

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Report No: 50-346/99015(DRS)

Licensee: FirstEnergy Nuclear Operating Company

Facility: Davis-Besse Nuclear Power Station

Location: 5503 N. State Route 2
Oak Harbor, OH 42449

Dates: July 12 - 16, 1999

Inspector: Wayne Slawinski, Senior Radiation Specialist

Observer: Karl Von Ahn, Ohio Department of Health

Approved by: Gary L. Shear, Chief, Plant Support Branch
Division of Reactor Safety

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EXECUTIVE SUMMARY

Davis-Besse Nuclear Power Station NRC Inspection Report 50-346/99015(DRS)

This routine, announced inspection assessed the effectiveness of the licensee's programs for the management of solid radioactive waste (radwaste), the transportation of radioactive material and radwaste and radiological environmental monitoring. Specifically, the inspector evaluated the implementation of the licensee's process control program (PCP) for processing waste streams into forms acceptable for land disposal and reviewed waste characterization methods, waste shipment manifesting, package preparation, and the training of staff involved in shipment activities. The inspector also evaluated several on and offsite environmental stations and accompanied station personnel during routine sampling activities. Within these areas, the following conclusions were made:

Plant Support

- The radiological environmental monitoring program (REMP) was generally implemented effectively in that environmental samples were collected and analyzed to meet offsite dose calculation manual (ODCM) criteria. Sample results from 1997 and 1998 showed that plant operations did not have a discernible radiological impact on the environment. Also, an enhanced REMP continued to be implemented and provided more comprehensive analyses of the plant's environmental impact (Section R1.1).
- Several deficiencies were identified with environmental sampling station maintenance, security and other aspects of the REMP that potentially impacted the representativeness of some samples and that indicated a need for improved program oversight (Section R1.1).
- Experienced staff and close supervisory oversight of waste processing activities ensured effective implementation of the radwaste management program. Wet solid wastes were processed in accordance with the licensee's PCP and implementing procedures, and dewatered waste streams were sampled and verified to ensure regulatory limits for free standing liquid were met. A comprehensive radioactive material inventory control system effectively tracked material storage and movement at the site (Section R1.2).
- The program for classifying radwaste streams and scaling difficult to measure radionuclides was implemented in accordance with industry guidance and recommendations (Section R1.3).
- The licensee had yet to develop a procedure to ensure consistent and appropriate implementation of the scaling factor program, a deficiency the licensee recognized as a result of an observation made during a 1998 NRC inspection (Section R1.3).
- The radioactive material and radwaste packaging and transportation program was effectively implemented. Shipments were appropriately classified and controlled; vehicle and package surveys were performed as required; and shipment manifests were completed in accordance with requirements (Section R1.4).

- Waste shipment manifest documentation and data entry errors identified by the inspector were attributed to isolated human error and were being addressed by the licensee (Section R1.4).
- The training provided to staff involved in the transportation of radioactive materials and radwaste was adequate and satisfied Department of Transportation requirements. Individuals designated as qualified shippers completed a comprehensive vendor course in radioactive material transportation requirements, and other staff involved in shipment activities completed training commensurate with their duties (Section R5.1).
- The audit and surveillance program for the packaging and transportation of radioactive material and for the processing of radwaste was effectively implemented. Audit and surveillance activities were properly focused, were of sufficient scope and depth to assess program performance and identified problems were placed into the licensee's corrective action system for resolution (Section R7.1).

Report Details

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Radiological Environmental Monitoring Program (REMP)

a. Inspection: Scope (84750)

The inspector reviewed the implementation of the REMP based on the criteria described in the licensee's Offsite Dose Calculation Manual (ODCM). The inspector observed radiation protection (RP) personnel collect air and water samples, and several environmental stations were examined. The inspector also reviewed results of previous sampling and the maintenance program for air sampling equipment.

b. Observations and Findings

The licensee continued to implement an enhanced REMP, which included additional sampling locations beyond those required by the ODCM. The enhanced program provided more comprehensive analyses of the environmental impact from plant operations. The REMP included the collection and analysis of air, water, milk, egg, vegetation, fish, meat and shoreline sediment samples, and thermoluminescent dosimeters (TLDs) were used to measure direct radiation. Samples were collected by the licensee and analyzed by a contract laboratory.

