

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Performance Appraisal for the NRC/State of Arkansas Environmental Monitoring  
Cooperative Agreement NRC-31-83-667

Facility Name: Arkansas Department of Health  
Division of Radiation Control & Emergency Management  
Division of Public Health Laboratories

Appraisal At: Little Rock, Arkansas

Appraisal Conducted: February 15-18, 1994

Appraisal Period: January 1, 1988, through December 31, 1992

Appraiser: J. Blair Nicholas, Ph.D., Senior Radiation Specialist  
Facilities Inspection Programs Branch

Approved: Blaine Murray 3/7/94  
Blaine Murray, Chief, Facilities Inspection Programs Branch Date

Appraisal Summary

Areas Appraised: Routine, announced performance appraisal of the state's adherence to the cooperative agreement including: management support, organization, staffing, training, facilities and equipment, procedures, quality assurance program, and compliance with the cooperative agreement statement of work.

Results:

- The radiological environmental monitoring program around the Arkansas Nuclear One Station was administered and conducted by qualified personnel who have experience in health physics and radiological environmental monitoring (Section 2).
- The state's radiological environmental monitoring program was supported with funds from the Department of Health budget and supplemented by the NRC cooperative agreement funds (Section 2).
- The cooperative agreement is administered and conducted under the direction and supervision of the Division of Radiation Control and Emergency Management within the Bureau of Environmental Health Services and supported by the Division of Public Health Laboratories (Section 3).

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- There had been one staff change in the Division of Radiation Control and Emergency Management directly responsible for the administration of the cooperative agreement. There had been a 100 percent turnover of staff in the radiochemistry laboratory (Section 4).
- The radiochemistry laboratory staff received offsite training in the areas related to their job responsibilities (Section 5).
- Training records had not been established for the radiochemistry laboratory staff which would document that laboratory supervision had reviewed and accepted a technician's proficiency to perform specific analytical procedures (Section 5).
- Supplemental technical training, especially instrument vendor supplied training, will be approved whenever possible (Section 5).
- No changes had been made to the radiochemistry laboratory facility (Section 6).
- The radiochemistry laboratory had purchased a high-purity germanium detector. The radiochemistry laboratory was proposing to replace the "old" multichannel analyzer system with a state-of-the-art gamma spectroscopy system and a second high-purity germanium detector and shield (Section 6).
- The purchase of two additional air samplers as spares for the four "old" air samplers was discussed, and the Division of Radiation Control and Emergency Management agreed to consider the purchase of the additional air samplers (Section 6).
- The air sampler flow rate calibration device was calibrated annually (Section 6).
- The Division of Radiation Control and Emergency Management had approved procedures for performing radiological environmental sampling and exchanging the thermoluminescent dosimeters (Section 7).
- The radiochemistry laboratory had revised procedures for the quality control, calibration, and operation of the radiochemistry laboratory counting instruments and the performance of sample analyses. The radiochemistry laboratory procedures were approved for official use (Section 7).
- Procedures for analyzing, annealing, and calibrating the state's environmental thermoluminescent dosimeters and for the routine calibration and maintenance of the state's environmental air samplers were written and approved. A maintenance/calibration record for each environmental air sampler was established (Section 7).

- The radiochemistry laboratory's performance in the Environmental Protection Agency's cross-check program was acceptable within the Environmental Protection Agency's acceptance criteria (Section 8).
- The radiochemistry laboratory staff were performing adequate calibrations and quality control performance checks to verify the accurate performance of the analytical instrumentation (Section 8).
- The state's performance during 1988, 1989, 1990, 1991, and 1992 satisfied the conditions of the radiological environmental monitoring cooperative agreement involving the collection and analyses of the environmental samples, the exchanging of the thermoluminescent dosimeters for the NRC, and the submittal of the annual reports (Section 9).
- Even though several minor program enhancements could be made, the state's overall performance was excellent and met the conditions of the radiological environmental monitoring cooperative agreement. Therefore, it is recommended that the NRC/State of Arkansas Environmental Monitoring Cooperative Agreement NRC-31-83-667 be continued.

## DETAILS

### 1 GENERAL

The purpose of this appraisal was to evaluate the state of Arkansas' performance of the conditions specified in the cooperative agreement. The appraisal effort was devoted to reviewing the 1988, 1989, 1990, 1991, and 1992 implementation of the environmental monitoring program around the Arkansas Nuclear One Station and the samples' analytical results. The NRC thermoluminescent dosimeter and the environmental monitoring sampling and analyses programs around the Arkansas Nuclear One Station were implemented in January 1980.

