

September 18, 2002

Mr. John L. Skolds  
President and Nuclear Officer  
Exelon Nuclear  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: NRC INSPECTION REPORT 05000295/20002-005(DNMS) - ZION

Dear Mr. Skolds:

On August 27, 2002, the NRC completed an inspection at the Zion reactor facility which examined decommissioning activities. The enclosed report documents the inspection findings which were discussed on August 27, 2002, with Mr. R. Landrum and other members of your staff.

The inspection consisted of an examination of activities at the Zion facility as they relate to safety and to compliance with the Commission's rules and regulations. Activities in the areas of facility management and control, decommissioning support, spent fuel safety, and radiological safety were examined. Within these areas, the inspection consisted of selective examinations of procedures and representative records, field observations and interviews with personnel.

No violations of NRC requirements were identified.

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We will gladly discuss any questions you may have regarding this inspection.

Sincerely,

**RA/**

Christopher G. Miller, Chief  
Decommissioning Branch

Docket No. 05000295  
License No. DPR-39

Enclosure: Inspection Report 05000295/2002-005(DNMS)

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cc w/encl:      Zion Nuclear Power Station Decommissioning Plant Manager  
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Senior Vice President - Nuclear Services  
Senior Vice President - Mid-West Regional Operating Group  
Vice President - Mid-West Operations Support  
Vice President - Licensing and Regulatory Affairs  
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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No.	05000295
License No.	DPR-39
Report No.	05000295/2002-005(DNMS)
Licensee:	Exelon Generation Company, LLC
Facility:	Zion Nuclear Station
Location:	101 Shiloh Boulevard Zion, IL 60099
Dates:	Illinois Department of Nuclear Safety Inspection June 27 through 28, 2002, and NRC Inspection July 16 through August 27, 2002
Inspectors:	Roy J. Leemon, Decommissioning Inspector Decommissioning Branch, DNMS  Peter J. Lee, Ph.D., CHP, Radiation Specialist Decommissioning Branch, DNMS  Jane Yesinowski, Illinois Department of Nuclear Safety Inspector
Approved by:	Christopher G. Miller, Chief Decommissioning Branch Division of Nuclear Materials Safety

## **EXECUTIVE SUMMARY**

### **Zion Nuclear Station NRC Inspection Report 05000295/2002-005(DNMS)**

This routine decommissioning inspection covered aspects of licensee facility management and control, decommissioning support activities including surveillance procedures status, spent fuel safety, and radiological safety. During the inspection, the plant was being maintained in a SAFSTOR [Safe Storage of the Spent Fuel] condition, with no major decommissioning work activities in progress. The annual spent fuel pool heat-up rate surveillance test was performed during this period.

#### Decommissioning Performance and Status Review at Permanently Shut Down Reactors

- Decommissioning Plant Manager responsibilities have been delegated to the Operations Manager or Shift Supervisor during the interim period until a permanent new Decommissioning Plant Manager has been selected. This has been adequately communicated to plant personnel.
- The licensee properly assessed corrective actions and root causes associated with Corrective Action Work Orders.
- The material integrity of structures, systems, and components necessary for SAFSTOR and for the conduct of safe decommissioning activities was being monitored and maintained.
- Housekeeping and fire protection conditions were acceptable.

#### Decommissioning Support Activities

- The spent fuel pool heat-up rate has decreased from 0.80°F per hour to 0.72°F per hour providing 31 more hours from normal operating temperature to spent fuel pool boiling temperature than last year. Therefore, the licensee's staff has more time to restore spent fuel pool cooling, if it is lost.

#### Spent Fuel Safety

- The safety of the stored spent fuel was being maintained by the spent fuel pool cooling and ventilation systems.
- Chemistry and criticality controls were being maintained within limits and requirements.
- During walkdown of the spent fuel pool, the inspectors found no paths for siphoning or draining the spent fuel pool. The clarity of the water in the spent fuel pool was good. Housekeeping and contamination control were adequate.

#### Radiological Safety

- The licensee had complied with procedural requirements for conducting general area surveys and had been successful in controlling external exposures and controlling the spread of contamination.

- The licensee was effectively implementing radiation control programs and processes. Personnel exposures were low, commensurate with decommissioning activities, and As-Low-AsReasonably-Achievable (ALARA) practices.
- The licensee was effectively implementing the radiological effluent control programs and processes.

