

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-315; 50-316  
License Nos: DPR-58; DPR-74

Report Nos: 50-315/97020(DRS); 50-316/97020(DRS)

Licensee: Indiana Michigan Power Company

Facility: Donald C. Cook Nuclear Generating Plant

Location: 1 Cook Place  
Bridgman, MI 49106

Dates: October 27-November 7, 1997

Inspector: D. Hart, Radiation Specialist

Approved by: Gary Shear, Chief, Plant Support Branch 2  
Division of Reactor Safety



## EXECUTIVE SUMMARY

D. C. Cook, Units 1 and 2  
NRC Inspection Reports 50-315/97020; 50-316/97020

This inspection included a review of the radiation protection program, including radiation protection planning and coverage for the Unit 2 refueling outage. The following specific observations were made:

### Plant Support

- As-low-as-is-reasonably-achievable (ALARA) controls were effective in maintaining the station dose totals below the goal. However, the inspector was concerned by the lack of conservative decision making that allowed work under a radiation work permit to continue until the dose estimate had been exceeded by 33 percent (Section R1.1).
- The reactor head set was well controlled. The inspector observed good communications between the radiation protection technicians (RPTs) and other workers regarding ALARA concerns at the pre-job briefing. Although communications between the two RPTs went well, there was some difficulty in communications between the other workers during the work evolution (Section R1.2).
- Radiation protection (RP) personnel identified that a contractor had arrived at the facility with several hot particles located in his shoe. The RP department was evaluating where and when the contractor had become contaminated with these particles. A preliminary estimate determined that the dose was approximately 82.7 rads to the skin, which would be an exposure in excess of the 10 CFR 20.1201 limits. The RP staff was able to demonstrate that the contamination did not originate at the station based on the results of the entrance whole body count, so the inspector determined that no violation of NRC requirements had occurred at D. C. Cook. This estimate was a preliminary number and further investigation by RP personnel, as well as the final dose assigned to the contractor, will be reviewed in future inspections (Section R1.3).



## Report Details

### IV. Plant Support

#### R1 Radiological Protection and Chemistry (RP&C) Controls

##### R1.1 Refueling Outage Radiological Controls (Unit 2) and As Low As Reasonably Achievable (ALARA) Program

###### a. Inspection Scope (IP 83750):

The inspector reviewed the radiological controls implemented for the Unit 2 refueling outage (U2R97). Several inspections of containment were made to observe radiation worker practices. The inspector observed several pre-job briefings conducted by radiation protection technicians (RPTs). The source term reduction program was also reviewed, as well as circumstances that resulted in suspending two radiation work permits (RWPs).

###### b. Observations and Findings:

The inspector noted that radiological postings and boundaries were well maintained, and housekeeping was good in the reactor containment. Containers of radioactive material were secured and appropriately labeled. Low dose waiting areas were well posted and easy to find. When questioned by the inspector, workers in containment were aware of the dose rates in their work areas. Radiation protection (RP) personnel in containment were easily identifiable, and the inspector noted that the RPTs had a good questioning attitude.

The inspector attended pre-job briefings for the movement of reactor upper internals, the reactor head set, the sandbox removal work, and the inservice inspection testing for various components in containment. The briefings were well organized, with all participants present and prepared to discuss the job evolution. The first part of the meeting involved a discussion of the job steps and precautions required by the procedure. Next, the RPT discussed the ALARA concerns and precautions. The inspector noted that there was good communications between the work groups with appropriate questions being raised.

The inspector reviewed the licensee's efforts to reduce the radiological source term in the plant. A significant amount of cobalt was removed from the reactor incore surfaces as a result of the shutdown chemistry program. There was also an ongoing effort to replace stellite bearing parts with low cobalt parts. In addition, the licensee planned to perform a resistance temperature detector (RTD) modification during the next outage. The licensee estimated that the removal of the RTD cold leg bypass piping would reduce dose by about 50 man-rem per outage.

The dose goal for the outage was set at 197 person-rem, which was consistent with the scope of work planned. Each job was assigned a dose estimate that was based on



historical data and time estimates by the workers. Procedure PMP 6010.ALA.001 "ALARA Program-Review of Plant Work Activities," states that if the actual exposure exceeds the estimate by 25 percent then the ALARA sub-committee shall reevaluate the work in progress to determine the cause of the discrepancy. There were two RWPs that were suspended. Prior to its suspension, RWP 971155, "U2R97 / Various Painting Activities in U-2 Containment," had reached 110 percent of the estimate. The RWP estimate was appropriately extended by the ALARA subcommittee for an additional 3.106 person-rem. The second RWP 971138, "DCP047 Modify U2 CTMT Pipe Supports-Outage/ Nonoutage," had an estimate of 10.5 rem. An RPT noted that the dose for this RWP was about 12 rem (115 percent) and notified the ALARA coordinator who started an investigation into why the dose was higher than expected. The RWP was not suspended until the dose had reached approximately 14 rem (133 percent). Although action was taken after the total dose exceeded the estimate by 25 percent, the RP staff did not act aggressively when the initial problem was identified. The inspector was concerned with the lack of conservative decision making that was used in allowing the work under this RWP to continue. The ALARA sub-committee was convened and a job exposure estimate adjustment was completed adding an additional 5.268 person-rem. The cause of the higher dose for both of these work groups was due to higher general area dose rates than expected.

