior Health Physicist

Approved: Blaine Murray
Blaine Murray, Chief, Facilities Inspection Programs Section

2/20/92
Date

Inspection Summary

Inspection Conducted January 27-31, 1992 (Report 50-313/92-04; 50-368/92-04)

Areas Inspected: Routine, announced inspection of the licensee's radiation protection and water chemistry programs with emphasis on how these programs affect the low as reasonably achievable (ALARA) program.

Results: Within the areas inspected, no violations or deviations were identified. Two previously identified violations, one deviation, and one open item were closed.

The new Radiation Protection Manager met the requirements of the Technical Specification (TS). An acceptable level of staffing was proposed to support the upcoming Unit 1 refueling outage.

Management provided strong support for the ALARA program. ALARA staffing and worker awareness of the ALARA had increased.

Excellent water chemistry and radiochemistry programs had been developed. An excellent chemistry data management program had been established. An

excellent program had been established for the maintenance and quality control (QC) of the analytical instrumentation.

An aggressive 5-year ALARA plan had been established involving strict reactor coolant system chemistry control for source term reduction.

Comprehensive quality assurance (QA) surveillances and audits had been performed in the chemistry area.

The volume of radioactive waste being stored on site had been reduced. An excellent training program had been implemented for personnel involved with radioactive material transportation activities. An effective radioactive material/waste transportation program was in place.

DETAILS

1. PERSONS CONTACTED

AP&L

*N. S. Carns, Vice President, Operations
*J. E. Yelverton, General Manager, Operations
R. A. Sessoms, Plant Manager, Central
C. R. Adams, Environmental Specialist
H. N. Bishop, Jr., Supervisor, Radwaste
*S. W. Boncheff, Licensing Specialist
*S. R. Cotton, Manager, Radiation Protection(RP)/Radwaste
R. L. Jones, Supervisor, Chemistry
*R. J. King, Supervisor, Licensing
D. J. Meatheany, Supervisor, Chemistry
R. D. McCormick, Nuclear Quality Specialist, Chemistry/Radiochemistry
*W. C. McKelvy, Superintendent, Chemistry
*D. G. Moore, Superintendent, Health Physics Operations
*T. W. Nickels, Superintendent, Radwaste
R. Partridge, Chemistry Specialist
W. R. Pool, Supervisor, Chemistry
*G. D. Provencher, Manager, QA
P. C. Robins, Supervisor, Chemistry
*S. P. Robinson, Supervisor, ALARA
*D. D. Snellings, Jr., Technical Assistant, RP
D. J. Wagner, Supervisor, QA
D. A. White, Chemistry Specialist

NRC

*L. J. Smith, Senior Resident Inspector
*B. Murray, Chief, Facilities Inspection Program Section

*Indicates those present at the exit meeting on January 31, 1992.

The inspectors also interviewed several other licensee employees including radiation protection, chemistry, and instrumentation and controls.

2. FOLLOWUP ON PREVIOUSLY IDENTIFIED INSPECTION FINDINGS (92702)

(Closed) Violation (368/8706-02): Failure to Monitor Gaseous Effluents - This violation was identified in NRC Inspection Report 50-368/87-06 and was updated and discussed in NRC Inspection Reports 50-368/88-18, 50-368/89-36, and 50-368/90-06. The violation involved the failure of the gaseous effluent sampling system in the radioactive waste storage building (RWSB) to collect a representative sample of the effluent being monitored. The licensee completed the design change package (DCP-88-2104) for the installation of a gaseous effluent sampling system which was designed to extract an isokinetic sample of the gaseous effluent for analysis by the SPING monitor (2RX-9850). The

inspectors reviewed the completed DCP-88-2104 and verified that the RWSB gaseous effluent was being sampled and that the sample was representative of the effluent stream. The licensee's corrective action was satisfactory to prevent a recurrence of the violation.

