

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-271/90-13

Docket No. 50-271

License No. DRP-28 Priority - Category C

Licensee: Vermont Yankee Nuclear Power Corporation
RD 5, Box 169
Ferry Road
Brattleboro, Vermont 05301

Facility Name: Vermont Yankee Nuclear Power Station

Inspection At: Vernon, Vermont

Inspection Conducted: October 1 - 5, 1990

Inspectors: *P. O'Connell* 11-19-90
P. O'Connell, Radiation Specialist date

J. Noggle 11-19-90
J. Noggle, Radiation Specialist date

Approved by: *W. Pasciak* 11-20-90
W. Pasciak, Chief, Facilities Radiation date
Protection Section

Inspection Summary: Inspection conducted on October 1 - 5, 1990
(Inspection Report No. 50-271/90-13)

Areas Inspected: Routine unannounced inspection of the radiological controls program. Areas reviewed included: Status of Previously Identified Items, Review of Workers Concerns, Facility Tours, and ALARA.

Results: One apparent violation and one non-cited violation were identified. The apparent violation involved a failure to adequately survey waste oil to ensure it did not contain licensed radioactive material. The non-cited violation involved a failure to follow radiation protection procedures. Also, an unresolved item was identified which involved your evaluation of a radiological intake by a worker.

DETAILS

1.0 Personnel Contacted1.1 Licensee Personnel

* D. Dyer	Quality Assurance Engineer
R. Grippardi	Quality Assurance Supervisor
* R. Leach	Hazardous Material Coordinator
* E. Lindamood	Radiation Protection Supervisor
* J. McCarthy	ALARA Engineer
* R. Morrisette	Plant Health Physicist
* R. Pagodia	Technical Services Superintendent
* D. Reid	Plant Manager
* M. Thornhill	Radiation Protection Assistant
* B. Wanczyk	Operations Superintendent

1.2 NRC Personnel

* H. Eichenholz	Senior Resident Inspector
T. Hiltz	Resident Inspector

Denotes attendance at the exit meeting on October 5, 1990.

2.0 Purpose

The inspection was a routine, unannounced inspection of the radiological controls program. Areas reviewed included: Status of Previously Identified Items, Review of Workers' Concerns, Facility Tours, and ALARA.

3.0 Status of Previously Identified Items

- 3.1 (Closed) 90-06-02, Non-cited violation, severity level 4. Failure to follow radiation protection procedures. The licensee failed to securely lock items, with high dose rates, suspended from the side of the spent fuel pool, and did not initiate a Health Physics Incident Report (HPIR) to correct the deficiency as required by procedure. The inspector verified that the corrective actions specified in the licensee's response letter dated August 24, 1990 were satisfactorily completed. The corrective actions included initiating a HPIR and securely locking the items in place. By reviewing the HPIR Log, the inspector noted that station personnel are sensitive to the need to initiate HPIRs when they become aware of noncompliance issues. This item is closed.
- 3.2 (Closed) 89-17-03, Unresolved. Review the effectiveness of management's corrective actions involving control of administratively locked high radiation areas (LHRAs). The inspector verified that the licensee had implemented their corrective actions as specified in their response letter

dated December 12, 1989. During daily tours by the Health Physics Technicians (HPTs), the doors securing LHRAs are checked to verify that they are appropriately locked. In addition, on an annual frequency, a locksmith is brought on site to verify that no one had tampered with the locking mechanisms on the LHRAs. The inspector reviewed the HPIR Log and noted only one instance in 1990 of an administratively LHRA door being found unlocked. The licensee's corrective actions were effective in addressing this issue. This item is closed.

4.0 Review of Workers' Concerns

The inspector reviewed several concerns which had been brought to the NRC's attention through both telephone conversations and written requests for NRC review.