The inspector accompanied an RP tester (technician) to several on and offsite environmental sampling stations and witnessed the collection of air and water samples and sample pump leak checks. Sampling stations were found to be properly equipped and maintained in an operable condition, and data posted at the stations showed that sample pump calibrations were completed at procedure required six month intervals. The inspector concluded that the technician's sampling techniques were sound and repeatable and that samples were appropriately labeled and handled to allow identification and prevent cross contamination. Good overall sampling practices were demonstrated by the technician, and adequate knowledge of sampling requirements and of sample pump calibration and maintenance were displayed.

However, deficiencies were identified with several environmental sampling stations and with other aspects of the sampling program that collectively indicated a need for improved oversight of the REMP. Specifically, the inspector identified that: (1) an overgrowth of vegetation at the air inlet of certain air sampling stations and the presence of large trees relatively near other stations potentially impacted the representativeness of the air samples; (2) the licensee had not developed criteria to address the presence of large obstructions (such as trees) located upstream of the air sample stations to coincide with industry standards (ASTM D1739 "Collection of Settleable Particles"); (3) the security of the air sampling equipment and the dosimetry, and the reliability of the electrical power supply at one publicly accessible air sampling station was weak; (4) unknown personnel collected ODCM required water samples from a municipal pumping

station; and (5) the licensee had not verified that the individual's sampling techniques and the sampling locations were adequate until prompted by the inspector. The licensee agreed with the inspectors findings, issued condition reports to track problem resolution and was considering options to improve program oversight.

In 1999, the ODCM was revised to modify the location for the nearest broadleaf vegetation sample based on the 1998 land use census and to change the collection location for a surface water indicator sample. The inspector verified that the changes were properly evaluated by the licensee and that new locations satisfied ODCM sample location criteria. However, while the licensee had a sufficient number of redundant air sampling stations to satisfy ODCM criteria, the inspector identified an air sample station that was not properly designated as an indicator location in the ODCM. The licensee agreed with the inspectors observation and planned to reevaluate all air sample station designations and to clarify their locations to better coincide with ODCM criteria.

Inspector review of the licensee's Annual Radiological Environmental Operating Reports for 1997 and 1998 and the monthly results for 1998 revealed that sample collection and analyses were completed in accordance with the ODCM and Technical Specifications. Occasional missed or anomalous results were described in the reports as required, and occurred mainly because of electrical problems with air sample pumps and missed (lost or stolen) TLDs. Additionally, inspector review of sample pump calibration records for 1998 and the manufacturer's calibration of the "master rotameter" used by the licensee to calibrate its pumps showed that these instruments were calibrated appropriately and at required intervals.

c. Conclusions

The REMP was generally implemented effectively in that environmental samples were collected and analyzed to meet ODCM criteria. Sample results from 1997 and 1998 showed that plant operations did not have a discernible radiological impact on the environment. Also, an enhanced REMP continued to be implemented and provided more comprehensive analyses of the plant's environmental impact. However, several deficiencies were identified with sampling station maintenance, security and other aspects of the REMP that indicated a need for improved program oversight.

R1.2 Radioactive Waste (Radwaste) Management

a. Inspection Scope (86750)

The inspector reviewed the solid radwaste management program, including the process control program (PCP) and associated implementing procedures for the processing of radwaste streams for disposal, and the licensee's system for inventory and control of stored radioactive material and radwaste.

b. Observations and Findings

The solid radwaste processing program remained as described in the Updated Safety Analysis Report (USAR). The waste solidification and evaporation systems originally installed at the station were no longer used and abandoned in place, and a vendor

supplied liquid processing system (LPS) was used instead of the original evaporator. The LPS employed media such as charcoal, sand, and resin and more effectively and efficiently processed liquid waste streams. Within the last year, processing capabilities were improved because the licensee replaced LPS vessels and associated media, as vessel screens were degraded. The licensee's solid radwaste streams consisted of bead-type resins from primary systems, media from the LPS, secondary system powdered resins, filters and filter cartridges and various types of contaminated dry waste (dry active waste(DAW)).