(Closed) Deviation (368/8706-03): Failure to Install, Calibrate, and Operate Radiological Monitoring Systems in the RWSB - This deviation was identified in NRC Inspection Report 50-368/87-06 and was updated and discussed in NRC Inspection Reports 50-368/88-18, 50-368/89-36, and 50-368/90-06. The deviation involved the licensee's failure to install radiological monitoring equipment in the RWSB. The licensee had completed the installation of a radiation monitoring system consisting of an airborne radioactivity monitor (2RX-9850) in the RWSB exhaust ventilation system. The inspectors verified that the radiation monitor (2RX-9850) had been installed, was operational, and had been calibrated and tested in accordance with approved procedures and at the frequencies required by TS. The inspectors reviewed the channel test and calibration procedures for radiation monitor (2RX-9850) and found them to be adequate and performed at the required frequencies. The licensee's installation, calibration, and maintenance of the RWSB exhaust ventilation monitor were adequate to close this deviation.

(Closed) Violation (313/8947-01; 368/8947-01): Failure to Whole Body Frisk - This violation was identified in NRC Inspection Report 50-313/89-47; 50-368/89-47 and involved the failure by a worker to follow specific Radiation Work Permit (RWP) instructions and perform a whole body frisk upon exiting a radiologically controlled area outside of the plant's controlled access area. The licensee performed corrective actions described in their response to the violation dated February 20, 1990, which included implementation of a program to identify personnel failing to read and follow the specific instructions of their work RWP; an evaluation of location, quantities, setpoints, and proper use of personnel contamination monitors; and training to address the operation and proper use of the RM-7 portal monitors. The inspectors verified the licensee's performance of the corrective actions and found them to be satisfactory to close the violation.

(Closed) Open Item (313/9047-01; 368/9047-01): Radioactive Effluent Dose Calculations - This item was identified in NRC Inspection Report 50-313/90-49; 50-368/90-49 and involved differences in the calculated offsite dose results between the licensee and the NRC for the critical organs of the child from airborne tritium, iodine, and particulate effluents. The licensee reviewed and evaluated their computer code dose factor tables and site-specific calculation parameters and determined the proper site-specific values for the calculation parameters requested by the inspectors to be used in the NRC computer code, PC-DOSE. The inspectors performed confirmatory offsite dose calculations using site-specific computer code calculation parameters and were able to resolve the differences in the offsite dose results and verify that all calculated doses resulting from airborne tritium, iodines, and particulate effluents compared exactly between the licensee and NRC for all child critical organs. The licensee's actions were satisfactory to close this item.

3. ORGANIZATION AND MANAGEMENT CONTROLS (83750)

The inspectors reviewed the licensee's organization and staffing of the RP department, the program for the identification and correction of RP program weaknesses, audits and surveillances, communication to employees, and program documentation and implementation to determine agreement with commitments in Chapter 12 of the Unit 1 Updated Safety Analysis Report (USAR) and Chapter 13 of the Unit 2 USAR and compliance with the requirements in the Units 1 and 2 TS 6.2.

The licensee had designated a new Manager, Radiation Protection/Radwaste (Radiation Protection Manager). The inspectors reviewed the educational background and previous related experience for the individual and determined that this individual met the requirements specified in TS 6.2 for Units 1 and 2.

The licensee was in the process of making arrangements to supplement the permanent staff with contractor radiation protection technicians for the upcoming Unit 1 refueling outage. The licensee had approved an additional 80 senior and 22 junior grade RP contract technicians. At the time of the inspection, the licensee had commitments from 76 senior and 18 junior RP contract technicians.

The licensee was constructing a permanent facility to improve control for access and egress from the Unit 1 reactor building during refueling and maintenance outages. The inspectors reviewed drawings of the facility under construction. The new access/egress facility will improve flow controls for personnel entering and exiting the Unit 1 reactor building.

Conclusions

The new Radiation Protection Manager met the requirements of the TS. Arrangement had been made to hire additional contract RP technicians to support the permanent RP staff for the upcoming Unit 1 refueling outage.

