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REGION III

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Licensee: Detroit Edison Company (DEC)

Facility: Enrico Fermi, Unit 2

Location: 6400 N. Dixie Hwy.
Newport, MI 48166

Dates: November 15-19, 1999

Inspector: M. Mitchell, Radiation Specialist

Approved by: Steven K. Orth, Acting Chief, Plant Support Branch
Division of Reactor Safety

EXECUTIVE SUMMARY

Enrico Fermi, Unit 2 NRC Inspection Report 50-341/99018(DRS)

This inspection reviewed various aspects of the licensee's radiation protection (RP) program. Specifically, the following areas were reviewed:

- **Radioactive Waste Processing, Storage, Packaging, and Transportation**
- **General RP Practices Related to External Dosimetry**

The following conclusions were reached in these areas:

- **Plant housekeeping was effective in maintaining areas free of unnecessary equipment and debris. Radiological posting and labeling in the plant was appropriate. (Section R1.1)**
- **The RP staff properly implemented the 10 CFR Part 61 waste characterization program. The staff sampled waste streams and evaluated the results of the analyses in accordance with plant procedures and NRC regulations. (Section R1.2)**
- **The RP staff properly packaged radioactive materials and wastes for shipment. Radioactive material shipments were completed in accordance with the current plant procedures and satisfied the requirements of 10 CFR Part 71 and 49 CFR Parts 172 and 173. (Section R1.3)**
- **The radioactive waste processing and storage areas were secured, clean and well-organized, and waste containers were properly sealed and labeled. The staff effectively used the corrective action program for problem identification and resolution of On Site Storage Facility (OSSF) operational issues. (Section R1.4)**
- **The licensee effectively implemented administrative external dose controls to ensure that personnel doses were maintained ALARA (as-low-as-is-reasonably-achievable). Personnel doses were maintained in accordance with the established administrative controls and were below the limits prescribed by 10 CFR Part 20. (Section R1.5)**
- **The RP staff calibrated and tested the direct reading dosimeters (DRDs) properly and the DRD program was implemented satisfactorily. (Section R2.1)**
- **Licensee staff responded appropriately to a radiological incident and effectively used the corrective action program. (Section R4.1)**

Report Details

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Walkdowns Within the Radiologically Restricted Area (RRA)

a. Inspection Scope (83750)

The inspector examined various areas of the RRA, including the Reactor Building, Turbine Building, Auxiliary Building and On Site Storage Facility. During these walkdowns, plant housekeeping, radiological posting and labeling, and general equipment condition were inspected. In addition, the inspector interviewed radiation protection (RP) staff regarding radiological conditions and controls within the plant.

b. Observations and Findings

The inspector found plant areas to be clean and free of unnecessary materials. The inspector measured dose rates in various plant areas in order to verify the proper use and placement of radiological postings. No discrepancies were found in the areas of posting or labeling. The inspector noted that posting changes were reflected on area maps available on each floor of the reactor, turbine and auxiliary buildings in the RRA and any changes were documented in a timely manner. These maps were routinely used for reference by plant workers. The inspector verified that high and locked high radiation areas (LHRAs) were properly posted and controlled.

Station staff observed entering LHRAs were in full compliance with interim limitations for key distribution. The staff were observed using the stay-time tracking methods according to procedure and under direct supervision of a radiation protection technician (RPT).

During the walkdowns, the inspector observed good worker awareness of radiological hazards. The workers observed properly donned protective clothing, consulted survey maps and radiation work permits (RWPs) and dosimetry was worn correctly.

No instances of unsecured items crossing contaminated area boundaries were found during plant walkdowns. Staff observed by the inspector followed appropriate radiation safety procedures in conducting work.

c. Conclusions

Plant housekeeping was effective in maintaining areas free of unnecessary equipment and debris. Radiological posting and labeling in the plant was appropriate.

