



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-4005

November 20, 2006

Richard M. Rosenblum  
Chief Nuclear Officer  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

SUBJECT: NRC INSPECTION REPORT 050-00206/06-015

Dear Mr. Rosenblum:

This refers to the inspection conducted on October 10-12, 2006, at Southern California Edison Company's San Onofre Nuclear Generating Station, Unit 1 facility. This inspection was an examination of decommissioning activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspection included an examination of selected procedures and representative records, observations of activities, and interviews with personnel. A preliminary exit briefing was presented to your staff at the conclusion of the onsite inspection, and a final briefing was presented telephonically to members of your staff on November 13, 2006, following receipt of results of radiological measurements made of soil and water samples collected during the inspection. The enclosed report presents the results of that inspection. The inspection determined that you were conducting decommissioning activities in compliance with regulatory and license requirements.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact the undersigned at (817) 860-8191 or Mr. Robert Evans, Senior Health Physicist, at (817) 860-8234.

Sincerely,

/RA/

D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle and Decommissioning Branch

Docket No.: 050-00206  
License No.: DPR-13

Enclosure: NRC Inspection Report  
050-00206/06-015

cc w/enclosure:  
Chairman, Board of Supervisors  
County of San Diego  
1600 Pacific Highway, Room 335  
San Diego, CA 92101

Gary L. Nolff  
Power Projects/Contracts Manager  
Riverside Public Utilities  
2911 Adams Street  
Riverside, CA 92504

Eileen M. Teichert, Esq.  
Supervising Deputy City Attorney  
City of Riverside  
3900 Main Street  
Riverside, CA 92522

Ray W. Waldo  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

David Spath, Chief  
Division of Drinking Water and  
Environmental Management  
California Department of Health Services  
P.O. Box 942732  
Sacramento, CA 94234-7320

Michael R. Olson  
San Onofre Liaison  
San Diego Gas & Electric Company  
P.O. Box 1831  
San Diego, CA 92112-4150

Director, Radiologic Health Branch  
State Department of Health Services  
P.O. Box 997414 (MS 7610)  
Sacramento, CA 95899-7414

Mayor  
City of San Clemente  
100 Avenida Presidio  
San Clemente, CA 92672

James D. Boyd, Commissioner  
California Energy Commission  
1516 Ninth Street (MS 34)  
Sacramento, CA 95814

Douglas K. Porter, Esq.  
Southern California Edison Company  
2244 Walnut Grove Avenue  
Rosemead, CA 91770

James T. Reilly  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

Daniel P. Breig  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

A. Edward Scherer  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

Brian Katz  
Southern California Edison Company  
San Onofre Nuclear Generating Station  
P.O. Box 128  
San Clemente, CA 92674-0128

bcc w/enclosure (via e-mail distribution):

LDWert  
DBSpitzberg  
JCShepherd, FSME/DWMEP/DD  
TCombs, OCA  
WAMaier, RSLO  
CCOsterholtz, SRI  
RJEvans  
RITS Coordinator  
FCDB File

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RJEvans	DBSpitzberg	
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**ENCLOSURE**

**U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV**

Docket No: 050-00206

License No: DPR-13

Report No: 050-00206/06-015

Licensee: Southern California Edison Co.  
P.O. Box 128  
San Clemente, California 92674

Facility: San Onofre Nuclear Generating Station, Unit 1

Location: San Clemente, California

Dates: October 10-12, 2006

Inspectors: Robert J. Evans, P.E., C.H.P., Senior Health Physicist  
Fuel Cycle & Decommissioning Branch

Approved By: D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle & Decommissioning Branch

Attachment: Supplemental Inspection Information

ADAMS Entry: IR05000206-06-015 on 10/10/2006 - 10/12/2006; Southern  
California Edison Co., San Onofre Nuclear Generating Station;  
Unit 1. Decommissioning Report. No VIOs.

## **EXECUTIVE SUMMARY**

### **San Onofre Nuclear Generating Station, Unit 1 NRC Inspection Report 050-00206/06-015**

This inspection was a routine, announced inspection of decommissioning activities being conducted at the San Onofre Nuclear Generating Station, Unit 1 facility. Areas inspected include decommissioning performance and status review; inspection of remedial and final surveys; and followup of a previous inspection finding. The inspection determined that the licensee was conducting decommissioning activities in compliance with regulatory and license requirements.