4. MAINTAINING OCCUPATIONAL EXPOSURES ALARA (83728)

The inspectors reviewed the licensee's program for maintaining occupational radiation exposures ALARA to determine agreement with the commitments in the Units 1 and 2 USAR; compliance with the requirements of 10 CFR Part 20.1(c); and agreement with the recommendations of Regulatory Guides 8.8, 8.10, and 8.27, and Information Notices 83-59, 84-61, 86-44, 86-107, and 87-39.

The licensee's ALARA program was well defined in Administrative Procedure 1000.033 and Section 1612.000 of the plant's operating procedures. The radiation protection/radwaste department ALARA supervisor was responsible for site ALARA activities. The licensee had made some changes within the ALARA group since the last NRC inspection. During normal plant operations, the ALARA supervisor is assisted by seven specialists, an ALARA coordinator and ALARA planner for each unit, an outage ALARA planner, a plant modification ALARA coordinator, and an ALARA data coordinator. The ALARA group will be assisted

by two licensee technicians, four contractor technicians, and four vendor technicians during refueling outage for Unit 1.

The licensee had exhibited a strong, proactive management involvement in the ALARA program. Senior management personnel and department managers were members of the ALARA committee. During an ALARA Awareness Day, ALARA committee members were directly involved in the solicitation of ALARA suggestions. This involvement resulted in the submittal of 32 ALARA suggestions. There were approximately 70 ALARA suggestions received in 1991. Worker awareness to ALARA had been enhanced from actions taken by the ALARA committee.

ALARA goals were established by the individual working departments and in most cases the goal was reduced and approved by the ALARA committee. The initial goal for 1992 was projected to be 700 person-rem. However, after review by management, the goal was reduced to 575 person-rem which is a challenging goal when considering that two refueling outages are scheduled for 1992. The Unit 1 refueling outage was budgeted at 320 person-rem, and the Unit 2 refueling outage was budgeted at 185 person-rem leaving 70 person-rem exposure for non-outage activities. Person-rem exposures were tracked daily for each unit.

In 1991, the combined goal for the site had been established at 408 person-rem. However, the licensee expended only 351 person-rem which included exposure from the Unit 2 refueling outage. The licensee had established a conservative goal for personnel contamination events and had increased worker awareness through practical factors during radiation worker training and black-lite training for contractor employees.

The licensee had several dose reduction projects that have been proposed for the Unit 1 refueling outage. These projects include shutdown chemistry controls which include early boration and hydrogen peroxide injection to control the source term in the RCS. There are approximately 15 locations where "hot spot" flushing will be attempted and approximately 80 sites where temporary lead shielding will be placed to reduce radiation levels. Chemical decontamination will also be performed on the reactor building drain header, letdown system, and quench tank. The licensee has also obtained both a reactor head shield and steam generator manway shield in order to reduce radiation exposures.

Additional program enhancements included the use of video cameras (12) for surveillance in high radiation areas, alarming dosimeters, teledose (radio-teledosimetry) for high radiation work, and increased usage of the video disc plant identification system ("Surrogate Tour"). The licensee will also update the Surrogate Tour system for Unit 1 during the outage.

The licensee had remodeled the entrance to the controlled access (CA-2) and had provided an area where ALARA personnel could perform pre-job briefings and have the necessary equipment available to ensure that personnel are familiar with the job-site and how to access the area. Mock-up training has also been expanded to cover jobs such as scaffold erection and disassembly.

The inspectors made several plant tours during the course of the inspection. The tours involved observing work in progress, verifying radiological posting and controls, and performing independent surveys. No adverse operating conditions were observed and radiation levels were in agreement with the licensee's documented surveys.

Conclusions

The management provided strong support for the ALARA program. ALARA staffing and worker awareness of the ALARA program had increased.