R1.2 Activity Determinations of Radioactive Waste

a. Inspection Scope (86750)

The inspector reviewed the licensee's method for determining the activity of radioactive waste and material shipments. The inspector reviewed the 1997 and 1998 waste stream analyses and the verifications which the RP staff performed to ensure the validity of radionuclide scaling factors used to determine the activity of difficult to detect radionuclides.

b. Observations and Findings

The licensee staff used scaling factors as an indirect method to determine radionuclide activity in radioactive waste shipments. This was done by calculating the concentration of hard-to-detect radionuclides through the application of scaling factors to a known concentration of an easier-to-detect radionuclide. This method is a technically sound industry practice provided that there is a reasonable assurance that the indirect method can be correlated with actual measurements. Licensee procedures contained the frequencies for sampling each of the licensee's three waste streams (dry active waste (DAW), condensate resins, and radioactive waste resins). Additionally, fuel pool clean-up resins and reactor water clean-up resins were sampled and directly quantified for all isotopes prior to classification and shipment as waste. Consistent with NRC guidance, licensee procedures required that the scaling factors be updated no less than biannually for each waste type shipped for disposal.

The inspector reviewed the licensee's scaling factor evaluations for 1997 and 1998. The licensee had samples of DAW, primary resin, and radioactive waste resin analyzed by a contract laboratory. The inspector observed that the RP staff evaluated the sample results in accordance with the requirements in station procedures. As a quality control check, the RP staff compared the vendor's gamma isotopic results to the chemistry staff's results for easy to detect isotopes, and found they were within procedural acceptance criteria. The scaling factor program was enhanced over the last two years to include additional isotopes based on the NRC Branch Technical Position and 10 CFR 61.55, Tables 1 and 2. The inspector confirmed that the lower limits of detection used for sample analysis was consistent with the branch technical position and adequately addressed a deficiency previously identified by the NRC.

The RP staff compared the 1997 and 1998 scaling factor results to previous annual results to ensure that changes in the waste streams were properly identified and that any anomalies in the sample results were investigated and resolved. From 1997 to 1998, licensee staff identified that cesium-134, cesium-137 and zirconium-95 present in DAW samples showed percentage decreases of more than one order of magnitude and scaling factors were adjusted and changed accordingly. The inspector noted that DAW sampling (smears) provided a variability in reproducibility of the samples; therefore, the DAW scaling factors fluctuation was not unexpected. In general, the 1997 and 1998 values for the scaling factors showed good agreement.

c. Conclusions

The RP staff properly implemented the 10 CFR Part 61 waste characterization program. The staff sampled waste streams and evaluated the results of the analyses in accordance with plant procedures and NRC regulations.

R1.3 Conduct of Radioactive Material and Waste Shipment Activities

a. Inspection Scope (86750)

The inspector reviewed the shipping documents for the following radioactive shipments, including the package classifications, labeling, and shipping papers:

99-038 Dewatered Resin
99-060 LSA-II Dry Active Waste
99-052 LSA-II Dual Batch Dewatered Resin

The inspector reviewed the shipping documents to determine their compliance with 10 CFR Part 71, 49 CFR Parts 172 and 173, and plant procedures.

b. Observations and Findings

The inspector found that the On Site Storage Facility (OSSF) radioactive waste staff prepared shipments in accordance with the applicable procedures. As allowed by these procedures, the RP staff used the procedures and a computer program to classify shipments and to prepare required shipping documents. The inspector verified that the waste classification calculations were performed in accordance with 10 CFR Part 61.

The inspector reviewed the classification of materials/wastes shipped as Low Specific Activity-II (LSA-II) and associated Type A packages and noted that the shipments were properly classified, prepared and packaged. The OSSF radioactive waste staff shipped the packages under the provisions of exclusive use shipments in accordance with the requirements of 49 CFR 173.427.

The inspector verified that shipment documents and waste manifests contained the information required by 49 CFR Part 172 and Appendix F of 10 CFR Part 20, respectively, and that documentation included the appropriate required emergency response information.

The inspector observed package preparation of low level radioactive waste by the OSSF radioactive waste staff. The materials were being prepared for transport to a waste segregation vendor. The packages were properly blocked and braced for the shipment. The staff had not yet progressed to placarding the shipment, but the containers were properly posted in the OSSF.

c. Conclusions

The RP staff properly packaged radioactive materials and wastes for shipment. The inspector noted that shipments were performed in accordance with the current plant procedures and met the requirements of 10 CFR Part 71 and 49 CFR Parts 172 and 173.