#### **Decommissioning Performance and Status Review at Permanently Shutdown Reactors**

- The licensee identified and voluntarily reported its discovery of tritium in the subsurface area beneath the containment sphere. The licensee collected, analyzed and then released the groundwater in compliance with Offsite Dose Calculation Manual requirements, and the licensee has been proactive in formulating corrective actions to address the problem. The sources of the tritium were still under investigation at the conclusion of the inspection (Section 1).
- The NRC collected and split three water samples with the licensee. The sample results indicate that tritium was present in the groundwater but at levels below the reporting limit. The split sample results were generally comparable, suggesting that the licensee's sampling program was adequate to detect and quantify tritium in groundwater (Section 1).

#### **Inspection of Remedial and Final Surveys at Permanently Shutdown Reactors**

- The inspector conducted a confirmatory survey of an open trench in the Unit 1 yard. The survey revealed that one area of the trench required additional remediation. The licensee planned to decommission the old yard sump in the near future, and the area of concern will be remediated concurrent with the removal of the old yard sump (Section 2).
- The NRC collected and split three soil samples with the licensee. The sample results were comparable indicating that the licensee was capable of detecting and quantifying gamma-emitting radionuclides in soil (Section 2).

#### **Followup**

- The inspector conducted a followup review of the licensee's corrective actions for three previously-cited violations involving a container that leaked during transportation to an out of state disposal site. The inspector confirmed that all corrective actions to prevent recurrence have been implemented by the licensee (Section 3).

### **Report Details**

#### **Summary of Plant Status**

San Onofre Nuclear Generating Station, Unit 1 was permanently shut down during November 1992 and was permanently defueled by March 1993. The unit remained in SAFSTOR until June 1999 when decommissioning was initiated. At the time of this inspection, the licensee was conducting decommissioning activities under the DECON option as stated in its Post Shutdown Decommissioning Activities Report dated December 15, 1998. DECON is defined as the immediate removal and disposal of all radioactivity in excess of levels which would permit the release of the facility for unrestricted use.

Work in progress during the inspection included remediation of concrete inside of the containment sphere and demolition of the former turbine building north extension structure. The contaminated debris was being packaged for transport to an out-of-state disposal site.

The plant equipment still in service included three effluent radiation monitors (vent stack, old yard sump, and new yard sump), containment fan and associated discharge stack, and the old yard sump. The old yard sump remained in service until the piping connections to the new yard sump were complete. The salt water pump system remained in service to provide dilution water for any liquid effluents that were released through the old yard sump. The salt water system and old yard sump will be permanently removed from service in the near future, once the new yard sump is placed into service. Finally, the licensee permanently removed the radwaste and spent fuel building fans from service because these areas no longer required forced ventilation.

#### **1      Decommissioning Performance and Status Review at Permanently Shutdown Reactors (71801)**

##### **1.1     Inspection Scope**

The inspector evaluated whether the licensee and its contracted workforce were conducting decommissioning activities in accordance with license and regulatory requirements. In particular, the inspector conducted a review of the licensee's response to its discovery of radioactive hydrogen-3 (tritium) in the groundwater immediately beneath the Unit 1 containment sphere.

##### **1.2     Observations and Findings**

During late-May 2006, demolition activities were being conducted inside of the containment sphere with a mechanical impact hammer. The impact hammer accidentally punctured the containment sphere wall, a 1-1/8 inch thick steel plate. Water was observed in the area of the puncture. The hole was sealed at that time to prevent water intrusion into the sphere.

The licensee installed three taps into the floor of the containment sphere to allow for removal of the water. The three taps were installed into the void space between the lower containment sphere wall and the building foundation. The licensee elected to

pump the water from the void space because the water had the potential to destabilize the sphere. Approximately 3500 gallons of fluid were removed and placed into holding tanks for temporary storage.

At the time of discovery, the licensee was not sure if the water was trapped water, or if the water was in contact with groundwater and would re-establish itself. About 1-1/2 days later, the water level re-established itself indicating that the water in the void space was in contact with groundwater. Because the elevated water table could be detrimental to the stability of the sphere structure, the licensee installed about 120 anchor bolts through the sphere wall and into the building foundation.

