



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION III
2443 WARRENVILLE RD. SUITE 210
LISLE, IL 60532-4352

November 4, 2015

Mr. John Sauger
General Manager
Zion Restoration Project
ZionSolutions, LLC
101 Shiloh Boulevard
Zion, IL 60099

SUBJECT: NRC INSPECTION REPORT NO. 05000295/2015009(DNMS);
05000304/20150009(DNMS) – ZION NUCLEAR POWER STATION

Dear Mr. Sauger:

On September 30, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed onsite inspection activities for July 1, 2015, through September 30, 2015, at the permanently shut down Zion Nuclear Power Station (ZNPS) in Zion, Illinois. The purpose of the inspection was to determine whether decommissioning activities were conducted safely and in accordance with NRC requirements. The enclosed report presents the results of this inspection, which were discussed with Mr. Gerard P. Van Noordennen on October 6, 2015.

During the inspection period, the NRC inspectors reviewed the following aspects of onsite activities: self-assessments, audits, and corrective actions; decommissioning performance and status review; decommissioning emergency preparedness scenario review and exercise evaluation; occupational radiation safety exposure; and transportation of radioactive materials. The inspection consisted of an examination of activities at the site as they relate to safety and compliance with the Commission's rules and regulations. Areas examined during the inspection are identified in the enclosed report. 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.

J. Sauger

-2-

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Sincerely,

/RA/

Robert J. Orlikowski, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Docket No: 050-00295; 050-00304
License No: DPR-39; DPR-48

Enclosure:
IR 05000295/2015009(DNMS);
05000304/20150009(DNMS)

cc w/encl: *ZionSolutions*, Service List

J. Sauger

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U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Docket No: 050-00295; 050-00304

License No: DPR-39; DPR-48

Report No: 05000295/2015009(DNMS)
05000304/2015009(DNMS)

Licensee: *ZionSolutions*, LLC

Facility: Zion Nuclear Power Station

Location: Zion, Illinois

Dates: July 1, 2015, through September 30, 2015

Inspectors: Bill C. Lin, Health Physicist
Peter Lee, Ph.D, Ch.P, Health Physicist
Rhex A. Edwards, Senior Health Physicist

Approved by: Robert J. Orlikowski, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

Zion Nuclear Power Station, Unit 1 and 2 NRC Inspection Report 05000295/2015009 (DNMS); 05000304/2015009 (DNMS)

The Zion Nuclear Power Station (ZNPS) is a permanently shut-down and defueled power reactor facility that was maintained in a safe storage (SAFSTOR) condition with spent fuel in wet storage from 1998 through 2010. Active decommissioning began in 2011, and continued throughout this quarterly inspection period. The spent fuel transfer campaign commenced in late 2013, and was successfully completed in January 2015. This routine safety inspection reviewed the decommissioning activities related to the Unit 1 and Unit 2 steam generator segmentation; Unit 1 reactor coolant pump cleanup; and reviewed the licensee's activities regarding the spent fuel rack segmentations. The inspectors also reviewed the licensee's ability to identify and correct problems, and the execution and evaluation process of an emergency exercise.

Self-Assessment, Auditing, and Corrective Action

- Issues were identified by the licensee at appropriate thresholds and entered into the corrective action program (CAP). Issues were screened and prioritized commensurate with safety significance. Licensee evaluations determined the significance of issues and included appropriate remedial corrective actions. (Section 1.0)

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 conduct of safe decommissioning. (Section 2.0)

Decommissioning Emergency Preparedness Scenario Review and Exercise Evaluation

- The inspectors determined that the licensee's exercise scenario provided sufficient opportunities to demonstrate the capability to protect public health and safety. Additionally, the licensee demonstrated adequate performance to identify weaknesses during the conduct of a critique following an emergency exercise. Identified weaknesses were entered into the CAP as appropriate. (Section 3.0)

Occupational Radiation Exposure

- Radiation Work Permits (RWP) and As Low As is Reasonably Achievable (ALARA) controls provided contamination controls and dose reduction measures appropriate for the work activities. Workers adhered to the radiological controls provided in the RWPs and ALARA plans and followed the Radiation Protection (RP) staff instruction.
- Decommissioning activities were executed in general alignment with planning documents and as provided in RWPs and ALARA reviews. Radiation surveys were performed adequately to identify the hazards present. Command and control of radiologically significant activities was executed in a manner that was safe and achieved the desired result. (Section 4.0)

Solid Radioactive Waste Management and Transportation of Radioactive Materials

- Radioactive materials planned for shipments were in the process of being classified and characterized. At the time of this report, Zion was in the process of determining the appropriate waste characterization for the spent fuel pool storage racks. (Section 5.0)

Report Details

Summary of Plant Activities

During the inspection period, the licensee continued numerous decommissioning activities. Specifically, the licensee continued the Unit 1 and Unit 2 steam generator segmentation; Unit 1 reactor coolant pump clean up; and spent fuel pool rack segmentation and characterization. The licensee also completed an emergency exercise involving contaminated injured workers.