### 2 MANAGEMENT SUPPORT

The state of Arkansas currently does not conduct a separate state radiological environmental monitoring program (e.g., airborne, surface water, fish, food products, and shoreline sediment) around the Arkansas Nuclear One Station in addition to the samples and analyses specified in the cooperative agreement. However, the state maintains an independent thermoluminescent dosimeter monitoring network around the Arkansas Nuclear One Station. The state's radiological environmental monitoring program around the Arkansas Nuclear One Station, as described by the cooperative agreement, was conducted by the state's Division of Radiation Control and Emergency Management with assistance from the Division of Public Health Laboratories within the Arkansas Department of Health. The state's radiological environmental monitoring program around the Arkansas Nuclear One Station was administered and conducted by qualified personnel who have experience in health physics and radiological environmental monitoring and took a concerned interest in the performance of the radiological environmental monitoring program. The state's radiological environmental monitoring program was supported by the NRC cooperative agreement funds and funds from the Department of Health budget. These funds appeared to be adequate to maintain the sampling and analyses program around the Arkansas Nuclear One Station and to furnish the Division of Public Health Laboratories' radiochemistry laboratory with the necessary equipment and supplies.

### 3 ORGANIZATIONAL STRUCTURE

The appraiser reviewed the state of Arkansas' Division of Radiation Control and Emergency Management and Division of Public Health Laboratories organizational structures and staff assignments and responsibilities for the management and implementation of the cooperative agreement requirements. The cooperative agreement was administered and conducted under the direction and supervision of the Division of Radiation Control and Emergency Management within the Bureau of Environmental Health Services, and the reporting sequence remained the same as previously reported in the NRC Appraisal Report 99990004/88-26.

#### 4 STAFFING

The appraiser reviewed the Division of Radiological Health and Division of Health Laboratories staffing responsible for administering and implementing the requirements of the cooperative agreement. There had been one personnel change in the Division of Radiation Control and Emergency Management related to the administration of the cooperative agreement since the previous appraisal conducted in October 1988. This change was the assignment of Donald Greene as Health Physicist in the Programs and Emergency Management Section. There had been a 100 percent change of personnel in the radiochemistry laboratory since the previous appraisal. The appraiser reviewed the educational background and previous employment experience of the new radiochemistry laboratory supervisor and two new chemists. The new radiochemistry laboratory supervisor assumed the radiochemistry laboratory supervisor's responsibilities in July 1992 after a 2-month turnover from his predecessor. The two chemists had worked in the radiochemistry laboratory since July and December 1990, respectively. The appraiser determined that the radiochemistry laboratory staff had chemistry degrees but had no prior radiochemistry experience before being assigned to the radiochemistry laboratory.

#### 5 TRAINING

The appraiser reviewed the offsite and on-the-job training received by the radiochemistry laboratory staff. It was determined that the radiochemistry laboratory staff had received offsite vendor training on the analytical instruments related to their analytical responsibilities during the time period covered by the appraisal. The radiochemistry laboratory staff had received on-the-job training in radiochemistry analysis techniques, analytical instrumentation operation, and quality control procedures, as required to perform their job responsibilities. The appraiser noted that training records had not been established which would document that laboratory supervision had reviewed and accepted a technician's proficiency to perform specific analytical procedures. The radiochemistry laboratory staff should be encouraged to attend specific job related courses and workshops to maintain an appropriate level of technical competence. This supplemental technical training was discussed with the Public Health Laboratories' management during the appraisal, and the Public Health Laboratories' management agreed that supplemental offsite training, especially instrument vendor supplied training, was valuable and that it will be approved whenever possible.

#### 6 FACILITIES AND EQUIPMENT

The appraiser inspected the radiochemistry laboratory and the counting instrumentation used in the performance of the cooperative agreement radiological environmental analyses requirements. There had been no changes in the radiochemistry laboratory since the previous appraisal. The appraiser reviewed the radiochemistry laboratory counting instrumentation upgrade. A new high-purity germanium detector had been purchased in September 1991. The radiochemistry laboratory had proposed in the Fiscal Year 1995 budget to

replace the Nuclear Data Model 990 multichannel analyzer system (purchased in 1987 and no longer supported by the manufacturer) with a state-of-the-art gamma spectroscopy system and possibly add a second high-purity germanium detector and shield to enhance the gamma isotopic analysis capability and increase the efficiency of the gamma isotopic analyses.