## Report Details<sup>1</sup>

### Summary of Plant Activities

During the period covered by this inspection, the plant remained in SAFSTOR with no major decommissioning work activities in progress. The annual spent fuel pool heat-up rate surveillance test was performed during this period.

#### **1.0 Facility Management and Control**

##### **1.1 Decommissioning Performance and Status Review at Permanently Shut Down Reactors (71801)**

The inspectors evaluated the progress of decommissioning activities and the licensee's conduct of decommissioning activities, in accordance with licensed requirements and commitments. Control and conduct of facility decommissioning activities were examined to verify that NRC requirements were being met. These requirements included: Defueled Technical Specifications (DTS) and requirements and commitments described in the Defueled Safety Analysis Report (DSAR); the Post Shutdown Decommissioning Activities Report (PSDAR); and the Emergency Plan.

##### **1.2 Plant Manager's Duties**

###### **a. Inspection Scope**

The inspectors discussed plant manager's responsibilities with the licensee during the interim period when the Zion Station Operations Manager is the acting Decommissioning Plant Manager.

###### **b. Observations and Findings**

The Zion Station Decommissioning Manager recently took on other responsibilities, away from the site. He designated the present Operations Manager to perform his Decommissioning Plant Managers' responsibilities during the interim until a new Decommissioning Plant Manager is selected. From discussions with the Operations Manager, the inspectors believe that the Operations Manager is cognizant and capable of assuming the Decommissioning Plant Managers' responsibilities. When the Operations Manager is acting as the Decommissioning Plant Manager, and the Operations Manager is offsite, the Shift Supervisor assumes the responsibilities of the Decommissioning Plant Manager. The Shift Supervisor has the authority to sign and act as the Decommissioning Plant Manager per an authorization letter dated May 31, 2002.

###### **c. Conclusions**

Decommissioning Plant Manager responsibilities have been delegated to the Operations Manager or Shift Supervisor during the interim period until a permanent new Decommissioning Plant Manager has been selected. This has been adequately communicated to plant personnel.

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**Note:** A list of acronyms used in these "Details" is provided at the end of the report.

### 1.3 Self-Assessment, Auditing, and Corrective Actions (40801)

#### a. Inspection Scope

The inspectors reviewed Corrective Action Work Orders from July 7 through August 8 to evaluate if the corrective actions and root causes were adequate.

#### b. Observation and Findings

The inspectors reviewed the Corrective Action Work Orders and discussed them with the licensee's staff for two safety classifications.

##### Classification as Condition Adverse to Quality:

<b>Work Order Number</b>	<b>Title</b>
00438128	"SPENT FUEL POOL NUCLEAR ISLAND EXHAUST FAN BELT FAILS WHEN UNIT IS PUT IN HIGH SPEED"
00442395	"OB FIRE PUMP CHECK VALVE FAILED TO OPEN DURING PERFORMANCE TEST 201"
00458718	"FIRE PROTECTION SYSTEM WIRING DISCREPANCY"

##### Classification as Condition Not Adverse to Quality:

<b>Work Order Number</b>	<b>Title</b>
00460640	"FALSE FIRE ALARM IN CRIBHOUSE"
00472232	"LOSS OF WATER TO THE WAREHOUSE AND FABRICATION SHOP"

The inspectors had no concerns with the licensee's assessment of the above Corrective Action Work Orders.

#### c. Conclusion

The licensee properly assessed Corrective Action Work Orders's corrective actions and root causes.

### 1.4 Plant Tours to Evaluate Material Conditions and Housekeeping (IP 71801)

#### a. Inspection Scope

The inspectors performed plant tours of the control room and the Spent Fuel Pool Nuclear Island (SFNI) to evaluate the material condition of Structures, Systems, and Components (SSC) necessary for the safe storage of spent fuel along with the auxiliary building. These areas were also inspected for housekeeping and fire protection.

b. Observations and Findings

The inspectors walked down accessible areas which contain SSCs for the safe storage of spent nuclear fuel. The material condition was acceptable. The inspectors did not identify any SSC condition that impacted the safe storage of spent fuel. Housekeeping was acceptable. No fire hazards were identified, and no conditions that were adverse to plant equipment or personnel safety were identified.

The inspectors found that control room manning met regulatory requirements. The status of spent fuel pool SSCs were being monitored in the control room and applicable parameters trended.