4.1 Review the Licensee's Practice of Burning Waste Oil On Site

The inspector reviewed the radiological significance of the licensee's practice of burning waste oil on site. The waste oil originated from components located inside the radiation control area (RCA) of the facility. The inspector reviewed chemistry sample counting logs which documented the dates the waste oil was counted and the origin of the waste oil. Licensee Procedure AP-0516, "Survey and Release of Materials, Vehicles, and Trash from the RCA", specifies, in Section 7.0, the method for releasing liquid material other than water. The procedure specifies a gross gamma count which is conducted on a sodium iodide well counter. A lower limit of detection (LLD) is calculated for the counting system and waste oil having less activity than the LLD of the system is released from the RCA and incinerated on site. A review of the counting log indicated that the LLD of the counting system was in the range of $6.8 \text{ E-}6$ to $7.6 \text{ E-}6 \text{ uCi/cc}$. The inspector noted that the procedure did not specify an acceptable LLD which must be met in order to release the waste oil and the licensee could not provide a technical basis for the LLD used to release the waste oil from the RCA. The licensee's counting procedure was not adequate to assure that the environmental LLDs listed in Table 4.9.3 of the licensee's Technical Specifications were being met. Table 4.9.3 lists the following detection capabilities for environmental sample analysis.

<u>Analysis</u>	<u>Water (pCi/l)</u>
Gross beta	4
H-3	3000
Mn-54	15
Fe-59	30
Co-58, 60	15
Zn-65	30
Zr-Nb-95	15
Cs-134	15
Cs-137	18
Ba-La-140	15

Thus the inspector concluded that the licensee had failed to adequately analyze the waste oil to ensure that it did not contain licensed material in concentrations greater than regulatory limits, prior to disposal. This constitutes a violation of 10 CFR 20.201 (b) which requires, in part, that the licensee make such surveys as may be necessary to ensure compliance with the regulations. 10 CFR 20.301 specifies, in part, that no licensee shall dispose of licensed material except by: transfer to an authorized recipient, as authorized pursuant to 20.302 or Part 61 of 10 CFR, or as provided in 20.303, 20.306, or 20.106. (50-271/90-13-01)

The licensee was responsive to the inspector's concern and immediately terminated the practice of burning the waste oil and agreed to either discontinue burning the waste oil until this matter is resolved or ensure that the Technical Specification Environmental LLD is met.

4.2 Review concerns regarding leaking fuel at the facility

During the last refueling outage the licensee conducted fuel sipping on 40 fuel bundles and found 2 leaking pins. This was consistent with the anticipated number of leaking pins based on off-gas levels prior to shut down. During the first 50 days of the most recent operating cycle, Cycle 14, off-gas levels were low. Approximately 50 days into the operating cycle the licensee observed a notable increase in the off-gas rate, which was indicative of leaking fuel. With the level of off-gas steadily increasing over the length of the operating cycle, the licensee aggressively pursued the increase and developed a Failed Fuel Action Plan (FFAP). The FFAP Committee made recommendations regarding the termination of continued operation if the steam jet air ejector instantaneous off-gas level reached 80,000 uCi/sec. This was a very conservative value compared to the Technical Specification limit of 160,000 uCi/sec for a 30-minute delay of the off-gas sample. The FFAP Committee also made appropriate recommendations regarding adjusting the control rod pattern to minimize the level of off-gas.

After shutdown, the licensee conducted fuel sipping on all of the fuel bundles. Five bundles were found to have leaking pins. The worse fuel pin had a visible gap of approximately 5 inches in length. Photographs of this gap indicated that approximately 10 to 12 fuel pellets had dissolved or eroded into the reactor coolant.

The inspector reviewed the licensee's evaluation regarding the in-plant radiological consequences of the failed fuel. Preliminary surveys showed that the failed fuel had not resulted in a significant increase of general area dose rates. Smear samples and air samples taken throughout the facility have not shown an increase in alpha contamination. However, these assessments were still preliminary and the longer term effect of the failed fuel on the plant radiological environment will be reviewed during future

inspections. It appeared that the licensee was taking appropriate actions to evaluate the radiological consequences of the failed fuel.