The licensee sampled the 3500 gallons of collected water in accordance with the requirements of the Offsite Dose Calculation Manual (ODCM), a license-required document. The licensee discovered tritium and detectable amounts of cesium-137, a gamma-emitting radionuclide, in the water. While the concentrations of these isotopes did not exceed any NRC reporting criteria, the licensee made a voluntary telephonic report of the finding to the NRC. The licensee began investigating the sources of both the water and the radioactivity in the water. The licensee's preliminary investigation indicated that the radioactivity may have come from one of three possible sources:

- From spills in the former sphere penetration room (also known as the doghouse). This building previously housed piping traversing between containment and the auxiliary radwaste building.
- From previous spent fuel pool leaks. The pool was found to be leaking in January 1986, and the leaks became significant during 1989. Most leakage was contained, but some fluid apparently leaked into the grounds around the former fuel storage building. Repairs were conducted in 1989 which reduced the leakage rate to less than 5 gallons a week thereafter. The fuel has since been removed from the pool, and the pool has since been decommissioned.
- From leakage of the reactor coolant system sampling line between containment and the primary chemistry sampling laboratory. The surface areas outside containment were remediated by 2002, although the subsurface areas under containment were not accessible for reclamation at that time.

The licensee subsequently removed a total of about 18,800 gallons of fluid from beneath the containment sphere, including the original 3500 gallons. The licensee sampled the fluid in batches for tritium and gamma-emitting radionuclides. The cesium-137 concentrations varied between non-detectable to 7.96 E-08 microcuries per milliliter ( $\mu\text{Ci}/\text{ml}$ ). Tritium concentrations ranged from 2.92 E-05  $\mu\text{Ci}/\text{ml}$  to 3.30 E-4  $\mu\text{Ci}/\text{ml}$ . The NRC's annual liquid effluent concentration limits, listed in 10 CFR Part 20, Appendix B, Table 2, are 1 E-6  $\mu\text{Ci}/\text{ml}$  for cesium-137 and 1E-3  $\mu\text{Ci}/\text{ml}$  for tritium. The highest tritium sample result was 33-percent of the effluent concentration limit, while the highest cesium-137 sample result was about 8-percent of the limit.

Table 5-2 of the ODCM provides the reporting levels for radioactivity concentrations in environmental samples. The reporting level for cesium-137 is 50 picoCuries per liter ( $\text{pCi}/\text{L}$ ), or 5 E-8  $\mu\text{Ci}/\text{ml}$ . For tritium in water, the reporting level is 30,000  $\text{pCi}/\text{L}$ , or

3 E-5  $\mu$ Ci/ml, if no drinking water pathway exists at the site. [The licensee has previously determined that a drinking water pathway does not exist at the site because the water is brackish as a result of site proximity to the Pacific Ocean.] Accordingly, the discovery of the cesium-137 and the tritium in the groundwater underneath the Unit 1 site was not reportable to the NRC, unless the cesium-137 and tritium concentrations in offsite monitoring wells exceeded the reporting levels of 50 pCi/L and 30,000 pCi/L, respectively.

The licensee monitors for cesium-137 and tritium, among other radionuclides, in two offsite wells. The NRC recently reviewed the licensee's implementation of the radiological environmental monitoring program during the July 2006 inspection (refer to NRC Inspection Report 050-00206/06-012 dated August 10, 2006). Section 4.2.b of the report states:

"Drinking water samples were collected on a monthly basis from one indicator location [2.2 miles from the site] and from a control location [15.6 miles from the site]. Samples were analyzed for tritium, gross beta, and 26 naturally-occurring and licensee-related radionuclides. No licensee-related radionuclides were detected in drinking water during 2005."

In summary, there are no indications that radioactivity in the groundwater underneath the Unit 1 site has impacted local drinking water supplies, and the discovery was not reportable to the NRC. However, the licensee voluntarily elected to report the incident to the NRC as well as State and local officials. The licensee reported the incident to the NRC Headquarters Operation Officer on August 14, 2006 (Event Number 42767).

The licensee quantified the amount of radioactive tritium present in the 18,800 gallons of fluid collected. Based on batch sampling, the liquid contained a total of 8.3 millicuries of tritium. The estimated whole body dose from any exposure to tritium was less than 2 E-6 millirems. The licensee subsequently released the 18,800 gallons of fluid to the environment in accordance with ODCM requirements.

