



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION III  
2443 WARRENVILLE ROAD, SUITE 210  
LISLE, ILLINOIS 60532-4352

February 13, 2018

Mr. Bruce Hinkley  
General Manager  
Zion Restoration Project  
ZionSolutions, LLC  
101 Shiloh Boulevard  
Zion, IL 60099

SUBJECT: NRC INSPECTION REPORT NO. 05000295/2017002(DNMS);  
05000304/2017002(DNMS) – ZION NUCLEAR POWER STATION

Dear Mr. Hinkley:

On January 16, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the permanently shut down Zion Nuclear Power Station in Zion, Illinois. The purpose of the inspection was to determine whether decommissioning activities were conducted safely and in accordance with NRC requirements. On January 16, the inspectors discussed the results of this inspection with you and members of your staff. The results of this inspection are documented in the enclosed report.

The inspection consisted of an examination of activities at the facility as they relate to safety and compliance with the Commission's rules and regulations. Areas examined during the inspection included decommissioning performance and status review; occupational radiation exposure; inspection of remedial and final status surveys; radioactive waste treatment, effluent, and environmental monitoring; solid radioactive waste management; and transportation of radioactive materials. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observation of work activities, and interviews with personnel.

Based on the results of this inspection, no violations of NRC requirements were identified.

B. Hinkley

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Sincerely,

***/RA/***

Michael A. Kunowski, Chief  
Materials Control, ISFSI, and  
Decommissioning Branch  
Division of Nuclear Materials Safety

Docket Nos: 050-295; 050-304  
License Nos: DPR-39; DPR-48

Enclosure:  
IR 05000295/2017002(DNMS);  
05000304/2017002(DNMS)

cc w/encl: *ZionSolutions*, Service List

B. Hinkley

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Letter to Bruce Hinkley from Michael Kunowski dated February 13, 2018

SUBJECT: NRC INSPECTION REPORT NO. 05000295/2017002(DNMS);  
05000304/2017002(DNMS) – ZION NUCLEAR POWER STATION

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U.S. NUCLEAR REGULATORY COMMISSION  
REGION III

Docket Nos: 050-295; 050-304

License Nos: DPR-39; DPR-48

Report Nos: 05000295/2017002(DNMS);  
05000304/2017002(DNMS)

Licensee: *ZionSolutions*, LLC

Facility: Zion Nuclear Power Station, Units 1 and 2

Location: Zion, Illinois

Dates: June 22, 2017, through January 16, 2018

Inspectors: Bill C. Lin, Health Physicist  
Rhex A. Edwards, Senior Health Physicist

Approved by: Michael A. Kunowski, Chief  
Materials Control, ISFSI, and  
Decommissioning Branch  
Division of Nuclear Materials Safety

Enclosure

## **EXECUTIVE SUMMARY**

### **Zion Nuclear Power Station, Units 1 and 2 NRC Inspection Report 05000295/2017002(DNMS); 05000304/2017002(DNMS)**

The Zion Nuclear Power Station is a permanently shut-down and defueled power reactor facility that was maintained in a safe storage condition from 1998 through 2010. Active decommissioning began in 2011, and continued throughout this inspection period. This routine safety inspection reviewed licensed activities associated with performance of final status surveys, transportation of radioactive materials, environmental monitoring and effluent release, and radiation safety.

#### **Decommissioning Performance and Status Review**

- The inspectors determined that the licensee and supplemental workforce conducted decommissioning activities in accordance with the regulations and license requirements. The inspectors conducted frequent plant tours to verify the material condition of structures, systems, and components, and the safe conduct of decommissioning. (Section 1.0)

#### **Occupational Radiation Exposure**

- Workers adhered to the radiological controls provided in the Radiological Work Permits (RWPs) and As Low As Is Reasonably Achievable (ALARA) plans and followed the Radiation Protection (RP) staff instruction. Radiation and contamination surveys were performed adequately to identify the hazards present. Licensee personnel had all applicable dosimetry to ensure monitoring. (Section 2.0)

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

- NRC inspectors and Nuclear Material Safety and Safeguards (NMSS) personnel reviewed the results of the Final Status Survey (FSS) of the 345-kiloVolt (kV) tower concrete base.
- NRC inspectors and NMSS personnel reviewed the results of the FSS of the south buried storm sewer header.
- NRC inspector's performed independent gamma scan surveys of the 345-kV tower concrete base and south buried storm sewer header footprints. (Section 3.0)