The Division of Radiation Control and Emergency Management maintained an inventory of four environmental air samplers for use in conducting the cooperative agreement air sampling requirements. Two air samplers were routinely in service with two spare air samplers stored and kept in repair and calibration as backup replacements. The appraiser discussed at the exit meeting the possibility of purchasing two additional air samplers as spares for the four "older" air samplers which were purchased in January 1986. The appraiser noted that the air samplers had been calibrated annually using a flow rate calibration device. The flow rate calibration device was calibrated annually by a certified laboratory, and the calibration documentation was in order. The Division of Radiation Control and Emergency Management agreed to evaluate and consider the purchase of the additional air samplers.

## 7 PROCEDURES

The appraiser reviewed the state's radiological environmental monitoring program procedures for sample collection, control, preparation, and analyses; the calibration and quality control of analytical counting instrumentation; thermoluminescent dosimeter reader; and air sampling equipment. The appraiser noted that significant progress had been made in the area of procedural development since the previous appraisal. The Division of Radiation Control and Emergency Management had revised and approved procedures for performing radiological environmental media sampling and exchanging the thermoluminescent dosimeters during the appraisal period. The radiochemistry laboratory had revised procedures for the quality control, calibration, and operation of the various radiochemistry counting instruments and the performance of sample analyses. The appraiser specifically noted the procedures for exchanging, analyzing, annealing, and calibrating the state's environmental thermoluminescent dosimeters and for the routine calibration and maintenance of the state's environmental air samplers. A maintenance/calibration record for each environmental air sampler had been established.

The appraiser reviewed the radiochemistry laboratory's procedures which provided instructions for the labeling and control of samples; for the performance of radiochemistry laboratory analyses; and for the operation, calibration, and quality control of the radiochemistry counting instruments. All of the procedures in the radiochemistry laboratory had been revised and approved during the appraisal period.

## 8 QUALITY ASSURANCE PROGRAM

The appraiser reviewed the state's quality control program for the radiochemistry counting instruments. The radiochemistry laboratory participated in the Environmental Protection Agency's cross-check confirmatory measurements program during the appraisal period. The radiochemistry laboratory's performance during the appraisal period was reviewed and found acceptable within the Environmental Protection Agency acceptance criteria. A summary of the radiochemistry laboratory's analytical results in the Environmental Protection Agency's cross-check program was included with each annual report as required by the cooperative agreement.

The radiochemistry laboratory also performed an internal quality control program. The program consisted of quality control performance checks and calibrations of the counting instruments. The radiochemistry laboratory had approved procedures to document the calibration and quality control programs for the analytical counting instruments and had established frequencies and acceptance criteria for the routine quality control performance checks. However, the radiochemistry counting instrument calibration procedures had not established a calibration frequency for each instrument. The appraiser reviewed selected calibration and quality control data for the radiochemistry laboratory counting instruments during the appraisal period which had been performed with radioactive standards traceable to the National Institute of Standards and Technology. Quality control performance checks were being performed on the counting instruments routinely, results were being tabulated, and quality control charts were being used to trend instrument performance except for the Nuclear Data multichannel analyzer system. The review of quality control and calibration data for the Packard Tri-Carb Model 2000A liquid scintillation counting system indicated that a new quench curve calibration was being performed by the instrument service representative during the semiannual vendor preventive maintenance visit as part of the vendor service contract, that a quality control tritium standard and background sample were being counted along with each set of samples analyzed for tritium, and that the results of the quality control standard and background sample were being tabulated and plotted on quality control charts to document instrument performance. The Canberra Model 2201 low-background alpha/beta counting system was calibrated by the instrument service representative during the semiannual vendor preventive maintenance visit as part of the vendor service contract and the gross beta efficiency was last determined in September 1986. An Americium-241 alpha standard, a Strontium-90/Yttrium-90 beta standard, and a background sample were counted prior to each instrument use as a quality control performance check and alpha and beta efficiency checks. This quality control data was tabulated and plotted on quality control charts to document instrument performance. A chi-square test of the quality control data was performed periodically. A review of the quality control and calibration data for the Nuclear Data Model 990 multichannel analyzer system indicated that the 3.5 liter liquid Marinelli beaker calibration standard was analyzed on the high-purity germanium detector daily prior to instrument use to verify the system's energy calibration and performance, that all environmental sample counting geometries were calibrated