In response to the discovery of tritium in the groundwater and to support subsurface decommissioning of the Unit 1 site, the licensee installed eight dewatering wells in a ring around the containment sphere. The dewatering wells were installed at depths of 74-90 feet below ground surface with a pump installed in each well. The licensee planned to operate the eight pumps simultaneously to create a cone of depression around the containment sphere to support subsurface remediation activities.

During the onsite inspection, the licensee conducted a functional test of the eight pumps and collected water samples from each well for analysis. The NRC inspector collected three split samples with the licensee. The dewatering wells selected for split sampling were Numbers 4 (area of the reactor coolant system sample line), 5 (spent fuel building area), and 6 (sphere penetration room area).

The NRC's three water samples were submitted to Oak Ridge Institute for Science and Education (ORISE) in Oak Ridge, Tennessee, for analysis. The licensee conducted onsite sampling of the eight water samples. The three split sample results for tritium are presented below:

Table 1: Split Water Sampling Results

Sample Description	NRC's Tritium Results	Licensee's Tritium Results
Well 4	$80 \pm 110$ pCi/L	Less than minimum detectable activity of 3750 pCi/L
Well 5	$21,750 \pm 810$ pCi/L	25,800 pCi/L
Well 6	$740 \pm 130$ pCi/L	4,410 pCi/L

The results indicate elevated tritium in the sample originating from well 5, the area down-gradient of the former spent fuel building, although the licensee was not confident that any of the water samples were truly representative of actual groundwater conditions. No tritium above the respective minimum detectable activity levels were identified by the licensee in wells 1-3 and 7-8.

The differences between the two sets of tritium sample results were attributed to differences in the minimum detectable activities of the measurement equipment and the sampling protocols used by ORISE and the licensee. Regardless, all sample results were below the action level of 30,000 pCi/L (if the source of water was a drinking water source) for reporting to the NRC.

The cesium-137 sample results in the three samples analyzed by ORISE ranged from a low of  $-0.7 \pm 2.4$  pCi/L to a high of  $3.2 \pm 2.8$  pCi/L, suggesting that the cesium-137 concentrations were essentially at background or non-detectable levels. The licensee did not detect gamma-emitting radionuclides in any of their eight water samples.

On September 22, 2006, just prior to the onsite inspection, the licensee collected eight water and sediment samples from the beach located adjacent to the Unit 1 site. The samples were submitted to an offsite laboratory for analysis of gamma-emitting radionuclides and tritium. After the conclusion of the onsite inspection, the licensee informed the inspector that no detectable radioactivity was identified in any of the samples.

During dewatering well installation, the licensee collected soil and water samples at varying depths for analysis. The water samples were not representative samples of groundwater because the well boreholes had not been properly purged prior to sampling. The soil samples were analyzed for gamma-emitting radionuclides and tritium concentrations. The preliminary sample results indicate that tritium and cesium-137 were present in the subsurface soils in wells 5 and 6.

The cesium-137 and tritium concentrations in a limited number of soil samples exceeded the acceptance criteria being used by the licensee for future license termination. The acceptance criteria being used is the NRC's surface soil screening values provided in Table H.2 of NUREG-1757, Volume 2, Consolidated NMSS Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria. The screening criteria for cesium-137 and tritium are

11 picocuries per gram (pCi/g) and 110 pCi/g, respectively. Based on the licensee's preliminary data, one cesium-137 sample result was 35 pCi/g and one tritium sample result was 202 pCi/g. Both sample results exceeded the screening criteria.

At the conclusion of the onsite inspection, the licensee was still analyzing the data and was continuing with its investigations. The sources of the tritium were not clearly identified by the conclusion of the onsite inspection but may have been the result of previous leaks in the vicinity of the fuel storage building. Future actions included development and implementation of a Groundwater Protection Initiative. As part of this initiative, the licensee plans to include all groundwater samples, collected both onsite and offsite, in future annual radioactive effluent release reports.

The licensee commenced with dewatering operations after the onsite inspection. The draw-down of groundwater is designed to support sub-surface decommissioning activities, although the dewatering operations may also assist in cleanup of tritium from the subsurface soil and the groundwater. During early November 2006, the licensee collected two sets of water samples from dewatering wells 4-6. The samples were analyzed onsite. None of the sample results indicated radioactivity above the minimum detectable concentration levels of the measuring equipment.

In summary, the licensee has identified tritium and cesium-137 in the subsurface area of Unit 1. The licensee has developed a plan of action to investigate and to resolve the issue. The radioactivity concentrations were less than the reporting levels, and there is no evidence that the contamination has migrated offsite.