During the summer months, the spent fuel pool temperature is about 93°F, reflecting atmospheric conditions. With an initial spent fuel pool temperature of 93°F, spent fuel pool time-to-boil is approximately 165 hours at the current spent fuel heat load. Spent fuel pool evaporative losses and liner leakage losses are being monitored. A daily plant status sheet lists these and other parameter values.

c. Conclusions

The material integrity of structures, systems, and components necessary for SAFSTOR and for the conduct of safe decommissioning activities was being monitored and maintained. Housekeeping and fire protection conditions were acceptable.

## **2.0 Decommissioning Support Activities**

### **2.1 Surveillance at Permanently Shut Down Reactors (62801)**

The inspectors evaluated maintenance and surveillance activities on structures, systems, and components that could affect the safe storage of spent fuel and reliable operation of radiation monitoring equipment. Reviews, and interviews of licensee personnel were conducted to assess whether surveillance activities were being performed in accordance with regulatory requirements.

The inspectors determined that regulatory requirements were being met for the surveillance activities inspected, contributing to the safe storage of spent fuel.

### **2.2 Spent Fuel Pool Annual Heat-Up Rate Test**

a. Inspection Scope

The inspectors reviewed Operation's Special Procedure OSP-01-002 Revision 0, "Spent Fuel Pool (SFP) Heat Up Data Collection Procedure," and discussed the results with the licensee's staff.

b. Observation and Findings

The purpose of this test was to document Spent Fuel Pool heat-up data in a controlled manner while the Spent Fuel Pool Nuclear Island Cooling Tower Pumps were turned off.



The spent fuel pool heat-up test was performed once a year during the hottest months of the year. The result of last year's spent fuel pool heat-up test was a heat-up rate of 0.80°F per hour.

An SFP heat-up test was started on July 30. Spent Fuel Pool cooling was stopped, and the test was initiated at 12:00 p.m. The test was terminated at approximately 12:00 p.m. on July 31. Fuel Building Ventilation was restored at 08:00 a.m. on July 31, due to high humidity conditions in the Fuel Building. Only data obtained with the Fuel Building Ventilation off was used to determine an SFP heat-up rate. There was a 14.4°F. SFP temperature increase over the 20-hour test duration with Fuel Building Ventilation off. The SFP heat-up rate was 0.72°F per hour.

The SFP Cooling System maintains the SFP temperature between 90°F and 95°F. Assuming an initial SFP temperature of 90°F, it would take approximately 48 hours (two days) for the pool to heat up to the high temperature alarm of 125°F, and it would take approximately 169 hours (seven days) for the pool to heat up to the boiling temperature of 212°F.

The SFP heat-up rate has decreased from 0.80°F per hour last year to 0.72°F per hour this year. The time to boil from the normal operating temperature has increased by approximately 31 hours; therefore, the licensee's staff has more time to restore SFP cooling if it is lost.

c. Conclusion

The spent fuel pool heat-up rate has decreased from 0.80°F per hour to 0.72°F per hour providing 31 more hours from normal operating temperature to spent fuel pool boiling temperature than last year. Therefore, the licensee's staff has more time to restore spent fuel pool cooling if it is lost.

2.3 Operator Logs

a. Inspection Scope

The inspectors reviewed Zion Shift Manager Logs.

b. Observations and Findings

The inspectors reviewed Zion Shift Manager Logs dated July 1, July 5, July 6, August 15, August 13, and August 22. The inspectors had no concerns with the details or quality of these logs.

c. Conclusions

Zion Shift Manager Logs were being adequately completed.

### **3.0 Spent Fuel Safety (60801)**

#### **3.1 Cooling the Spent Fuel Pool**

##### **a. Inspection Scope**

The inspectors verified the safe wet storage of spent fuel in the Spent Fuel Building (SFB). Factors considered in the evaluation included: SFP instrumentation, alarms and leakage detection; cleanliness control; chemistry of the SFP; criticality controls; ventilation; SFP operation; and power supplies. The inspectors reviewed plant documents to determine the requirements and evaluations for SFP temperature and level.

##### **b. Observations and Findings**

The inspectors reviewed the Defueled Technical Specifications (DTS); Defueled Safety Analysis Report (DSAR); and various procedures relevant to the operation of the SFP. During a tour of the spent fuel pool area the inspectors looked at instrumentation, portions of local electrical breaker positions, local valve line-ups. No problems or concerns were identified.

On August 27 the SFP temperature was being controlled at 94°F with a heat up rate of 0.72°F per hour, and the time to start boiling the water in the SFP (with no SFP cooling) was 164 hours. The spent fuel pool level was at elevation 615 feet 2 inches. These parameters were within procedural limits. The SFP boron concentration was 1997 parts per million (ppm) versus the technical specifications limit of greater than 500 ppm.