during the appraisal period, and that the last calibration of seven of the ten sample counting geometries was performed during the fourth calendar quarter of 1990 when the new detector was initially calibrated. The only counting geometry calibrations performed since the initial counting geometry calibrations of the detector were of 1 kilogram of sand in a 1.0 liter Marinelli beaker (Geometry 16) in July 1993, a 3.5 liter liquid Marinelli beaker (Geometry 7) in January 1994, and a silver zeolite cartridge (Geometry 17) in February 1994. A calibration frequency for each sample counting geometry had not been established. However, based on the analytical results from the Environmental Protection Agency's cross-check program, it appeared that the radiochemistry laboratory staff were performing adequate calibrations and quality control performance checks to verify the accurate performance of the analytical instrumentation.

## 9 SAMPLE COLLECTIONS AND ANALYSES

The appraiser reviewed the sample collection and analyses performed for the appraisal period January 1, 1988, through December 31, 1992, to determine agreement with the cooperative agreement's radiological environmental sampling and analysis program and the exchange of the NRC thermoluminescent dosimeters. Arkansas Nuclear One Station conducted its own independent radiological environmental monitoring program in accordance with its Technical Specification and Offsite Dose Calculation Manual requirements. State personnel and personnel from Arkansas Nuclear One Station performed routine radiological environmental sampling and sample splitting as required by the cooperative agreement. State personnel performed all sample preparations and analyses of their samples in the radiochemistry laboratory. The state's thermoluminescent dosimeters were processed by state personnel. State personnel exchanged the thermoluminescent dosimeters associated with the NRC thermoluminescent dosimeter direct radiation measurement network and submitted them for processing to the NRC Region I office on a quarterly exchange frequency. The appraiser accompanied state personnel to several radiological monitoring sample locations, verified that sampling equipment was operating and calibrated, verified that sample location descriptions were correct, and witnessed the collection of air samples and surface water samples and the handling and labeling of the samples.

The following radiological environmental monitoring program, as specified in the statement of work to the cooperative agreement, was evaluated:

### 9.1 Airborne - Particulate and Radioiodine

The cooperative agreement required two continuous air samplers at the Arkansas Nuclear One Station: one air sampler in close proximity to the station's air sampler in the highest X/Q area from the station and another air sampler at a control location in close proximity to the station's control air sampler. The cooperative agreement required continuous air sampling with airborne particulate and radioiodine samples collected weekly at two locations as described above. Gross beta analysis of the air particulate samples was required following each weekly filter change and the filters were composited



by location for a quarterly gamma isotopic analysis. The weekly radioiodine charcoal cartridge samples were required to be analyzed for Iodine-131 following each cartridge exchange.

Airborne particulate and radioiodine samples were collected weekly by state personnel at the state's sample locations. Gross beta, gamma isotopic, and iodine-131 analyses were performed at the required frequencies in the radiochemistry laboratory. The results reported by the state in the 1988, 1989, 1990, 1991, and 1992 annual reports met the requirements specified in the cooperative agreement.

### 9.2 Surface Water

The cooperative agreement required two surface water samples to be collected and analyzed monthly at the Arkansas Nuclear One Station: one sample downstream of the station in the immediate area of the station's effluent discharge and another sample upstream of the station at a control location.

The cooperative agreement required a gamma isotopic analysis and a tritium analysis on a monthly frequency from each sample location. Surface water samples were collected from two sample locations at the Arkansas Nuclear One Station as described above and gamma isotopic and tritium analyses were performed at the required frequency in the radiochemistry laboratory. The results reported by the state in the 1988, 1989, 1990, 1991, and 1992 annual reports met the requirements specified in the cooperative agreement.

### 9.3 Milk

The cooperative agreement required one monthly sample from a dairy located in the highest X/Q location. A gamma isotopic analysis and a specific iodine-131 analysis was required on a monthly frequency. The required samples were collected and split between the state and the Arkansas Nuclear One Station monthly. Gamma isotopic and Iodine-131 analyses were performed at the required frequency in the radiochemistry laboratory. The results reported by the state in the 1988, 1989, 1990, 1991, and 1992 annual reports met the requirements specified in the cooperative agreement.