4.3 Review the Effect of Opening the Turbine Building Truck Bay Doors

During operations the truck bay doors in the turbine building are frequently left open. The inspector reviewed the effect this practice would have in reducing airborne radioactivity levels in the turbine building. By discussing this matter with licensee representatives, reviewing the designed ventilation system of the turbine building, and reviewing the licensee's Technical Specification requirements for gaseous effluent monitoring the inspector determined that operating with the truck bay doors open did not violate any Technical Specification requirement. At the time of the inspection the licensee had not taken any quantitative measurements to verify that the air flow path was into the turbine building. During the Exit Meeting on October 5, 1990, the licensee stated that, during the next operating cycle, they would take actual air flow measurements to verify the flow path. The results of these measurements will be reviewed during a future Effluents Radiation Protection inspection.

4.4 Review Contamination Incidents on the Turbine Deck and Staffing Levels of HPTs

On September 12, 1990, positive whole body counts (WBC) were reported for four individuals terminating employment. The individuals had been working on the turbine deck. The inspector reviewed the whole body count records, the radiation work permit (RWP) for the turbine deck, and applicable air sample results for the work area. The results of the analyses indicated that the individual intakes were below any regulatory limit. However, several weaknesses in both the job coverage for the workers and in the licensee's bioassay program were noted and are detailed below.

The inspector discussed, with HPTs, contractor maintenance workers, and supervisors, the scope of work conducted on the turbine deck prior to September 12, 1990. The inspector also reviewed turbine deck RWP sign-in sheets and the HPT turbine deck logbook entries for the time period prior to September 12, 1990. Significantly higher levels of contamination had been found on turbine deck relative to previous outages. This was related to the failed fuel issue discussed earlier in this report. On September 12, 1990 there were 15 to 25 individuals working on 5 different activities on the turbine deck. There was only one HPT providing job coverage for these activities. It appeared that the licensee had not addressed the higher levels of contamination by upgrading the HPT job coverage for turbine deck activities. The inspector noted that after the contamination incident, the licensee had upgraded the number of HPTs providing job coverage for the turbine deck.

The inspector reviewed the work schedules for both contractor and permanent HPTs and supervisors to determine if individuals had been working an excessive amount of overtime. No deficiencies were noted in this area.

The inspector reviewed the qualifications of the contractor HPTs who provided job coverage on the turbine deck as well as other contractor HPTs. The qualifications of all the HPTs reviewed met the minimum Technical Specification requirement for experience. However, the inspector noted that the licensee had brought on site Senior HPTs with only Navy nuclear experience and no commercial nuclear power experience. The licensee stated that they try to limit the scope of jobs which Senior HPTs without commercial nuclear power experience can cover, but they do not administratively or procedurally control assigning the jobs. This practice was viewed as a weakness in the contractor qualification program.

Early in the inspection period, the inspector requested to see the licensee's evaluation of the intakes for the individuals working on the turbine deck. The licensee stated that they had performed a quick estimate of the dose to the individuals, determined the dose to be minimal, and therefore did not document their estimate. 10 CFR 20.103(a)(3) requires that the licensee account for intakes which would result from inhaling 2 MPC-hours in any one day or 10 MPC-hours in any one week. The inspector requested that the licensee evaluate the intake, not the dose, of the individual with the highest positive WBC value. On the last day of the inspection the licensee provided the inspector with their evaluation of the individual's intake. Their evaluation concluded that the individual's intake was 0.339 MPC-hours.