The license continued to process certain waste streams onsite to meet waste characteristic requirements of 10 CFR Part 61 and utilized offsite vendors to process and dispose of other waste streams. Specifically, spent resins from primary systems and LPS media were transferred from the spent resin storage tank, dewatered in high integrity containers (HICs) by the licensee, and shipped to a licensed low level waste burial site. Filter media were dried and placed into HICs to meet 10 CFR Part 61 stability requirements and likewise shipped to a disposal site. Secondary resins were partially dewatered by the licensee onsite, but typically transferred in metal containers to a licensed vendor for further processing and subsequent disposal. Dry active waste was collected from various areas of the plant and packaged and shipped to a vendor for processing incident to disposal or recycling.

The licensee maintained a PCP to establish the parameters and test criteria to ensure that radwaste was processed in a manner consistent with 10 CFR Part 61 and with the low level disposal site license requirements. The inspector reviewed the PCP and the dewatering verification procedure, which were both recently revised to address previously identified NRC deficiencies (Inspection Report No. 50-346/98010(DRS)), and concluded that they adequately addressed the radwaste processes used at the station and were consistent with 10 CFR Part 61 and the NRC Branch Technical Position on Waste Form. While no dewatering or resin sluice activities took place during the inspection, inspector review of dewatering data sheets and discussions with licensee staff revealed that processing activities were closely supervised and were completed in accordance with procedure to meet burial site requirements.

The licensee implemented a comprehensive radioactive materials management inventory system to continually track the location of material throughout the site. The inventory was updated regularly to reflect material movement and provided material description, location and the assigned custodian. The inspector verified that tags affixed to individual storage containers coincided with the inventory database and adequately described the materials stored. The inspector also verified that radioactive material located in open areas of the low level radioactive waste building and in the north pad and other outdoor storage areas were in good physical condition and were properly and consistently labeled and that the areas were posted and access was controlled by the RP organization in accordance with 10 CFR Part 20 requirements.

c. Conclusions

Experienced staff and close supervisory oversight of waste processing activities ensured effective implementation of the radwaste management program. Wet solid wastes were processed in accordance with the licensee's PCP and implementing procedures, and

dewatered waste streams were sampled and verified to ensure regulatory limits for free standing liquid were met. A comprehensive radioactive material inventory control system effectively tracked material storage and movement at the site.

R1.3 Classification of Radwaste Shipments

a. Inspection Scope (86750)

The inspector reviewed the licensee's methods for determining the classification of radioactive waste shipments and evaluated the scaling factor program for waste stream sampling and analysis. Members of the RP and chemistry staffs were interviewed by the inspector about the classification program; sample analysis and waste stream scaling data and procedures were reviewed; and calculations were independently made to verify program implementation.

b. Observations and Findings

The licensee established a scaling factor program for the analysis of difficult to measure (DTM) radionuclides, in accordance with the NRC's branch technical positions on waste classification and form and industry guidance. The licensee sampled and analyzed waste streams that included spent primary resins from the spent resin storage tank, secondary system media from the LPS, particulate buildup (crud) on the purification demineralizer inlet filter and spent fuel pool filter, and DAW from representative areas of the plant and from contaminated equipment. Waste streams normally classified as class A were sampled at least every 18 months, and those typically classified as class B or C were sampled at least every 12 months. The inspector reviewed a new procedure for sampling waste streams for 10 CFR Part 61 analysis and discussed its pending implementation with the RP staff. The procedure was developed to address a deficiency previously identified by the NRC (Inspection Report No. 50-346/98010(DRS)). The staff planned to revise the procedure to improve its clarity and to ensure it produced representative samples of the waste stream to coincide with the final processed product.

Sample analyses were contracted to a vendor laboratory, and scaling factors were generated by the laboratory to correlate the concentration of DTM radionuclides to more easily measured gamma emitters. Results were then averaged with historical data to establish waste stream specific scaling factors, which were used to calculate the radioactivity content of waste shipments pursuant to 10 CFR Part 61. Scaling factor data was entered into a database, and waste shipment classification was determined by a vendor supplied software program.