### 9.4 Fish

The cooperative agreement required one sample of a commercially or recreationally important species in the vicinity of the effluent discharge from the Arkansas Nuclear One Station semiannually or when in season. Gamma isotopic analysis of the edible portions was required. The required samples were collected and split between the state and the Arkansas Nuclear One Station. Gamma isotopic analyses were performed in the radiochemistry laboratory. The results reported by the state in the 1988, 1989, 1990, 1991, and 1992 annual reports met the requirements specified in the cooperative agreement.

### 9.5 Food Products

The cooperative agreement required two samples of principal food products grown near a point having the highest X/Q or grown in an area irrigated by water into which the Arkansas Nuclear One Station's effluent discharge flows or green leafy vegetables grown in a private garden or farm in the immediate area of the Arkansas Nuclear One Station to be split between the state and the Arkansas Nuclear One Station at the time of harvest. Gamma isotopic analysis including radioiodine analysis of the edible portions was required. The required samples were collected and split between the state and the Arkansas Nuclear One Station. Gamma isotopic analyses were performed in the radiochemistry laboratory. The results reported by the state in the 1988, 1989, 1990, 1991, and 1992 annual reports met the requirements specified in the cooperative agreement.

### 9.6 Soil/Sediment

The cooperative agreement required one annual sample of shoreline sediment along a body of water into which the Arkansas Nuclear One Station's effluent discharge flows to be split between the state and the Arkansas Nuclear One Station. Gamma isotopic analysis was required. The required samples were collected and split between the state and the Arkansas Nuclear One Station. Gamma isotopic analyses were performed in the radiochemistry laboratory. The results reported by the state in the 1988, 1989, 1990, 1991, and 1992 annual reports met the requirements specified in the cooperative agreement.

### 9.7 Direct Radiation Levels

The state had established an independent thermoluminescent dosimeter direct radiation monitoring network around the Arkansas Nuclear One Station. The state had established 52 independent thermoluminescent dosimeter locations in conjunction with the Arkansas Nuclear One Station and the NRC's thermoluminescent dosimeter 43 location network established in December 1979. Sixteen of the Arkansas Nuclear One Station's thermoluminescent dosimeter sites and seventeen of the state's thermoluminescent dosimeter sites were collocated with the NRC's thermoluminescent dosimeter sites.

The cooperative agreement required the state personnel to exchange the NRC's thermoluminescent dosimeters quarterly and send them for processing by NRC, Region I, personnel. The results reported in the 1988, 1989, 1990, 1991, and 1992 annual reports for the Arkansas Nuclear One Station met the requirements specified in the cooperative agreement.

### 9.8 Lower Limits of Detection

The appraiser reviewed the state's lower limits of detection reported in the 1988, 1989, 1990, 1991, and 1992 annual reports. The lower limits of detection reported by the state for the required analyses met the requirements specified in the cooperative agreement.

## 10 REPORTS

The cooperative agreement required an annual report of the state's analyses results with comparisons of duplicate or split sample analyses results reported by the Arkansas Nuclear One Station within 120 days after January 1 of each calendar year. The 1988, 1989, 1990, 1991, and 1992 annual reports were submitted by the state to the NRC within the time period specified in the cooperative agreement.

## ATTACHMENT

### 1 PERSONS CONTACTED

#### 1.1 Arkansas Department of Health Personnel

- \*B. R. Bevill, Health Physics Supervisor, Programs & Emergency Management Section
- \*G. J. Dicus, Director, Division of Radiation Control & Emergency Management
- \*R. F. Dobbins, Associate Director, Bureau of Environmental Health Services
- \*G. M. Foreman, Director, Environmental Chemistry Section, Division of Public Health Laboratories
- D. J. Greene, Health Physicist, Programs & Emergency Management Section
- \*J. G. Hill, Director, Bureau of Environmental Health Services
- \*J. B. Hockey, Chemistry Supervisor, Radiochemistry Laboratory
- \*R. A. Horn, Director, Division of Public Health Laboratories
- J. G. Hyde, Health Physicist, Nuclear Planning & Response Section
- T. D. Poposky, Chemist, Radiochemistry Laboratory
- C. G. Rogers, Chemist, Radiochemistry Laboratory

#### 1.2 Others

- \*P. Whitfield, Senior Chemist, Entergy Services, Entergy Operations, Inc.

\*Denotes those present during the exit meeting on February 18, 1994.

### 2 EXIT MEETING

At the conclusion of the appraisal on February 18, 1994, the appraiser discussed the scope and findings of the appraisal. The Arkansas Department of Health representatives present at the exit meeting agreed to review the appraiser's findings as detailed in the report.