### 1.3 Conclusion

The licensee identified and voluntarily reported its discovery of tritium in the subsurface area beneath the containment sphere. The licensee collected, analyzed and then released the groundwater in compliance with ODCM requirements, and the licensee has been proactive in formulating corrective actions to address the problem. The sources of the tritium were still under investigation at the conclusion of the inspection.

The NRC collected and split three water samples with the licensee. The sample results indicate that tritium was present in the groundwater but at levels below the reporting limit. The split sample results were generally comparable, suggesting that the licensee's sampling program was adequate to detect and quantify tritium in groundwater.

## 2 **Inspection of Remedial and Final Surveys at Permanently Shutdown Reactors (83801)**

### 2.1 Inspection Scope

During the inspection, portions of a final status survey were compared to site procedure requirements, and an NRC confirmatory survey was conducted in a trench located in the Unit 1 yard to independently measure the radiological condition of subsurface soils.

## 2.2 Observations and Findings

Site procedure S01-XXVIII-6.2.5, Revision 0, "Comprehensive Ground Record Program for SONGS 1 Decommissioning Project," provides the guidance for generating, processing, storage and retrieval of records documenting the radiological and environmental condition of the SONGS 1 site to support future termination of both the NRC license and site easement agreements. The licensee conducted final status surveys of subsurface areas, in part, to document the as-left condition of these areas for future evaluation. The inspector conducted a confirmatory survey and observed the implementation of a final status survey in a sub-surface trench located adjacent to the old yard sump.

The trench had been excavated to allow for removal of old underground piping and concrete and to allow for installation of new piping. The new piping included a connection between catch basin #5, the lowest point on site, and the new yard sump. At the time of the inspection, the licensee was pumping groundwater out of the south dewatering well to create a cone of depression which prevented water infiltration into the open trench.

The confirmatory survey consisted of measurement of ambient gamma radiation exposure rates and collection of three soil samples. The ambient gamma exposure rates were measured using a Ludlum Model 19 MicroRoentgen meter (NRC No. 015518, calibration due date of 12-22-06). With a background of 15 microRoentgens per hour ( $\mu\text{R}/\text{hr}$ ), the trench ranged from 15-42  $\mu\text{R}/\text{hr}$ . Acceptance criteria has not been established for exposure rates, but the exposure rate measurements were used to locate soils for sampling.

The inspector collected three soil samples for analysis by ORISE. The licensee conducted an onsite gamma spectroscopy analysis of these three samples using high purity germanium detectors. The inspector observed the licensee conducting the sampling analyses, including performance of a daily instrument calibration check. The daily check included measurement of instrument background and measurement of a calibrated check source. The NRC's and licensee's soil sample results are presented below:

Table 2: Trench Soil Sampling Results

Sample Description	NRC's Results	Licensee's Results
NRC-1, North wall of trench	cesium-137, 0.02 pCi/g cobalt-60, -0.01 pCi/g	cesium-137, not detected cobalt-60, not detected
NRC-2, Northwest corner of trench, adjacent to old yard sump	cesium-137, 11.09 pCi/g cobalt-60, 0.31 pCi/g	cesium-137, 12.2 pCi/g cobalt-60, 0.59 pCi/g
NRC-3, West wall of trench beneath drain line pipe	cesium-137, 0.73 pCi/g cobalt-60, 0.01 pCi/g	cesium-137, 0.75 pCi/g cobalt-60, not detected

The acceptance criteria being used by the licensee was the NRC's surface soil screening values provided in Table H.2 of NUREG-1757, Volume 2. The screening value for cobalt-60 is 3.8 pCi/g, while the screening value for cesium-137 is 11 pCi/g. All sample results were below the screening values, with one exception. The cesium-137 concentration in sample NRC-2, collected in the northwest corner adjacent to the old yard sump, was measured at the screening value. This finding was not safety significant because the licensee planned to remediate the old yard sump in the near future, and the area where sample NRC-2 was collected is expected to undergo further remediation and resurvey by the licensee at a later date.

The sample results indicate agreement between ORISE and the licensee's laboratory. Accordingly, the licensee's laboratory was determined to be technically capable of accurately detecting and quantifying gamma-emitting radioactive material in site soils.