Upon review of the methodology used by the licensee in estimating the individual's intake, it was concluded that the licensee's bioassay program has weaknesses. Weaknesses in methodology that were identified consist of the following:

- A. The licensee assumed that the deposition was due to an inhalation incident, not an ingestion incident, of radioactive material. The licensee also assumed that the intake occurred immediately prior to the whole body count. The licensee's evaluation concluded that the second assumption was conservative. However, this assumption is not conservative for inhalation incidents. Had the intake actually occurred several days prior to the whole body count the intake estimate would be significantly low.
- B. The licensee evaluated the intake using a worker breathing rate of 1.0 E 8 cc/working day. This value is not consistent with current internal dosimetry methodology or with 10 CFR 20.103(a)(1) which specifies a total volume of air breathed in 520 hours as 6.3 E 8 cc or 9.7 E 6 cc/working day. Based on this correction, the licensee's evaluation of the intake was low by about a factor of ten.
- C. The licensee's evaluation was based on the assumption that 63% of the intake was retained in the respiratory tract. Although the percent deposition that was assumed is consistent with current internal

dosimetry methodology for lung deposition, actual WBC data indicated no detectable lung deposition as the activity was located in the GI tract. The licensee did not explain this anomaly. The percent of an intake present in the GI tract immediately after an inhalation intake is actually much smaller than 63%¹. The percent of an intake present in the GI tract immediately after an ingestion intake is larger than 63%². Appropriate retention factors should have been evaluated in consideration of the WBC results and the activities of the individual.

- D. The licensee has no proceduralized program for performing intake estimates in order to demonstrate compliance with 10 CFR 20.103(a)(3).

Pending resolution of items A, B, and C above for the individual in question, the determination of licensee compliance with 10 CFR 20.103(a)(3) will remain unresolved (50-271/90-13-02).

5.0 Facility Tours

The inspector conducted several tours of the facility. The inspector noted numerous examples where the boundary markers and postings at the entrances to contaminated areas were either laying on the floor or missing. The licensee stated that they noted this in the past and that this is due to individuals not repositioning the boundary markers and postings when they leave the contaminated areas of the facility. The licensee stated that they are evaluating the use of swinging stanchions to address this issue. The inspector noted that the licensee is using the swinging stanchions on the access points to the refueling floor. The inspector noted other weaknesses in posting and labeling including an unmarked floor drain with flexible tubing, marked internally contaminated, running into it, and a contaminated hydrolaser drain pan not properly labeled as contaminated. Licensee performance in this area needs improvement and will be reviewed during future inspections.

During a tour of the drywell and as a result of subsequent discussions with licensee representatives, the inspector noted that the lowest level of the drywell had not been decontaminated for the past 3 years. At the time of the inspection, contamination levels in this area were documented to be 6 to 100 mrad/hr-100cm². Air samples of the area indicated airborne radioactivity concentrations of over 15 times MPC. Since the area is a routine work area every outage, the need for engineering controls in lieu of respiratory protection should be emphasized. The licensee stated that they are evaluating the feasibility of decontaminating this area.

¹NUREG/CR-4884, p. B-377 indicates that the percentage in the GI tract immediately after an inhalation intake is 0.73%.

²NUREG/CR-4884, p. B-525 indicates that the percentage in the GI tract immediately after an ingestion is 98.4%.

Drywell HPT job coverage and postings were found to be in need of improvement in 2 areas. First, there were only 2 areas in the drywell posted as low exposure waiting areas and there were no high exposure or "hotspot" postings in the drywell. The second area involved a breakdown in communication between the rover HPT, who provides intermittent job coverage inside the drywell, and the HPT stationed at the drywell checkpoint, who conducts the pre-job briefings. The rover HPT is not present for the pre-job briefings for workers entering the drywell and therefore is not always aware of the scope of work going on in the drywell. The rover HPT, while conducting tours through the drywell, encounters workers while work is in progress and at that time elicits another briefing from the workers in order to evaluate the effect of the work on the radiological conditions. The overall affect of poor HPT communications and the absence of any radiological hazard postings is weak HP control in the drywell.