c. Conclusions:

ALARA controls were effective in keeping the station dose totals below the goal. However, the inspector was concerned by the decision that allowed work under a RWP to continue until the dose estimate had been exceeded by 33 percent instead of acting on an original identification of a problem with job progress.

R1.2 Reactor Head Set Job

a. Inspection Scope (IP 83750):

The inspector attended the pre-job ALARA briefing for the reactor head set work and also observed the job evolution.

b. Observations and Findings:

The pre-job briefing included a discussion of the major steps of the evolution and a discussion by the RPT, assigned to the job, of ALARA controls and dose concerns for the evolution. Everyone required for the job was present and communications between the work groups was good.

Radiation protection staff provided good coverage in the reactor cavity. The RPT entered the cavity to perform a survey before the other workers joined him and identified a hot spot of approximately 20,000 disintegrations per minute (dpm) per 100 cm<sup>2</sup>. The RPT identified and maintained control of the area around the hot particle, and he communicated the location and dose rates to the other workers in the cavity. In addition to the RPT assigned to be in the cavity, an RPT was also located in the containment.



The two RPTs had communications equipment so that the technician in the cavity could relay dose rates and survey data to the technician above who documented the information. The communications between the two RPTs was good; however, none of the other workers had any type of communications equipment. The topic of communications was raised during the pre-job briefing. The staff stated that there should be no shouting during the job evolution and addressed the use of hand signals during the movement of the reactor head. However, the staff did not discuss how to communicate between the two work groups. The workers attempted to use the RPTs to relay information from the workers in the cavity to those in containment. When the RPTs were not available, the workers shouted back and forth. The inspector noted that although no problems occurred, this type of communication has the potential to lead to error and confusion.

The job was completed for 861 millirem (mrem). The workers in the cavity received 490 mrem, with the RPT having received the highest individual dose for the job of 190 mrem. Dose rates in the cavity were significantly reduced by decontamination. Dose rates went from about 600-800 mrem/hr down to 40-50 mrem/hr on contact.

c. Conclusions

There was good communications between the RPTs and other workers regarding ALARA concerns at the pre-job briefing. However, the inspector noted that although communications between the two RPTs were good during the work evolution there was some difficulty in communications between the other workers.

R1.3 Worker Contaminated With Hot Particles

a. Inspection Scope (IP 83750):

The inspector reviewed the RP staff's evaluation of a contract worker who entered the station with five hot particles located in his shoe.

b. Observations and Findings

A contract worker arrived at D. C. Cook on October 14, 1997, as a fuel handler. The contractor indicated to the licensee that he had received an intake while working at a foreign plant. His exit whole body count from this site indicated niobium (Nb)-95. The licensee performed an incoming whole body count (WBC) on the contractor and identified Nb-95 as well as zirconium (Zr)-95 contamination. The contractor was allowed access to the station, and the RPTs were alerted to the fact that he had an intake and would potentially alarm the personnel monitors. While exiting the radiologically controlled area the contractor alarmed the personnel contamination monitor (PCM), indicating contamination on the right foot. The RPTs removed the contractor's shoe to perform a radiological survey. Without his shoe, the contractor successfully passed through the PCM. The RPTs performed a survey of the shoe and identified contamination on the inner sole. The contractor was whole body counted without his



shoe, and no contamination was identified. Station personnel analyzed the contaminated particles inside of the shoe and identified Nb-95 and Zr-95.

The contractor's history showed that he had been contaminated while at other nuclear facilities with hot particles of a similar isotopic mix. However, the contractor had successfully passed through PCM and WBC analysis with no detected contamination.

RP personnel had performed a preliminary estimate of the contractor's skin dose and had calculated 82.7 rads, which would be an exposure to the skin in excess of 10 CFR 20.1201 limits. This dose estimate was obtained via preliminary data and using various assumptions based on information provided by the contractor. The assumptions included: the contractor's belief that he was contaminated with these particles while at the foreign facility; the time the contractor indicated that he had worn the shoes; and the preliminary isotopic measurements of the activity of the particles.