A review of the April 2002 through July 2002 SFP water chemistry and gamma spectrum analysis results indicated that all parameters were within the limits specified in 401, "Zion Chemistry Procedure 401, "Zion Chemistry Sampling."

The inspectors evaluated SFP criticality controls monitoring by observing the local SFP radiation monitors which were normal (less than 1 millirem per hour).

All the above parameters were being maintained within required limits.

##### **c. Conclusions**

The safety of the stored spent fuel was being maintained by the spent fuel pool cooling and ventilation systems. Chemistry and criticality controls were being maintained with limits and requirements.

#### **3.2 Siphon and Drain Protection for the Spent Fuel Pool**

##### **a. Inspection Scope**

Inspectors evaluated the potential for siphoning the SFP which included a review of licensee procedures dealing with siphon and drain protection, and a walkdown of the area surrounding the SFP with the Operations Manager including a discussion of skimmer operations.

b. Observations and Findings

During the inspectors' walkdown of the areas surrounding the spent fuel pool, no deficiencies were identified that could result in siphoning the spent fuel pool or transfer canal. The inspector observed that the SFP water was very clear, with no visible debris on the surface. During discussion with the Operations Manager, the inspector found that the system design features and physical limitations would preclude siphoning the spent fuel pool during skimmer operations.

The inspector found that Zion Administrative Procedure, ZAP 110-02, Revision 13, "Procedure Process Control", contained requirements for processing a new procedure or for making changes to an existing procedure. There are requirements within this procedure (Step 1.7.1) for an anti-siphon review for evolutions associated with or around the Spent Fuel Pool. Station Operating Instruction SOI-75P, Revision 10, "Spent Fuel Transfer Canal Operations", contains guidance to use when performing evolutions within the transfer canal that could cause siphoning to occur. Also, procedure AOP-6.2, Revision 2, "Spent Fuel Pit/Transfer Canal Uncontrolled Loss of Level", contains steps to be taken if water is being lost from the spent fuel pool including checking for hoses in the spent fuel pool which could be causing siphoning. The procedures were adequate in addressing the prevention of siphoning of the SFP, during plant activities.

c. Conclusions

The inspectors found no paths for siphoning or draining the spent fuel pool during their walkdown of the SFP. The clarity of the water in the spent fuel pool was good. Housekeeping and contamination control were adequate.

**4.0 Radiological Safety**

4.1 General

The inspectors conducted reviews of ongoing activities in order to assess the overall Radiation Protection (RP) Program. Specific findings are detailed in the sections below.

4.2 Radiation Protection Program (83750)

a. Inspection Scope

The inspection examined and evaluated aspects of the RP Program including air sampling results, direct radiation survey results, and procedures and records of routine source checks for the area radiation monitors in the Zion Fuel Building.

b. Observations and Findings

A review of the general air sampling results from the Zion Fuel and Auxiliary Buildings indicated that the internal exposures were well below regulator 10 CFR 20 limits.

The inspectors reviewed a sampling of direct radiation survey results and smear sample results from the fuel building and the auxiliary building for the second quarter of 2002. The results indicated that the licensee had complied with the requirements. The

contamination levels within the facility had been kept to a minimum, and the spread of contamination had been contained.

The inspectors reviewed the procedures and records of routine source checks for the area radiation monitors in the Zion Fuel Building. The results indicated that the licensee had complied with the requirements specified in the Defueled Technical Specifications.

c. Conclusions

The licensee had complied with procedural requirements for conducting general area surveys and had been successful in controlling external exposures and controlling the spread of contamination.

4.3 Occupational Radiation Exposure (83750)

a. Scope

The inspectors performed a balanced but limited examination and evaluation of the area of occupational radiation safety. Elements of the program which were examined included: the external and internal dose controls; practices to maintain exposures as-low-as-reasonably-achievable (ALARA); an equipment calibration; contamination controls; air monitoring; area surveys, postings, and radiation work permit (RWP) activities.

b. Observations and Findings

The licensee's internal and external dose control program limited total exposure for all of the staff for July 2002 to 4 millirem. The licensee's staff total exposure for year-to-date as of July 31, 2002 was 106 millirem. The July goal was 30 millirem, and the year-to-date goal was 219 millirem. These exposures were below the ALARA goals. Most of the work activities performed during the month of July were performed outdoors because of the good weather and not radiological controls areas. This kept the exposure to personnel low.

c. Conclusions

The licensee was effectively implementing radiation control programs and processes. Personnel exposures were low, commensurate with decommissioning activities, and ALARA practices.