5. LIGHT WATER REACTOR CHEMISTRY CONTROL AND CHEMICAL ANALYSIS (79701, 84750)

The inspectors reviewed the licensee's water chemistry control and analysis program including implementation of a water chemistry control program, water sampling, facilities and equipment, implementation of a QC program for chemical measurements, and QA audits and surveillances to determine agreement with the commitments in Chapters 4, 9, 11, 13, and 17 of the Unit 1 USAR and Chapters 5, 9, 11, 13, and 17 of the Unit 2 USAR and compliance with the requirements in the Unit 1 TS 3.10, 6.5.2.8, and 6.8 and Unit 2 TS 3/4.7.1.4, 6.5.2.8, and 6.8.

The inspectors' review of the water chemistry program found that the licensee had revised and approved administrative procedures, surveillance procedures, chemistry control procedures, sampling procedures, instrument calibration and QC procedures, and analytical procedures. A review of selected procedures revised since the previous NRC water chemistry inspection conducted in March 1991 indicated that the nuclear chemistry department had developed and implemented excellent procedures to meet the commitments of the USAR and the TS requirements.

The inspectors inspected the secondary chemistry laboratory, laboratory instrumentation, and chemistry sample rooms and in-line process instrumentation for both units. The secondary chemistry laboratory was equipped with the necessary chemicals, reagents, labware, standards, and state-of-the-art analytical instrumentation to perform the required analyses. The licensee had purchased a new atomic absorption spectrometer for the secondary chemistry laboratory and was in the process of writing operation and calibration procedures for it and calibrating the instrument for routine analysis work. It was noted that Unit 1 had installed an in-line ion chromatograph for the analysis of anions and cations and to monitor chemical parameters in most of the secondary water systems. The licensee had received an in-line ion chromatograph for Unit 2. It was scheduled to be installed in the Unit 2 sample room in March 1992 during the modification of the plant chemistry facilities. The inspectors reviewed the facility modification plans to consolidate the radiochemistry counting room, secondary chemistry laboratory, and chemistry supervisors' offices. The facility modification appeared to provided more efficient work space for conducting chemistry department business.

The inspectors reviewed selected chemistry department procedures for operation, calibration, and QC of the laboratory and in-line process analytical instrumentation. The inspectors verified that the secondary chemistry laboratory analytical instruments and the process instruments in both units had been calibrated in accordance with procedures and an instrument QC program had been implemented. All in-line process analytical chemistry instrumentation in both units was operational. Instrument maintenance logs for process instrumentation were maintained in the chemistry sample rooms for both units. It was noted that the licensee had implemented the use of instrument QC charts to trend QC data. The licensee had implemented a program using two independent standards for calibration and QC measurements of chemistry analytical instrumentation.

The inspectors reviewed secondary water chemistry data and reactor coolant chemistry data for 1991 to determine compliance with TS requirements. It was verified that TS required water chemistry sampling and analyses had been performed for both units. The review included an inspection of the recorded trends of the secondary water quality data and the reactor coolant chemistry data. The licensee had implemented an excellent chemistry data management program. The inspectors reviewed the records of out-of-specification chemical parameters and the licensee's corrective actions taken when chemical parameters did not meet established chemical control limits. The licensee's chemical control limits were established according to the Electric Power Research Institute (EPRI) owner's group guidelines for pressurized water reactor (PWR) secondary and primary water chemistry and the reactor manufacturer's chemistry specifications. The licensee had established action levels and corrective actions for out-of-specification chemistry conditions. The action levels and corrective actions were strictly enforced.

The inspectors reviewed the effectiveness of the water chemistry program to measure and prevent the introduction of chemical contaminates into the secondary water systems and the reactor coolant system and found that the licensee had implemented an excellent consumable chemical material control program. The inspectors verified that all chemicals brought on site must be classified and placed on the Consumable Chemical Material List prior to use. A spot check of chemical containers throughout both units was performed and all chemicals inspected were properly labeled and stored.

The inspector interviewed selected chemistry staff at all levels including plant operations and maintenance personnel who were involved with water chemistry control and the use of industrial chemicals in performing their assigned tacks to determine whether they understood the need for, and importance of, these chemical controls in maintaining water quality. Everyone who was interviewed was well aware of the need and importance of good chemical control throughout the plant.