1.0 Self-Assessments, Audits, and Corrective Actions (IP 40801)

1.1 Inspection Scope

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

- Administrative procedures prescribed actions for the identification, evaluation and resolution of problems;
- License procedures prescribed thresholds for the performance of self-assessments, audits, and surveillances;
- License management reviewed self-assessments, audits, and corrective actions to remain knowledgeable of plant performance;
- Self-assessments were conducted with technically qualified personnel and sufficient independence from the licensee;
- Issues or problems were identified and corrected in accordance with the licensee's CAP through a sampling of select issues;
- Quality assurance personnel audited changes in the status of decommissioning and licensee organization; and
- Licensee management observed maintenance and surveillance activities, operations evolutions and training.

The inspectors reviewed CAP documents on a daily basis to determine: if a sufficiently low threshold for problem identification existed; the quality of follow-up evaluations including extent-of-condition; if the licensee assigned timely and appropriate prioritization for issue resolution commensurate with the significance of the issue. Issues that were repetitive and those with the potential for safety or regulatory consequence were evaluated further to assess apparent and/or common cause and significance. The inspectors also observed a sample of licensee corrective action review meetings to ascertain if the CAP procedures were implemented appropriately.

1.2 Observations and Findings

The inspectors determined that issues were identified by the licensee at an appropriate threshold within various functional areas of the site and entered into the CAP. Issues were effectively screened, prioritized and evaluated commensurate with safety significance. The scope and depth of evaluations were adequate in that the evaluations reviewed addressed the significance of issues and assigned an appropriate course of remedial action.

The inspectors verified that self-assessments conducted during the inspection period were performed with technically qualified personnel; and when appropriate, utilized personnel independent of the licensee. Finally, the inspectors verified that quality assurance personnel continued to audit changes implemented at the plant.

No findings were identified.

1.3 Conclusions

Issues were identified by the licensee at appropriate thresholds and entered into the CAP. Issues were screened and prioritized commensurate with safety significance. Licensee evaluations determined the significance of issues and included appropriate remedial corrective actions.

2.0 Decommissioning Performance and status reviews (IP 71801)

2.1 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:

- Status of decommissioning through the observation of licensee meetings that planned, reviewed, assessed and scheduled the conduct of facility decommissioning;
- Whether licensee activities were in accordance with license conditions and docketed commitments, as well as, within the bounds of the docketed post shutdown activity report;
- Verified pre-job briefs were conducted for facility operations including maintenance, surveillance, operations, and decommissioning activities;
- Performed plant tours to assess field conditions and decommissioning activities;
- Observed in progress field work to verify activities were conducted in accordance with approved work instructions and workers were knowledgeable of tasks.

2.2 Observations and Findings

a. Unit 1 and Unit 2 Steam Generator Segmentations

The inspectors determined through plant tours and observations that the licensee had the proper PPE and dosimetry and they implemented the applicable ALARA practices. The inspectors also observed that licensee's Radiation Protection personnel performed the proper radiation and contamination surveys after each piece of the steam generators were segmented.

b. Unit 1 Reactor Coolant Pump Cleanup

The inspectors determined through plant tours and observations that the licensee was performing the Unit 1 reactor coolant pump cleanup in accordance with the approved licensee procedures and regulatory requirements. The licensee had the proper personal protection equipment and dosimetry.

c. Fuel Rack Segmentation

The inspectors determined through plant tours and observations that the licensee was performing the Spent Fuel Pool rack segmentation in accordance with the approved licensee procedures and regulatory requirements. The licensee had the proper personal protection equipment and dosimetry. Radiation protection personnel performed the appropriate radiation and contamination surveys during the fuel rack segmentation process.

No findings were identified.

2.3 Conclusions

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

3.0 Decommissioning Emergency Preparedness Scenario Review and Exercise Evaluation (IP 82401)

3.1 Inspection Scope

The inspectors conducted document reviews, performed interviews, and observed an emergency exercise to assess:

- Whether the exercise scenario provided sufficient opportunities to demonstrate the licensee's capability to perform key skills in principle functional areas to protect public health and safety; and
- The adequacy of the licensee's conduct of an exercise and ability to assess performance via a formal critique to identify and correct weaknesses.

3.2 Observations and Findings

The inspectors reviewed and determined that the exercise scenario provided sufficient opportunities to demonstrate key skills in principle functional areas to protect public health and safety. Additionally, through direct observation of the emergency response organization during an emergency exercise, the inspectors confirmed the scenario provided sufficient opportunities to demonstrate the licensee's capability. Following the exercise, the inspectors observed portions of the licensee's critique and concluded that the licensee adequately assessed performance and entered identified weaknesses into the CAP as appropriate.