The inspector reviewed station waste stream sampling information for 1998 and 1999 to date, calculated the activity content of selected waste shipments, discussed waste classification activities with involved RP staff and determined that the scaling factor program was implemented in a generally sound and consistent manner. The inspector also verified that DTM nuclides were scaled to appropriate gamma emitters in accordance with industry standards and Electric Power Research Institute recommendations. Concentrations of technetium-99 and iodine-129 nuclides, not normally identified in the licensee's waste streams, were assumed to be present at vendor laboratory lower limits of detection, which yielded more conservative scaling

factors than if industry averages were used. Additionally, the inspector verified that results of reactor water chemistry data were reviewed by the individual responsible for waste stream classification and that a small fuel leak identified by the licensee during the current cycle was being evaluated for its potential impact on the waste stream scaling factors for future waste shipments.

Although radwaste was characterized consistent with NRC and industry guidance, the licensee had not developed specific criterion for waste stream characterization and had yet to develop a procedure to ensure consistent and appropriate implementation of the waste stream scaling factor program. Instead, scaling factor data was applied and waste characterization was completed primarily on the judgement of a member of the RP staff. This was a deficiency the licensee recognized as a result of an observation previously made by the NRC (Inspection Report No. 50-346/98020(DRS)). For example, criteria had not been established to ensure that: (1) DTM radionuclides were scaled to appropriate, more easily measurable nuclides and the circumstances for scaling to other nuclides; (2) appropriate chemistry and operational data was evaluated at specified intervals, and that thresholds were established for more frequent waste stream sampling and for reevaluating existing scaling factors; (3) scaling factors were evaluated for statistical outliers, unexpected variations, anomalies and for indications of vendor mis-analysis; and (4) waste stream tritium concentrations were adequately and consistently determined. The RP staff planned to collaborate with other licensee's and its sister station before a procedure was developed.

c. Conclusions

The program for classifying radwaste streams and scaling DTM radionuclides was implemented in accordance with industry guidance and recommendations. However, the licensee had yet to develop a procedure to ensure consistent and appropriate implementation of the scaling factor program, a deficiency the licensee recognized as a result of an observation made during a 1998 NRC inspection.

R1.4 Shipment Preparation and Transportation

a. Inspection Scope (86750)

The inspector reviewed the licensee's radwaste packaging and transportation program for compliance with NRC, Department of Transportation (DOT), and waste burial site license requirements. This review included interviews with plant staff and inspection of records of past shipments and applicable procedures.

b. Observations and Findings

In accordance with Information Notice 79-19, the licensee designated specific individuals responsible for the safe packaging and transportation of radioactive material. A shipping coordinator provided oversight of the radioactive material and radwaste transportation program and ensured by direct involvement that packages were properly marked and labeled, that waste destined for burial site disposal was properly characterized, and that

all NRC and DOT requirements were met before certifying the shipment and authorizing its release. A backup coordinator was recently appointed but, thus far, had limited involvement in shipment activities.

A vendor software program was used to compute the activity of each package of radwaste offered for transport based on waste stream sample analysis, direct package radiation measurements and scaling factor data. For licensee processed (dewatered) wastes, the program adjusted established scaling factors based on the licensee's gamma isotopic analysis at the time of shipment. The concentration of other waste forms was calculated based on scaling factor application and a dose-to-curie-calculation, which related a package's measured radiation levels to the isotope activities. The inspector verified that software activity calculations were accurate for several selected waste shipments made during 1998 and 1999; however, one minor discrepancy was noted by the inspector and attributed to a data entry error.

The inspector reviewed procedure DB-HP-01500, "Shipping Radioactive Material," and determined that it was consistent with the station's practices and with DOT regulations. The inspector also found that the procedure was generally thorough, in that it provided sufficient guidance to ensure that DOT requirements were met. However, the licensee planned to address minor procedure deficiencies that the inspector noted related to the surface area involved in package contamination surveys, the level of detail provided to determine compliance with requirements for mixtures of radionuclides and for excepted packages of radioactive material, and to clarify references to procedure attachments.