The inspectors reviewed the chemistry department QC program for the inter-laboratory cross check program and chemical analyses of blind and spiked samples in secondary and primary chemistry. The results of the 1991 QC program records for selected chemistry technicians indicated a high percentage of initial analysis results meeting the acceptance criteria. Very few analyses

had to be repeated to meet acceptable analytical technique. The chemistry inter-laboratory QC program was being implemented in accordance with procedure.

The inspectors discussed with chemistry personnel occupational dose as it relates to plant water chemistry control. The inspectors reviewed the licensee's proposed five year ALARA plan and the chemistry department's responsibility. The plan proposed an aggressive implementation of a source term reduction effort. The licensee had proposed an elevated pH program for the reactor coolant during operation. The proposal recommended plant operation with the reactor coolant pH being maintained in a band from 6.9 to 7.4. Reactor coolant pH will be controlled by maintaining a lithium concentration of 2.2 $\pm$0.15 ppm lithium by the addition of lithium hydroxide to the RCS in accordance with plant operating parameters, EPRI guidelines, and approved PWR primary water specifications. The licensee was currently maintaining reactor coolant pH in the range of 6.0 to 7.0. Prior to the upcoming Unit 1 refueling and maintenance outage in March 1992, the five year ALARA plan proposed the implementation of an early boration of the RCS to 2000 ppm boron during reactor cool-down prior to reaching 450 degrees Fahrenheit. This is to minimize crud bursts during outage shutdowns. In conjunction with the early boration of the RCS, hydrogen peroxide is to be injected into the RCS to shock the system from a chemically reducing environment during the cool-down to a highly oxidizing environment to put into solution crud contamination which will be removed from the RCS by demineralizer ion exchangers. The licensee had also installed in the reactor coolant letdown system sub-micron filters in an attempt to maximize RCS purification and remove as much suspended particulate matter as possible from the RCS which could become activated and trapped in the system producing "hot spots" and unnecessary radiation exposure. The licensee's proposed 5-year ALARA plan appeared to be an aggressive attempt to reduce occupational exposure to a minimum with the help of chemical control and maintain plant operations ALARA.

The inspectors reviewed QA surveillances, QA audit plans and checklists, and the qualifications of the QA auditors. Audit and surveillance reports generated from QA activities during 1990 and 1991 in the areas of water chemistry and radiochemistry were reviewed for scope to ensure thoroughness of chemistry/radiochemistry program evaluation and the timely follow-up of identified deficiencies. The inspectors determined that the surveillances, audit plans, and checklists were technically comprehensive and provided a good programmatic evaluation. Very few findings were identified, and they were corrected and responded to in a timely manner. However, it was observed that very little attention was given to responding to audit recommendations and observations for program improvements since they did not require corrective actions and a formal response. This observation was discussed with the plant staff during the inspection and with plant management at the exit meeting on January 31, 1992. The licensee stated that they were aware of this problem and were pursuing means to address formally QA audit recommendations and observations for program improvement. The documents which were reviewed are listed in the Attachment to this report.

Conclusions

The water chemistry and radiochemistry programs had been developed and implemented in accordance with NRC requirements and industry guidelines. The licensee had implemented an excellent chemistry data management program. An excellent program had been established for the maintenance and QC of the analytical instrumentation in the secondary chemistry laboratory and Units 1 and 2 sample rooms. The secondary chemistry laboratory and in-line process analytical instrumentation had been upgraded since the previous chemistry inspection. An excellent consumable chemical material control program had been implemented. The licensee had proposed an aggressive five year ALARA plan involving strict RCS chemistry control for source term reduction. QA surveillances and audits had been performed as required and were technically comprehensive and provided excellent program evaluation.

6. TRANSPORTATION ACTIVITIES (86750)

The inspectors reviewed the licensee's program for the transportation of radioactive material, spent fuel, procurement of and evaluation of packaging, preparation of packages for shipment, and receipt of radioactive material for compliance with the requirements of 10 CFR Parts 20, 30, and 71; and the Department of Transportation requirements, 49 CFR Parts 171 through 189.