#### **Radioactive Waste Treatment, and Effluent and Environmental Monitoring**

- The licensee controlled, monitored, and quantified releases of radioactive materials released to the environment to ensure offsite doses were within regulatory limits and were ALARA.
- The inspectors reviewed the licensee's corrective actions regarding the violation that was issued in NRC Inspection Report (IR) 05000295/2017001; 05000304/2017001. (Section 4.0)

### **Solid Radioactive Waste Management and Transportation of Radioactive Materials**

- Radioactive materials planned for shipment were classified, characterized, and packaged appropriately, in accordance with NRC and Department of Transportation (DOT) regulations, to meet low-level waste burial site criteria. (Section 5.0)

## Report Details

### Summary of Plant Activities

During the inspection period, the licensee continued preparations for open air demolition of Unit 1 and Unit 2 containments and the demolition of the auxiliary building. The licensee also performed waste transportation, and continued with its environmental monitoring program.

#### 1.0 Decommissioning Performance and Status Reviews (Inspection Procedure (IP) 71801)

##### 1.1 Inspection Scope

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- Status of ongoing decommissioning activities and planning for future activities;
- Whether licensee activities were in accordance with license conditions and docketed commitments, as well as, within the bounds of the docketed post shutdown decommissioning activities report;
- Operability and functionality of systems necessary for safe decommissioning were assessed through plant walkdowns, such as: radioactive effluent monitoring and radiation protection monitors and alarms;
- Performed plant tours to assess field conditions and decommissioning abandonment activities; and
- Observed in-progress field work to verify activities were conducted in accordance with approved work instructions and workers were knowledgeable of tasks;

##### 1.2 Observations and Findings

The inspectors determined through plant tours and activities observed that the licensee conducted activities in accordance with the regulatory requirements and plant procedures.

No findings were identified.

##### 1.3 Conclusions

The inspectors determined that the licensee and supplemental workforce conducted decommissioning activities in accordance with the regulations and license requirements. The inspectors conducted frequent plant tours to verify the material condition of structures, systems, and components, and the safe conduct of decommissioning.

## **2.0 Occupational Radiation Exposure (IP 83750)**

### **2.1 Inspection Scope**

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- Personal dosimetry for external exposure meets requirements;
- Processes or engineering controls were used to the extent practicable to limit concentrations of airborne radioactive materials;
- Survey and monitoring activities were performed as required; and
- Control of radioactive materials and contamination met requirements;

### **2.2 Observations and Findings**

The inspectors reviewed contamination surveys and air sample results taken in preparation for the open air demolition of Unit 1 and Unit 2 containments. The results of the surveys indicated that there was no radiological contamination present. The air sample results also indicated that there were no occurrences of airborne contamination during the open air demolition prep work. The inspectors also observed the performance of contamination surveys during the loading of radioactive waste onto transport trucks. Based on the observations, the licensee performed the surveys in accordance with the licensee's procedures and regulatory requirements. All licensee personnel had the appropriate dosimetry in accordance with all applicable procedures and regulations.

No findings were identified.

### **2.3 Conclusions**

Workers adhered to the radiological controls provided in the RWP and ALARA plans and followed the RP staff instruction. Radiation and contamination surveys were performed adequately to identify the hazards present. Licensee personnel had all applicable dosimetry to ensure monitoring.

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

### **3.1 Inspection Scope**

The inspectors conducted document reviews, observations, and interviews with plant personnel to assess the licensee's performance as it related to the following areas:

- Permanently shutdown power reactor sites were decontaminated to acceptable residual radioactivity levels in accordance with the License Termination Plan (LTP) requirements for unrestricted or restricted use;
- Radiological measurements, surveys, and documentation of remedial action support



surveys and FSSs were conducted in accordance with the licensee's LTP and implementation procedure;

- Licensee's implementation or completion of remediation surveys were adequately performed and the survey units had been prepared and were acceptable for the performance of FSSs; and
- Licensee's implementation of the FSS program and FSS results, to date, were appropriate.

### 3.2 Observations and Findings

#### 345-kV Concrete Base

As part of the decommissioning process, the licensee performed an FSS of the 345-kV tower concrete base Class 3 area. The 345-kV tower concrete base footprint was a well traversed area for licensee personnel and vehicles. Therefore, licensee requested NRC review of the survey results to ensure that the surveys performed were appropriate and in accordance with the licensee's submitted LTP so they can backfill the area at risk to reduce any personnel and vehicle safety incidents. The NRC inspectors from Region III and NMSS personnel reviewed the FSS data and determined that the survey was performed in accordance with the licensee's submitted LTP. Because the LTP had not yet been approved by the NRC; however, the licensee's plan to backfill the area to reduce the potential for personnel and vehicle safety incidents would be at risk for conducting additional surveys depending on the approval of the LTP.