No findings of significance were identified.

3.3 Conclusions

The inspectors determined that the licensee's exercise scenario provided sufficient opportunities to demonstrate the capability to protect public health and safety. Additionally, the licensee demonstrated adequate performance to identify weaknesses during the conduct of a critique following an emergency exercise. Identified weaknesses were entered into the CAP as appropriate.

4.0 **Occupational Radiation Safety (IP 83750)**

4.1 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:

- Planning and preparation for radiation work were adequate and if licensee management supported radiation protection planning;
- Personal dosimetry for external exposure met requirements;
- Management and administrative controls of external radiation exposure met requirements and were designed to make exposures ALARA;
- 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;
- Control of radioactive materials and contamination met requirements;
- Did effectively implement the ALARA program;
- ALARA related training was adequate and provided to appropriate personnel;
- Initiatives to implement operational methods and practices maintained doses ALARA;

- Issues, events, or problems were identified, resolved, and prevented future problems in the area of radiological controls.

4.2 Observations and Findings

The inspectors reviewed the radiological work permits (RWP), ALARA Review, the external exposure records and air sampling results of the spent fuel rack segmentation evolution. The personnel external exposures were below the Title 10 of the *Code of Federal Regulations* (CFR) Part 20 limits. Enclosures with HEPA exhaust system were set up in work area to minimize internal exposure. Based on the review of air sampling results, the inspector concluded that the workers received no detectable internal exposures.

No findings were identified.

4.3 Conclusions

RWP and ALARA reviews provided contamination controls and dose reduction measures appropriate for the work activities. Workers adhered to the radiological controls provided in the RWPs and ALARA plans and followed the RP staff instruction.

Decommissioning activities were executed in general alignment with planning documents and as provided in RWPs and ALARA reviews. Radiation surveys were performed adequately to identify the hazards present. Command and control of radiologically significant activities was executed in a manner that was safe and achieved the desired result.

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

5.1 Inspection Scope

The inspectors conducted document reviews, performed interviews, and observed the licensee's classification and characterization of a planned waste shipment to determine:

- Whether the material was properly classified, described, packaged, marked, and labeled for transportation;
- Whether shipments made by the licensee were in compliance with NRC and Department of Transportation regulations.

5.2 Observations and Findings

The inspectors discussed the Title 10 CFR Part 61 analysis with the licensee to determine whether the spent fuel racks were appropriately characterized. The licensee originally proposed to use the Part 61 analyses from the spent resin for the waste characterization and assumed that scaling factor of radionuclides from the primary coolant would be the same as the spent fuel rack. The contamination on the surface of

the spent fuel rack was contaminated primary coolant that was brought into the spent fuel pool by the spent fuel rods. However, due to the neutron activation of the spent fuel rack, the fixed contamination also occurred inside the spent fuel rack. Due to this fact, the ratio of activation to fission products from spent fuel rack may be significantly different from the primary coolant. Therefore, the Part 61 analysis from spent resin could not be used for the waste characterization of the spent fuel rack.

5.3 Conclusions

The licensee agreed to perform an activation study of the spent fuel rack to accurately determine the scaling factor for the waste characterization. The activation study was ongoing and the inspectors will follow-up with the licensee once the study is completed during the fourth quarter inspection of the facility.

6.0 **Exit Meeting**

The inspectors presented the results of the inspection to Mr. Gerard P. Van Noordennen at a teleconference meeting on October 6, 2015. 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. Ashley, Zion Licensing Engineer
T. Orawiec, Plant Manager
C. Keene RP Director

INSPECTION PROCEDURES (IPs) USED

IP 40801 Self-Assessment, Auditing and Corrective Action at Permanently Shutdown Reactors
IP 71801 Decommissioning Performance and Status Reviews at Permanently Shutdown Plants
IP 82401 Decommissioning Emergency Preparedness Scenario Review and Exercise Evaluation
IP 83750 Occupational Radiation Exposure
IP 86750 Solid Radioactive Waste Management and Transportation of Radioactive Materials

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

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.

- Zion Work Order 01812822-01
- Radiological Survey Number 2015-2344, dated May 27, 2015
- ALARA Review 2015-0-0033, Revision 2, dated June 16, 2015
- Radiological Work Permit 2015-0-0033
- Zion Condition Report 2015-000500
- Zion Station Post Medical and DSEP Drill Evaluation
- Zion Station Defueled Station Emergency Plan, Rev 17

- Zion Station 2015 HP Drill Outlined
- Zion Station 2015 Medical Drill outline
- Zion Station Defueled Station Emergency Plan, Emergency Action Level Basis Document, Rev 0
- Zion Station Emergency Preparedness Administration, Dated: June 29, 2015
- Zion Station Emergency Preparedness Implementation, Dated: June 29, 2015