The station made nine shipments of radwaste in 1998 and five through the first half of 1999, including three made directly to a low level waste burial site after processing by the licensee. Other radwaste shipments made during this period were sent to waste processors prior to ultimate disposition. Approximately 100 shipments of radioactive material were made to a variety of authorized recipients during the 18-month period beginning in January 1998 and were comprised primarily of small quantities of radioactive samples sent to vendors for analysis or of contaminated protective clothing sent to a licensed laundry facility. The inspector independently verified that five selected radioactive material/radwaste shipments made since July 1998 were correctly classified according to 10 CFR Part 61 and DOT regulations, that scaling factors were properly applied, that package labeling and marking was satisfactory, and that the results of package and transport vehicle surveys satisfied DOT requirements. The inspector also verified that shipment manifests were completed consistent with the regulations and included proper emergency response information and that the shipments were tracked as required by 10 CFR Part 20. Although some, isolated manifest documentation errors were noted by the inspector, the errors did not alter the accuracy of the radiological information or compromise the safe handling of the shipment and were attributed to human error while completing the manifest forms.

c. Conclusions

The radioactive material and radwaste packaging and transportation program was effectively implemented. Shipments were appropriately classified and controlled, vehicle

and package surveys were performed as required, and shipment manifests were completed in accordance with requirements; however, isolated documentation deficiencies were noted.

R5 Staff Training and Qualifications in RP&C

R5.1 Training of Staff Involved in the Transportation of Radioactive Material and Radwaste

a. Inspection Scope (86750)

The inspector reviewed the training provided to station staff involved in radioactive material and radwaste shipping activities (i.e., hazardous material (hazmet) employees). The hazmet training program was discussed with station staff, and training certificates and course information was reviewed.

b. Observations and Findings

The inspector reviewed training records for the shipping coordinator and designated alternate, for health physics servicemen who conduct most packaging and loading activities and for RP testers (technicians) who conduct radiation surveys and provide radiological support incident to the shipment program.

The licensee provided hazmet training to servicemen and RP technicians that included general awareness and safety (emergency response) training and training specific to the functions performed by these individuals. The shipping coordinator and alternate completed a comprehensive vendor hazmet course that included a review of DOT regulations governing radioactive material shipments. The inspector reviewed training certificates, the licensee's course objectives and lesson plans and discussed the training program with licensee staff. The review disclosed that the training satisfied the requirements of 49 CFR 172.704 and that the proper personnel had successfully completed training within the last three years. The inspector verified that the licensee tested the trainees on the information provided as required by DOT regulations and maintained documentation to demonstrate that workers successfully completed the training courses. Interviews of the shipping coordinator and other staff involved in shipment activities revealed that they were knowledgeable of pertinent DOT requirements and station procedures.

c. Conclusions

The training provided to staff involved in the transportation of radioactive materials and radwaste was adequate and satisfied DOT requirements. Individuals designated as qualified shippers completed a comprehensive vendor course in radioactive material transportation requirements and other staff involved in shipment activities completed licensee training commensurate with their duties.

R7 Quality Assurance in RP&C Activities

R7.1 Audits, Assessments and Inspections

a. Inspection Scope (86750)

The inspector reviewed the licensee's quality assessment (QA) activities to assess its ability to identify and correct problems related to processing radioactive waste and transporting radioactive materials. The inspector interviewed QA personnel and reviewed audit and assessment reports for 1998 and 1999 to the date of the inspection.

b. Observations and Findings

The inspector reviewed audit and assessment activities related to radwaste processing and radioactive material transportation that took place over the 12-month period preceding the inspection. Activities included a technical specification required QA audit of the PCP, radwaste processing and packaging procedures and shipment documentation completed in July 1998, a QA surveillance conducted during primary system resin processing activities in January 1999, and quality control (QC) inspections of radioactive material shipments in February and June 1999.

The inspector's review disclosed that audit and assessment activities were conducted at required frequencies and in accordance with station procedures and included performance based assessments during processing and shipping activities. The scope of the QA/QC activities were sufficient to assess the areas reviewed, and findings added value to the licensee's program. In particular, the surveillance conducted during resin sluice and processing activities identified equipment problems and procedure issues that warranted vendor evaluation of the HIC and related hardware used to dewater resins. Based on these problems, dewatering activities were postponed until hardware changes were made.