4.4 RadWaste Treatment, and Effluent and Environmental Monitoring (84750)

a. Inspection Scope

The licensee's activities to effectively control, monitor, and quantify releases of radioactive materials in liquid, gaseous, and particulate forms to the environment were examined.

b. Observations and Findings

The inspectors reviewed the procedures and records of routine source checks for gas, particulate, and liquid effluent radiation monitors. The inspectors also reviewed the procedures and records for liquid effluent releases.

The effluent monitors had been calibrated and source checked as required by station procedures.

c. Conclusions

The licensee was effectively implementing the radiological effluent control programs and processes.

## **5.0 Exit Meeting Summary**

The inspectors presented the inspection results to members of licensee management during a meeting on August 27. The licensee acknowledged the findings presented. The licensee did not identify any of the documents or processes reviewed by the inspectors as proprietary.

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

- \* J. Ashley, Design Engineering
- M. Bittmann, Shift Supervisor
- \* K. King, Maintenance Supervisor
- \* B. Ganser, Illinois Department of Nuclear Safety
- D. Nodin, Shift Supervisor
- \* R. Landrum, Operations and Engineering Manager
- B. Maicke, Shift Supervisor
- \* M. Petersen, Administrative Manager
- \* R. Schuster, Radiation Protection and Chemistry Supervisor
- \* G. Smith, Security Manager
  
- \* **Present at the August 27 exit meeting.**

## **INSPECTION PROCEDURES USED**

IP 36801:	Organization, Management, and Cost Controls at Permanently Shut Down Reactors
IP 37801:	Safety Reviews, Design Changes, & Modifications
IP 40801:	Self-Assessment, Auditing, and Corrective Actions
IP 60801:	Spent Fuel Pool Safety at Permanently Shut Down Reactors
IP 62801:	Maintenance and Surveillance at Permanently Shut Down Reactors
IP 71801:	Decommissioning Performance and Status Review at Permanently Shut Down Reactors
IP 83750:	Occupational Radiation Exposure
IP 83726:	Control of Radioactive Materials and Contamination, Surveys, and Monitoring
IP 84750:	RadWaste Treatment, and Effluent and Environmental Monitoring

## **ITEMS OPENED, CLOSED AND DISCUSSED**

### Opened

None

### Closed

None

### Discussed

None

Note: At present there are no items open at Zion.

## **DOCUMENTS REVIEWED<sup>2</sup>**

DSAR, "Defueled Safety Analysis Report"

DSEP, "Defueled Station Emergency Plan"

DTS, "Defueled Technical Specifications"

PSAR, "Post Shut-Down Activities Report"

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<sup>2</sup>Other documents or records reviewed during this inspection are identified in the Report Details.

Shift Manager's Logs

Zion Station Work Activities Schedule

Zion Daily Plant Status Sheet

Calibration Documentation for Area Radiation Monitors

Zion Administrative Procedure, ZAP 110-02, "Procedure Process Control", Revision 13

Station Operating Instruction SOI-75P, "Spent Fuel Transfer Canal Operations", Revision 10

Abnormal Operating Procedure 6.2 "Spent Fuel Pit/Transfer Canal Uncontrolled Loss of Level", Revision 2

### **LIST OF ACRONYMS USED**

ALARA	As-Low-As-Reasonably-Achievable
CFR	Code of Federal Regulations
CTEM	Changes, Tests, Experiments and Modifications
DSAR	Defueled Safety Analyses Report
DSEP	Defueled Station Emergency Plan
DTS	Defueled Technical Specifications
EAL	Emergency Action Level
ERO	Emergency Response Organization
IDNS	Illinois Department. of Nuclear Safety
IFI	Inspector Follow-up Items
IP	Inspection Procedure
NARS	Nuclear Accident Reporting System
NRC	Nuclear Regulatory Commission
mrem	millirem
ODCM	Offsite Dose Calculation Manual
PSDAR	Post-Shutdown Decommissioning Activities Reports
SAFSTOR	Safe Storage of the Spent Fuel
SFNI	Spent Fuel Pool Nuclear Island
SFB	Spent Fuel Building
SFP	Spent Fuel Pool
SOI	Station Operating Instruction
SSC	Structures, Systems, Components
WR	Work Request
ZAP	Zion Administrative Procedure