#### South Buried Storm Sewer Header

As part of the decommissioning process, the licensee performed an FSS of the south buried storm sewer header Class 3 area. This area was also a well traversed area for licensee personnel and vehicles. The NRC inspectors from Region III and NMSS personnel reviewed the FSS data and determined that the survey was performed in accordance with the licensee's submitted LTP. Because the LTP had not yet been approved by the NRC; however, the licensee's plan to backfill the area to reduce the potential for personnel and vehicle safety incidents would be at risk for conducting additional surveys depending on the approval of the LTP.

#### Inspectors Survey

During this inspection period, NRC inspectors performed gamma surveys of the above mentioned areas. The survey data obtained by the inspectors were similar to the results obtained by the licensee and verified that there was no loose surface contamination present within the 345-kV tower concrete base and the south buried storm sewer header foot prints.

No findings were identified.

### 3.3 Conclusions

NRC inspectors and NMSS personnel reviewed the FSS results of the 345 KV tower concrete base and the south buried storm sewer header. The data presented were appropriate for a Class 3 area. NRC inspectors also walked down the area and verified that there were no loose surface contamination present at the time. The licensee performed the FSS of these areas in accordance with their submitted LTP.

## 4.0 **Radioactive Waste Treatment, and Effluent and Environmental Monitoring (IP 84750)**

### 4.1 Inspection Scope

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- Radioactive waste treatment systems were maintained and operated to keep offsite doses ALARA;
- The licensee effectively controlled, monitored, and quantified releases of radioactive materials in liquid, gaseous, and particulate forms to the environment; and
- The radiological environmental monitoring programs were effectively implemented to ensure effluent releases were being adequately performed as required to minimize public dose;

### 4.2 Observations and Findings

The inspectors reviewed the licensee's corrective actions from the Non-Cited Violation in NRC IR 05000295/2017001; 05000304/2017001. The inspectors had identified that the licensee's 2016 Annual Effluent report contained errors. As part of the corrective actions, the licensee implemented a new review process that simplified the annual effluent report to reduce the likelihood of future errors.

The inspectors also reviewed the licensee's liquid effluent records and the environmental monitoring program to ensure that all liquid effluents released were properly monitored and documented.

No findings were identified.

### 4.3 Conclusions

The licensee maintained effluent monitoring as described within the Offsite Dose Calculation Manual. Annual effluent report corrective actions were implemented and documented in the licensee's procedure.

## **5.0 Solid Radioactive Waste Management and Transportation of Radioactive Materials (IP 86750)**

### **5.1 Inspection Scope**

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- Whether the licensee provided detailed instructions and operating procedures for transfer, packaging, and transport of low-level radioactive waste;
- Whether the material was properly classified, described, packaged, marked, and labeled for transportation;
- Training and qualification of select employees responsible for the processing, testing, storage, and shipping of radioactive materials; and
- Whether shipments made by the licensee were in compliance with NRC and DOT regulations.

### **5.2 Observations and Findings**

The inspectors directly observed the licensee load waste and debris into rail cars from Unit 1 and Unit 2 containment buildings. The inspectors found that the licensee's procedures and instructions appropriately classified, packaged, and labeled radioactive materials for shipping in accordance with DOT and NRC requirements. Additionally the inspectors found that personnel involved in the processing, storage, and shipping of waste were adequately trained and met the DOT training requirements. The licensee periodically performed audits and appropriately assigned corrective actions for any deficiencies identified. The inspectors performed an in-depth review of the licensee's corrective actions resulting from violations issued by the State of Utah, which has jurisdiction over the low-level waste site used by the licensee.

No findings were identified.

### **5.3 Conclusions**

Radioactive materials planned for shipment were classified, characterized, and packaged appropriately, in accordance with NRC and DOT regulations, to meet low-level waste burial site criteria.

## **6.0 Exit Meeting**

The inspectors presented the results of the inspection to Mr. B. Hinkley and other members of the plant staff at a telephone exit meeting on January 16, 2018. The licensee acknowledged the results presented and did not identify any of the information discussed as proprietary.