R1.4 Radioactive Waste Processing and Storage

a. Inspection Scope (86750)

The inspector reviewed the processing and storage of solid radioactive waste. The inspection consisted of interviews with cognizant personnel and review of select procedures and events, as well as walkdowns of the radioactive waste storage areas and radioactive waste processing equipment in the OSSF.

b. Observations and Findings

The inspector noted that the radioactive waste processing and storage areas including the High-Level Storage Area of the OSSF were clean and well organized. The licensee staff regularly made remote visual observation of container condition to assure container integrity. The inspector noted that the staff had implemented a previously planned program for barrel sampling that included a lid venting device to relieve internal pressure build-up to preclude potential personnel injury caused by an over pressurized container. Barrels and containers observed by the inspector were properly labeled and secured. The radioactive waste processing systems and radioactive materials storage bays were well organized and waste containers were properly sealed and labeled.

Through interviews and records reviews, the inspector noted that the radioactive waste processing and storage staff were effective in identifying a system and component weaknesses using a Condition Assessment and Resolution Document (CARD) system. The inspector reviewed the corrective action taken in response to licensee staff identified concerns or operational deviations. The licensee staff identified an error in a waste classification worksheet that resulted in an over-conservative classification. The review process resulted in detection of the error prior to shipment. The staff continued to review this matter for assessment of the root cause. Prior to the inspection, the RP staff identified an unposted radiological restricted area outside the OSSF caused by a cask liner that was moved too close to a bay door. Following the immediate corrective action of moving the cask, the staff responded with an administrative amendment to the crane operations procedure and a revision to the RWP to ensure surveys of liners placed in this location were completed. Additionally, the radioactive waste processing and storage staff were effective in identifying a system and component weakness, when a lifting sling was broken while attempting to weigh a container in the OSSF. The staff demonstrated effective and proper use of the CARD system for the event resolution. The staff made initial assessments of the root cause, implemented immediate corrective actions to limit recurrence and expanded the assessment to determine if site-wide container lifting activities were at risk. As a result of this

assessment, the staff developed an improved site-wide procedure for lifting sea van containers that utilized improved equipment in a configuration that will greatly improve safety on the site.

c. Conclusions

The radioactive waste processing and storage areas were secured, clean and well-organized, and waste containers were properly sealed and labeled. The staff effectively used the corrective action program for problem identification and resolution of OSSF operational issues.

R1.5 External Dose Control

a. Inspection Scope (83750)

The inspector reviewed the licensee's administrative external exposure controls, 1999 personnel doses and the RP staff's evaluations of thermoluminescence dosimeter (TLD) and direct reading dosimeter (DRD) results. The inspector also reviewed the progress of electronic dosimeter (ED) implementation.

b. Observations and Findings

The licensee staff implemented administrative dose controls to ensure that personnel doses at the site were maintained ALARA. The RP staff established a collective station dose goal of 43.680 rem for calendar year 1999. At the time of the inspection the total station dose was 31.589 rem, and the October dose of 676 millirem was the lowest monthly dose the station had ever accrued.

Based on the 1998 and 1999 TLD reports, the inspector noted that the licensee maintained occupational dose to workers well within the limits prescribed by 10 CFR Part 20 and monitored workers consistent with station procedures. For example, the licensee monitored two declared pregnant workers (DPWs) in 1998 and four DPWs in 1999, and effectively maintained the dose to the embryo/fetus ALARA. The individuals did not obtain any measurable dose following declaration. In addition, the inspector noted that other personnel doses were maintained below the administrative dose levels prescribed by procedure. In 1998 and 1999, all individual doses were maintained below the 2.0 rem administrative dose level. The highest individual dose for the site was 578 millirem year to date in 1999, and was incurred by a worker with specialized skills and experience associated with Reactor Water Clean-up (RWCU) pump maintenance. RWCU pump maintenance continues to present the highest proportion of annual site dose.

The inspector verified that the licensee's on-site TLD processing program maintained certification with the National Voluntary Laboratory Accreditation Program (NVLAP) and that the licensee maintained effective oversight of the program. For example, the licensee routinely submitted to internal and external quality control assessments, which included a fee for service agreement with other utilities and materials licensees. These customers routinely spiked TLDs prior to analysis and conducted vendor audits to

evaluate the program results. Based on these results comprehensive self-assessments of the program, the licensee maintained confidence in the quality control program.

The inspector reviewed the training and qualification process for staff involved in TLD processing. The licensee developed a specialized training program for the TLD program staff. Additionally, the staff met periodic quality control performance objectives. The training was effective in providing the necessary TLD processing quality to retain NVLAP certification. The inspector noted a professional work ethic and individual ownership for the program details by all the TLD staff interviewed.