The inspectors reviewed all records of radioactive material shipments made during the time period January 1, 1991, through December 31, 1991, for completeness of shipment records. The licensee had made 116 shipments of radioactive materials. Forty-nine shipments were laundry shipments. Approximately 14,033 cubic feet of low level radioactive waste was shipped to burial sites. The licensee had disposed of contaminated soil and other material that had been onsite for extended lengths of time. There was very little radioactive waste carried over from prior years.

The inspectors verified that the licensee had established procedures and checklists for the preparation of radioactive material for shipment and waste shipments. These procedures included requiring a visual inspection of the packages prior to use or loading the package, instructions for closing and sealing the packages, the package's identification and weight, labeling requirements for the appropriate type of package, and determining the Curie content and the radiation and contamination limits for each package. The licensee had routinely used QC hold or checkpoints during the preparation of radioactive materials packages.

The inspectors determined by discussions with licensee representatives that none of the ANO radioactive material or waste shipments had been involved in an accident or incident. The licensee had implemented an effective radioactive material/waste transportation program.

Conclusions

The licensee had reduced the volume of radioactive waste being stored on site. Personnel involved with radioactive material transportation activities received

annual training on federal requirements and burial site requirements. The licensee had maintained an effectively managed radioactive material/waste transportation program.

7. EXIT MEETING (30703)

The inspectors met with the NRC senior resident inspector and the licensee representatives identified in paragraph 1 of this report at the conclusion of the inspection on January 31, 1992. The inspectors summarized the scope and findings of the inspection as presented in the report. The licensee did not identify as proprietary any of the materials provided to, or reviewed by, the inspectors during the inspection.

ATTACHMENT

DOCUMENTS REVIEWED

Arkansas Nuclear One

NRC Inspection Report: 50-313/92-04; 50-368/92-04

1. Quality Assurance Audits and Surveillances

Quality Assurance Procedure (QAP)-1-90, Radwaste Management, conducted October 31, 1990 through December 26, 1990

QAP-3-90, Health Physics, conducted March 12, 1990 through May 7, 1990

QAP-22-90, Nuclear Chemistry, conducted September 10, 1990 through December 5, 1990

QAP-3-91, Health Physics, conducted April 4, 1991 through July 17, 1991

QAP-12-91, Facility Operating License - Secondary Water Chemistry Monitoring, conducted August 28, 1991 through December 11, 1991

Quality Assurance Surveillance Report (QASR)-90-005, Cold Laboratory Qua`ity Control, conducted January 9, 1990

QASR-90-010, Nuclear Chemistry Evening Shift Rounds, conducted January 11, 1990

QASR-90-035, Primary Boron Standardization - Hot Lab., conducted March 3, 1990

QASR-90-062, Health Physics - Radiation Surveys, conducted May 2, 1990

QASR-90-070, Unit 2 Spent Fuel Shipment to Chalk River, conducted March 12, 1990 through May 21, 1990

QASR-90-091, Unit 1 Technical Specification Primary Chemistry, conducted July 20 and 23, 1990

QASR-90-112, Health Physics Coverage (Weekend, Unit 2 Power Entry), conducted September 10, 1990

QASR-90-128, Personnel Contamination Events, conducted October 2 and 3, 1990

QASR-90-139, Reactor Building Hot Particle Controls, conducted October 22, 1990

QASR-90-162, Steam Generator Cleaning - Health Physics Controls, conducted October 28, 1990 through December 1, 1990

QASR-90-163, Health Physics Control Point Activities (Unit 1 CA-3), conducted November 30, 1990 through December 7, 1990

QASR-91-034, 2R8 Fuel Handling Operations, conducted March 14, 1990 through March 22, 1990

QASR-91-063, Control of Materials Designated for Use Inside Radiologically Controlled Areas, conducted May 24, 1991

QASR-91-088, Radiological Surveys, conducted August 26-29, 1991

QASR-91-103, Radiological Work Practices in Radiologically Controlled Areas Outside of Controlled Areas, conducted October 4-22, 1991