ATTACHMENT: SUPPLEMENTAL INFORMATION

## **SUPPLEMENTAL INFORMATION**

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

G. Van Noordennen, Vice President of Regulatory Affairs  
J. Houff, Decommissioning Plant Manager  
D. Wojtkowiak, Characterization/License Termination Manager  
C. Keene, Vice President of D&D and Radiation Protection  
B. Becker, Manager, Waste, Operations

### **INSPECTION PROCEDURES (IPs) USED**

IP 71801	Decommissioning Performance and Status Reviews at Permanently Shutdown Plants
IP 83750	Occupational Radiation Exposure
IP 83801	Inspection of Remedial and Final Surveys at Permanently Shutdown Reactors
IP 84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring
IP 86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials

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

<u>Opened</u>	<u>Type</u>	<u>Summary</u>
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None

<u>Closed</u>	<u>Type</u>	<u>Summary</u>
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None

### **PARTIAL LIST OF DOCUMENTS REVIEWED**

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

- CR-2017-0115; Momentary Power Loss at ISFI; June 24, 2017
- CR-2017-0116; Notification from Clive on Lead Blankets Mixed in with Rebar Debris from Zion; June 24, 2017
- CR-2017-0140; OSHA Request for Information; July 18, 2017
- CR-2017-0141; Fall Protection Safety Monitor; July 18, 2017
- CR-2017-0142; Rail Car Cover Lifter; July 18, 2017
- CR-2017-0143; ED Dose Rate Alarm; July 18, 2017
- CR-2017-0144; Excessive Water in AB Basement During Open Air Demolition; July 20, 2017
- CR-2017-0169; Site 10CFR61 Analysis; August 16, 2017

- CR-2017-0170; Contamination Control Practices; August 16, 2017
- CR-2017-0171; Communication Issues Between Workgroups; August 16, 2017
- IR 2017-0082; Contamination Identified on Outside of RAM Package at Clive; June 29, 2017
- Zion Corrective Action for Lead Blankets and Lithium Battery delivered to Clive with Building Debris; July 18, 2017
- Zion Radioactive Materials Shipment Index; July 25, 2017
- Zion Auxiliary Building Segmentation Memo; January 6, 2018
- Zion Survey Map for Final Status Survey; December 12, 2017
- Zion Final Status Survey Plan for Containment One and Containment Two for 560' level
- Zion Unit One Core Sump Discharge Pipe Final Status Survey Data
- Zion Unit Two Core Sump Discharge Pipe Final Status Survey Data
- Quality Audit Report No. A-15-001; Decommissioning Programs
- QA Surveillance Report S-16-003; Radioactive Waste Packaging Program Transition and Oversight
- QA Surveillance Report S-17-006; Training for Radwaste Packaging and Shipping Personnel
- QA Surveillance Report S-16-004; New Liquid Radwaste Mod Readiness Review
- ZS-GN-HMH-CLAS-001; DOT Hazmat Subpart H Training and Records; August 2, 2017
- TQ-JA-011; DOT Hazmat Transportation Subpart H Training; Revision 0
- ZS-WM-119; Container and Vehicle Receipt and Inspection; Revision 10
- ZS-WM-108; Waste Sampling; Revision 1
- ZS-WM-110; Packaging of Radioactive Materials and Waste Shipments; Revision 5
- WM-JA-101; Radioactive Waste Shipments to EnergySolutions' Clive Utah Disposal Facility Containerized Waste Facility; Revision 0
- WM-JA-102; Exclusive Use and Emergency Response Information; Revision 0
- RWP 2017-1-0002; Revision 0
- ALARA Review 2017-1-0002; January 1, 2017
- Survey 2017-2424; PZR Relief Tank; August 2, 2017
- 2017 Uniform Low-Level Radioactive Waste Manifest Shipping Papers
- Job Aid No. WM-JA-115; Radioactive Material Shipped to EnergySolutions Clive Utah Disposal Facility Bulk Waste Facility (BWF); Revision 2
- Job Hazard Assessment; Inspection of Shipping Containers; August 2, 2017
- Job Hazard Assessment; Industrial Yard Rail Ops; August 2, 2017
- Job Hazard Assessment; Use of Lifting Beam with Remote Hooks for Removing Rail Car Lids; August 2, 2017
- Job Hazard Assessment; Loading Waste in Industrial Area; August 2, 2017

## **LIST OF ACRONYMS USED**

ADAMS	Agencywide Documents Access and Management System
ALARA	As Low As Is Reasonably Achievable
CFR	Code of Federal Regulations
CR	Condition Report
DNMS	Division of Nuclear Materials Safety
DOT	U. S. Department of Transportation
FSS	Final Status Survey
LTP	License Termination Plan
NMSS	Nuclear Material Safety and Safeguards
NRC	U. S. Nuclear Regulatory Commission
RP	Radiation Protection
RWP	Radiation Work Permit