The inspector verified that condition reports were issued to document findings and to track resolution and that the RP staff adequately reviewed identified issues.

c. Conclusions

The audit and surveillance program for the packaging and transportation of radioactive material and for the processing of radwaste was effectively implemented. Audit and surveillance activities were properly focused, were of sufficient scope and depth to assess program performance and identified problems were placed into the licensee's corrective action system for resolution.

V Management Meetings

XI Exit Meeting Summary

The inspector presented the inspection results to Mr. Campbell and other licensee management and staff at the conclusion of the inspection on July 16, 1999. The licensee acknowledged the findings and identified no proprietary information.

PARTIAL LIST OF PERSONS CONTACTED

L. Bonker, Supervisor, ALARA Services
L. Bowyer, Supervisor, Radwaste Services
G. Campbell, Site Vice President
T. Chambers, Supervisor, Quality Assurance
R. Coad, Superintendent, Radiation Protection
R. Cook, Compliance Engineer
R. Donnellon, Director, Engineering and Services
J. Freels, Manager, Regulatory Affairs
B. Geddes, Supervisor, Nuclear Chemistry
J. Johnson, Supervisor, Independent Safety Engineering
S. Moffitt, Director, Nuclear Support Services
A. Percival, Environmental Specialist

INSPECTION PROCEDURES USED

IP 84750	Radioactive waste Treatment, and Effluent and Environmental Monitoring
IP 86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials

ITEMS OPENED, CLOSED, AND DISCUSSED

None

LIST OF ACRONYMS USED

AREOR	Annual Radiological Environmental Operating Report
CFR	Code of Federal Regulations
DAW	Dry Active Waste
DOT	Department Of Transportation
DTM	Difficult to Measure
Hazmet	Hazardous Materials
HIC	High Integrity
LPS	Liquid Processing System Container
LSA	Low Specific Activity
ODCM	Offsite Dose Calculation Manual
PCP	Process Control Program
QA	Quality Assessment
QC	Quality Control
Radwaste	Radioactive Waste
REMP	Radiological Environmental Monitoring Program
RP	Radiation Protection
RP&C	Radiological Protection and Chemistry
TLD	Thermoluminescent Dosimeter
USAR	Updated Safety Analysis Report

PARTIAL LIST OF DOCUMENTS REVIEWED

Station Procedures

DB-HP-01500, (Rev 02), Shipping Radioactive Material
DB-HP-01510, (Rev 02), Solid Radioactive Waste Processing and Handling
DB-HP-04024, (Rev 00), 10 CFR 61 Sampling for Waste Classification
DB-HP-03002, (Rev 02), Dewatering Verification
DB-HP-03005, (Rev 03), Radiological Monitoring, Weekly, Semimonthly and Monthly Sampling
DB-HP-00015, (Rev 01), Radiological Environmental Monitoring Program
DB-HP-01452, (Rev 03), Air Sampler Calibration

Reports

Annual Radiological Environmental Operating Reports for 1997 and 1998
Teledyne Brown Engineering Environmental Services REMP For The Davis-Besse Nuclear Power Station For 1998

Audits, Assessments and Inspections

Quality Assessment Radiation Protection Audit (AR-98-RPRWP-02), Process Control Program, July 16, 1998
Quality Assessment Surveillance Report (SR-99-RPRWP-02), February 1, 1999
Quality Control Inspection 99-IR-RW-0001, Radioactive Material Shipment, February 25, 1999
Quality Control Inspection 99-IR-RW-0002, Radioactive Material Shipment, June 2, 1999

Other Documents

Davis-Besse Nuclear Power Station Process Control Program (Rev 6)
Updated Safety Analysis Report, Chapter 11.5, (Rev 21), Solid Waste System
Offsite Dose Calculation Manual (Rev 12.0)
Lesson Plan, DOT Hazardous Material Training: Awareness (Rev 00)
Lesson Plan Objectives For Function Specific DOT Hazardous Material Training, 1997
Radioactive Materials Management Inventory, July 14, 1999