The licensee staff trended and monitored nonconservative bias between the TLD and DRD results (i.e., the ratio of DRD-to-TLD results). The results have been very consistent over 1998 and 1999. Investigations of bias results have for the most part shown individual differences in reading the DRD, which is highly subjective. Although the staff noted a small positive bias during non-outage years and a negative bias during the outage years, data trending over a five year period showed good correlation with little to no bias. The licensee staff planned to continue monitoring the ratios for change when they commission a new ED program in December 1999.

c. Conclusions

The licensee effectively implemented administrative external dose controls to ensure that personnel doses were maintained ALARA. Personnel doses were maintained in accordance with the established administrative controls and were below the limits prescribed by 10 CFR Part 20.

R2 Status of Radiation Protection and Chemistry Facilities and Equipment

R2.1 Calibration Functional Tests for Digital Alarming Dosimeters

a. Inspection Scope (84750)

The inspector reviewed records for DRD calibration functional tests. The inspector also interviewed RP staff regarding the overall performance and data review of the equipment.

b. Observations and Findings

The inspector walked-down the licensee's equipment and reviewed the procedure for calibrating the DRDs and selected calibration data. The inspector noted that during the use of the calibration source, the room used for the calibration was controlled as a locked high radiation area (LHRA). The procedure adequately integrated the procedural requirements for a LHRA. The inspector verified that the staff calibrated DRDs according to the established procedure and that the detectors were checked for consistent function using an National Institute of Standards and Testing (NIST) traceable source. Whenever the "as found" readings were out-of-tolerance, the dosimeter was removed from service immediately.

The licensee plans to implement the use of EDs in December 1999, in lieu of DRDs. The inspector reviewed the changes in the calibration methodology planned to be used for functional testing of EDs and found the methodology to be technically sound.

c. Conclusions

The RP staff calibrated and tested the DRDs properly. The inspector did not identify any material condition or operational findings associated with the DRD program.

R3 Radiation Protection and Chemistry Procedures and Documentation

R3.1 Radioactive Waste Program Procedures (86750)

The inspector reviewed the radioactive waste program procedures for radioactive waste processing, handling, labeling, packaging, storage, and shipment. The inspector found that these procedures were clear, concise, and current. The staff was knowledgeable in the use of the procedures and effectively implemented them. The licensee's radioactive waste program procedures for solid waste handling were acceptable.

R4 Staff Knowledge and Performance In Radiation Protection and Chemistry

R4.1 Entry to Locked High Radiation Areas

a. Inspection Scope (83750)

The inspector reviewed applicable procedures and CARDS associated with an event involving improper entry into a LHRA. The inspector observed two separate entries into LHRAs and interviewed staff on control of LHRAs to assess licensee immediate corrective action effectiveness.

b. Observations and Findings

The inspector reviewed the licensee's assessment and the immediate corrective actions taken as a result of an individual entering a LHRA without stay time tracking. This review was made in support of the NRC resident staff who followed-up the incident and planned to document the event in Inspection Report 50-341/99018(DRP). The immediate corrective actions included a temporary change to the procedure for issuing keys to LHRAs. The inspector confirmed that the procedural changes were properly implemented by observing two separate entries into LHRAs. The staff observed followed the appropriate procedure and stay time tracking was observed on both entries, as required by procedure.

Interviews with RP and Chemistry staff indicated an appropriate level of awareness to the temporary procedure changes. Interviews with the RP Engineer and RP management indicated that the staff investigation response to this event and the corrective actions being developed were of sufficient breadth and depth using the procedures in the licensee's corrective action program.

c. Conclusions

The inspector concluded that licensee staff responded appropriately to a radiological incident and effectively used the corrective action program.

R5 Staff Training and Qualification In Radiation Protection and Chemistry

R5.1 Radioactive Waste Program Staff Training and Qualifications (86750)

The inspector reviewed the training program procedures, course outlines, and exams for radioactive waste program staff training and qualification. In addition, the inspector evaluated the education, experience, and training of selected program personnel.

The inspector found that the radioactive waste program staff were properly trained and held appropriate educational credentials and experience to properly execute the plant's radioactive waste programs. Comprehensive training and retraining of personnel was provided to the staff, and the course content was kept up-to-date. The program supervisors and managers had efficient and effective methods in place to assess staff training needs and qualifications.