On October 2, 1990 the Resident Inspector observed an individual enter an area which was posted "RWP Required". The resident Inspector noted that the individual was not on an RWP and the individual was not wearing the protective clothing specified on the RWP for that work area. The individual mistakenly believed that he was not required to be on a RWP because he was only acting as a fire watch and was not working in the area. The inspector noted that the worker was not in compliance with licensee Procedure AP-0502, "Radiation Work Permits", which specifies, in Section 5, that each worker shall be in compliance with the provisions of the RWP. Technical Specification 6.5 B requires that radiation control standards and procedures shall be prepared, approved and maintained and made available to all station personnel.

The inspector reviewed a recent survey of the area and noted that the contamination and radiation levels were low. The licensee pulled the worker's dosimetry and scheduled the worker to retake General Employment Training. A review of HPIRs did not evidence multiple RWP infractions of this type and this appears to be an infrequent event. The inspector determined that, due to the minor safety significance and the prompt corrective actions taken by the licensee, this finding met the criteria, specified in 10 CFR 2, Appendix C, Section V. A. for a non-cited violation. (50-271/90-13-03)

5.1 DOP Testing HEPA Vacuum Cleaners

The station routinely uses vacuum cleaners containing HEPA filters for cleaning controlled areas of the plant. The vacuum units are used in both clean and contaminated areas and exhaust filtered air into the general plant working environment. The maintenance organization maintains the vacuum cleaners without the benefit of DOP testing of the units, which would ensure that clean air is exhausted to the plant environment. The lack of HEPA filter testing is considered a poor practice.

6.0 ALARA

The inspector noted excellent personnel qualifications for the contractor ALARA staff. Staff members follow specific work activities from the planning stage through the work evolution and conclude with post job reviews. The consistency in followup review allows a thorough post outage lessons learned package to be issued to station management.

The station collective exposure history is noteworthy, particularly the low cumulative exposures achieved over the past 4 years. Following a recirculation system chemical decontamination in 1985, a recirculation pipe replacement in 1986, and due to the active efforts of the station ALARA group, the average annual exposure for the past 3 years has been 233 person-rems. This time-frame includes 2 refueling outages. The collective exposure goals for 1990 include 80 person-rems during plant operations and 200 person-rem for the refueling outage. The goal appears reasonable and challenging.

7.0 Exit Meeting

The inspector met with licensee personnel denoted in Section 1.1 at the conclusion of the inspection on October 5, 1990. The scope and findings of the inspection were discussed at that time.

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TABLE 4.9.3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS(a)(c)(f)

Analysis ^(d)	Water (pCi/l)	Airborne Particulate or Gas (pCi/m ³)	Fish (pCi/Kg,wet)	Milk (pCi/l)	Vegetation (pCi/Kg,t)	Sediment (pCi/Kg,dry)
Gross beta	4	0.01				
H-3	3000					
Mn-54	15		130			
Po-210	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr-Nb-95	15(b)					
I-131		0.07		1	60	
Ce-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15(b)(e)			15(b)(e)		

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TABLE 4.9.3
(continued)

TABLE NOTATION

- (a) - See Footnote (a) of Table 4.8.1.
- (b) - Parent only.
- (c) - If the measured concentration minus the 5 sigma counting statistics is found to exceed the specified LLD, the sample does not have to be analyzed to meet the specified LLD.
- (d) - This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the listed nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Surveillance Report pursuant to Specification 6.7.C.3.
- (e) - The Ba-140 LLD and concentration can be determined by the analysis of its short-lived daughter product La-140 subsequent to an 8 day period following collection. The calculation shall be predicted on the normal ingrowth equations for a parent-daughter situation and the assumption that any unsupported La-140 in the sample would have decayed to an insignificant amount (at least 3.6 percent of its original value). The ingrowth equations will assume that the supported La-140 activity at the time of collection is zero.
- (f) - Nuclides which are below the LLD for the analyses should not be reported as being present at the LLD, but as "not detected". For purposes of averaging, the LLD will be assumed to be zero.