### 2.3 Conclusions

The inspector conducted a confirmatory survey of an open trench in the Unit 1 yard. The survey revealed that one area of the trench required additional remediation. The licensee planned to decommission the old yard sump in the near future, and the area of concern will be remediated concurrent with the removal of the old yard sump.

The NRC collected and split three soil samples with the licensee. The sample results were comparable indicating that the licensee was capable of detecting and quantifying gamma-emitting radionuclides in soil.

## 3 **Followup (92701)**

- 3.1 (Closed) Violation 050-00206/0611-01: Failure to ensure by examination or appropriate tests that the top discharge valve of a package containing licensed material was properly closed and sealed.

(Closed) Violation 050-00206/0611-02: Failure to load two intermodal portable tanks with a volume greater than 7,500 liters to a filling density of more than 20-percent and less than 80-percent by volume, and to offer these portable tanks for shipment.

(Closed) Violation 050-00206/0611-03: Failure to use a package that was maintained, filled and closed, so that under conditions normally incident to transportation, there would be no identifiable releases of hazardous materials to the environment.

On February 23, 2006, a small quantity of low specific activity radioactive material leaked from a transport container while in transit to a waste disposal site in Utah. The licensee took prompt corrective actions that included notification to State and Federal agencies and cleanup of the spilled material. During NRC inspection 050-00206/06-011, conducted in May 2006, three apparent violations were identified related to the incident. The NRC presented these apparent violations to the licensee in the inspection report letter dated July 5, 2006. The licensee responded to the apparent violations by letter dated August 2, 2006. The NRC subsequently submitted a Notice of Violation letter to the licensee on September 13, 2006.

In the licensee's August 2, 2006, response letter, the licensee provided a list of proposed corrective actions to prevent recurrence. During this inspection, the licensee's implementation of the corrective actions was reviewed to ensure that the actions have been completed by the licensee. The corrective actions included issuance of an industry operating experience report, revision of the site procedure for shipment of radioactive material, completion of a root cause evaluation through the Action Request program, and conduct of employee counseling and meetings. The inspector confirmed that all proposed corrective actions have been effectively implemented by the licensee.

#### **4      Exit Meeting Summary**

The inspector presented the preliminary inspection results to members of licensee management at the exit meeting on October 12, 2006. A final exit briefing was held telephonically with the licensee on November 13, 2006, following receipt of the split soil and water sample results. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspector.

## **ATTACHMENT**

### **PARTIAL LIST OF PERSONS CONTACTED**

#### Licensee

D. Axline, Licensing Engineer, Nuclear Regulatory Affairs  
B. Katz, Vice President, Nuclear Oversight & Regulatory Affairs  
M. Kirby, Operations Supervisor Unit 1  
C. McAndrews, Manager, Nuclear Oversight  
D. Pilmer, Project Manager, Nuclear Regulatory Affairs  
J. Posik, Technical Specialist, Health Physics  
A. Scherer, Manager, Nuclear Regulatory Affairs  
R. Waldo, Vice President, Nuclear Generation  
C. Williams, Compliance Manager  
K. Yhip, Licensing Engineer, Nuclear Regulatory Affairs

### **INSPECTION PROCEDURES USED**

IP 71801      Decommissioning Performance and Status Review at Permanently Shutdown Reactors  
IP 83801      Inspection of Remedial and Final Surveys at Permanently Shutdown Reactors  
IP 92701      Followup

### **ITEMS OPENED AND CLOSED**

#### Opened

None

#### Closed

VIO    050-00206/0611-01    Failure to ensure by examination or appropriate tests that the top discharge valve of a package containing licensed material was properly closed and sealed

VIO    050-00206/0611-02    Failure to load two intermodal portable tanks with a volume greater than 7,500 liters to a filling density of more than 20% and less than 80% by volume, and to offer these portable tanks for shipment

VIO    050-00206/0611-03    Failure to use a package that was maintained, filled and closed, so that under conditions normally incident to transportation there would be no identifiable releases of hazardous materials to the environment

#### Discussed

None

**LIST OF ACRONYMS**

IP	NRC Inspection Procedure
$\mu\text{Ci}/\text{ml}$	microcuries per milliliter
$\mu\text{R}/\text{hr}$	microRoentgens per hour
ODCM	Offsite Dose Calculation Manual
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
pCi/L	picocuries per liter
VIO	NRC Notice of Violation