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on November 19, 1999. The licensee staff acknowledged the findings presented.

The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

L. Bilbrey, Radiation Protection Technician
G. Bragg, Nuclear Quality Assurance, Supervisor
S. Booker, Work Control
B. Bowser, Radiation Protection Chemistry Technician
J. Carter, Radioactive waste Supervisor
D. Craine, Radiation Protection
L. Crissman, Radiation Protection
J. Davis, Outage Manager
P. Duffy, Dosimetry Processing Manager
P. Fessler, Nuclear Operations
R. Gillmore, Radiation Protection
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J. Pendergast, Licensing Compliance
N. Peterson, Licensing Compliance
J. Rotondu, Nuclear Quality Assurance
J. Stewart, Dosimetry Technician
P. Smith, Superintendent Compliance
J. Tansek, Radiation Protection Chemistry
J. Werner, Nuclear Quality Assurance
D. Williams, Radiation Protection

NRC

S. Campbell, Senior Resident Inspector, Fermi
J. Larizza, Resident Inspector, Fermi

INSPECTION PROCEDURES USED

IP 83750: Occupational Radiation Exposure
IP 86750: Solid Radioactive Waste Management and Transportation of Radioactive Materials

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS USED

ALARA	As Low As Is Reasonably Achievable
CFR	Code of Federal Regulations
CARD	Condition Assessment Resolution Document
DAW	Dry Active Waste
DOT	Department of Transportation
DRD	Direct Reading Dosimeter
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
DPW	Declared Pregnant Workers
ED	Electronic Dosimeter
HRA	High Radiation Area
LHRA	Locked High Radiation Area
LSA	Low Specific Activity
NIST	National Institute of Standards and Testing
NVLAP	National Voluntary Laboratory Accreditation Program
PDR	Public Document Room
OSSF	On Site Storage Facility
RP&C	Radiological Protection and Chemistry
RP	Radiation Protection
RPT	Radiation Protection Technician
RRA	Radiologically Restricted Area
RWP	Radiation Work Permit
TLD	Thermoluminescence Dosimeter

PARTIAL LIST OF DOCUMENTS REVIEWED

Reports and Memoranda

**Audit Report 99-0104, "Radiological Effluents and Radioactive Material, Transfer and Disposal";
Audit Report 98-0118, "Radiological Protection Program";
Radioactive Material Shipments - Authorized Shippers Memorandum, Dated May 17, 1999;**

Condition Assessment Resolution Documents:

**98-23401, "Rigging Sling Break During Lift of Container";
99-17780, "Error in Waste Classification Worksheet";
99-14644, "Unposted Radiological Restricted Area Found Outside OSSF";
99-11077, "One Inch Nylon Sling Over-stressed";**

Procedures:

**MRP-01 (Revision 12), "Radiation Protection Conduct Manual-Introduction";
MRP-02 (Revision 5), "Radiation Protection Conduct Manual-Administrative Controls";
MRP-03 (Revision 4), "Radiation Protection Conduct Manual-Personnel Radiation Monitoring";
MRP-04 (Revision 6), "Radiation Protection Conduct Manual-Accessing and Working in the Radiologically Restricted Area";
MRP-06 (Revision 6), "Radiation Protection Conduct Manual-Accessing and Control of High Radiation, Locked High Radiation and Very High Radiation Areas";
MRP-16 (Revision 3), "Radiation Protection Conduct Manual-Use of Onsite Storage";
MRP-21 (Revision 5), "Radiation Protection Conduct Manual-Radioactive Shipping Operations";
MRP-24 (Revision 0), "Radiation Protection Conduct Manual-Compliance Manual";
78.000.74 (Revision 9), "Chemistry Special Test Procedure-Isolock Sampling and Analysis";
66.000.34 (Revision 4), " Calibration Procedure-Verification of Gamma Calibrator Dose Rates";
66.000.231 (Revision 3), "Calibration Procedure-Calibration Check of Direct Reading Dosimeter";
QP-RC-742 (Revision 10), "Radiation Protection Selection, Training and Qualification Program Description, Radwaste";
QP-RC-758 (Revision 0), "Radiation Protection Selection, Training and Qualification Program Description, Radwaste Supervision";**

Radioactive Waste/Materials Shipping Documents:

**99-038 Dewatered Resin
99-060 LSA-II Dry Active Waste
99-052 LSA-II Dual Batch Dewatered Resin**