The RP staff was able to demonstrate that the contamination did not originate at the station based on the results of the entrance WBC. Radiation protection personnel were investigating the origin of the particles and had not completed a final assessment of the contractor's dose. In addition, the licensee had sent the particles to a contract facility for independent analysis; however, the results of that analysis were pending at the conclusion of this inspection period. The inspector will review the results of the licensee's investigation and the independent analysis during future inspections (IFI 50-315/97020-01; 50-316/97020-01).

c. Conclusions:

RP personnel identified that a contractor had arrived at the facility with several hot particles located in his shoe. The RP department was evaluating where and when the contractor had become contaminated with these particles. A preliminary estimate determined that the dose was approximately 82.7 rads to the skin, which would be an exposure to the skin in excess of the 10 CFR 20.1201 limits. The RP staff was able to demonstrate that the contamination did not originate at the station based on the results of the entrance WBC, so the inspector determined that no violation of NRC requirements had occurred at D. C. Cook. This estimate was a preliminary number and further investigation by RP personnel, as well as the final dose assigned to the contractor, will be reviewed in future inspections.

R8 Miscellaneous RP&C Issues

R8.1 (Closed) Licensee Event Report (LER) 50-315/97-015 (Revision 0): On September 2, 1997, the licensee concluded that the 609' drumming room did not meet the Final Safety Analysis Report (FSAR) criterion for monitoring waste storage and handling areas. The FSAR section 11.3 states that for areas of fuel storage or waste treatment there must be a continuous monitor which will alarm in the control room on a high radiation alarm. When this evaluation was made all processing of waste in this room was suspended and all stored waste was moved. The licensee conducted an investigation into this issue and determined that the drumming room did not have to meet this requirement as no



treatment of waste was performed in this room. The licensee retracted this LER on November 3, 1997. This drumming room is used only for the storage of low level waste and for sorting of dry active waste by hand, not treatment. This LER is closed.

R8.2 Documentation of Past Radiological Events Per 10 CFR Part 50.75(g)

NRC Inspection Report Nos. 50-315/97011; 50-316/97011 documented the review of the licensee's records for spills or unusual occurrences involving the spread of contamination in or around the facility as required by 10 CFR Part 50.75(g). The radiation protection department maintained all the information regarding events that pertained to 50.75(g), including those addressed under the former 10 CFR 20.302 in a file. The licensee had also revised procedure no. 12 THP 6010 RPP.704, "Loss of Control of Radioactive Material," (revision 4) to include that condition reports documenting a release of radioactive material to the environment be evaluated for 10 CFR 50.75(g) concerns. The inspector had no further concerns with this issue.

V. Management Meetings

X1 **Exit Meeting Summary**

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on October 31, 1997. The licensee acknowledged the findings presented.

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



## PARTIAL LIST OF PERSONS CONTACTED

D. Foster, Radiation Materials Specialist  
D. Helms, Senior Health Physicist  
P. Holland, General Supervisor, Radiation Support  
P. Hoppe, General Supervisor Radiation Controls  
R. Keller, Radiation Protection Supervisor  
D. Noble, Radiation Protection Superintendent  
A. Olivera, Nuclear Licensing  
J. Rambo, Radiation Protection Supervisor  
M. Snyder, Health Physicist

## INSPECTION PROCEDURES USED

IP 83750	Occupational Radiation Exposure
IP 92904	Followup-Plant Support

## ITEMS OPENED, CLOSED, OR DISCUSSED

### Opened

50-315/97020-01	IFI	Worker identified with hot particles in shoe, final dose to be determined (Section R1.3)
50-316/97020-01		

### Closed

50-315/97015	LER	609' Drumming room did not meet FSAR monitoring requirements (Section R8.1)
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## LIST OF ACRONYMS USED

ALARA	As-Low-As-Is-Reasonably-Achievable
CA	Contaminated Area
CFR	Code of Federal Regulations
CR	Condition Report
FSAR	Final Safety Analysis Report
IFI	Inspection Followup Item
mrem	Millirem
PCM	Personnel Contamination Monitor
PDR	Public Document Room
RA	Radiation Area
RCA	Radiologically Controlled Area
RTD	Resistance Temperature Detector
RP	Radiation Protection
RPM	Radiation Protection Manager
RPT	Radiation Protection Technician
RP&C	Radiation Protection and Chemistry
RWP	Radiation Work Permit
WBC	Whole Body Count

## LIST OF DOCUMENTS REVIEWED

RWP 971138  
RWP 971151  
RWP 971155  
RWP 971160  
RWP 971169  
Job Exposure Estimate Adjustment for RWP 971155  
Job Exposure Estimate Adjustment for RWP 971138

LER 97-015-00

LER 97-015-01

PMP 6010 ALA.001 "ALARA Program- review of Plant Work Activities" Revision 10  
12 THP 6010 RPP.704 "Loss of Control of Radioactive Materials" Revision 4

PAR removal of resistance temperature detector cold leg bypass piping

