



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, ILLINOIS 60532-4352

November 2, 2023

John Sauger
President and Chief Nuclear Officer
Zion Restoration Project
ZionSolutions, LLC
121 West Trade Street, Suite 2700
Charlotte, NC 28202

**SUBJECT: NRC INSPECTION REPORT NO. 05000295/2023001(DRSS);
05000304/2023001(DRSS)-ZION NUCLEAR POWER STATION**

Dear John Sauger:

On October 05, 2023, the U.S. Nuclear Regulatory Commission (NRC) completed onsite inspection activities for January 2, 2023, through October 5, 2023, 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 Justin Wheat and other members of your staff on October 5, 2023.

During the inspection period, the NRC inspectors reviewed the following aspects of onsite activities: safety reviews, design changes and modifications; problem identification and resolution; fire protection; decommissioning performance; occupational radiation exposure; radiological surveys; inspection of remedial and final surveys; radioactive waste treatment, and effluent and environmental monitoring; and solid radioactive waste management 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, reviewing work activities, and interviews with personnel.

Based on the results of this inspection, the NRC did not identify any violations.

J. Sauger

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Sincerely,

David E. Hills

Signed by Hills, David
on 11/02/23

David E. Hills, Chief
Decommissioning, Reactor, and ISFSI HP Branch
Division of Radiological Safety and Security

Docket Nos: 50-295; 50-304
License Nos: DPR-39; DPR-48

Enclosure:
As stated
IR Nos. 05000295/2023001 (DRSS); 05000304/2023001 (DRSS)

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Letter to J. Sauger from D. Hills dated November 2, 2023.

SUBJECT: NRC INSPECTION REPORT NO. 05000295/2023001(DRSS);
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U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Docket No: 50-295; 50-304

License No: DPR-39; DPR-48

Report No: 05000295/2023001(DRSS) and 05000304/2023001(DRSS)

Enterprise Identifier: I-2023-001-0092

Licensee: ZionSolutions LLC

Facility: Zion Nuclear Power Station Units 1 and Unit 2

Location: Zion, Illinois

Dates: January 02, 2023, to October 05, 2023

Inspectors: Bill Lin, Health Physicist

Approved by: David E. Hills, Chief
Decommissioning, Reactor, and ISFSI HP Branch
Division of Radiological Safety and Security

Enclosure

EXECUTIVE SUMMARY

Zion Nuclear Power Station, Units 1 and 2 NRC Inspection Report Nos. 05000295/2023001(DRSS); 05000304/2023001(DRSS)

The ZNPS 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. The active decommission activities have completed and the licensee continued performing additional final status surveys, discrete radioactive particles (DRPs) surveys, and visual surveillance of the ZNPS. This periodic safety inspection reviewed licensed activities associated with safety reviews, design changes and modifications; problem identification and resolution; fire protection; decommissioning performance; occupational radiation exposure; inspection of remedial and final surveys; radioactive waste treatment, effluent, and environmental monitoring; and waste management and transportation.

Safety Reviews, Design Changes, and Modifications

- The licensee had completed all active decommission and had no 10 CFR 50.59 evaluations. There were no safety Reviews, Design Changes, and Modification for the inspection period.

Problem Identification and Resolution

- 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.

Fire Protection Program

- An effective decommissioning Fire Protection Program was maintained and implemented that reasonably prevented fires; provided the capability to rapidly detect, control, and extinguish fires that could result in radiological hazards; and ensured the risk of fire-induced hazards to the public, environment, and plant personnel were minimized.

Decommissioning Performance and Status Review

- The licensee had completed all active decommission activities. The inspector had reviewed records and determined that all decommissioning staffing, qualifications, and training were appropriate to the requirements and current decommissioning status.

Occupational Radiation Exposure

- Adequate protection of worker health and safety from exposure to radiation and radioactive material was provided. Radiation surveys were performed adequately to identify the hazards present.

Inspection of Remedial and Final Surveys

- The licensee performed final status surveys and DRPs surveys in accordance with the appropriate procedures. The inspectors also observed that the licensee had implemented the appropriate isolation and controls.

Radioactive Waste Treatment, and Effluent and Environmental Monitoring

- There were no radioactive waste and effluent monitoring that were applicable around the ZNPS reactor footprint. All active decommissioning works were completed.

Solid Radioactive Waste Management and Transportation of Radioactive Materials

- The licensee effectively handled, stored, and transported radioactive material.

Report Details

Summary of Plant Activities

The active decommission activities have completed and the licensee continued performing additional final status surveys, discrete particle surveys, and visual surveillance of the ZNPS.

1.0 Safety Reviews, Design Changes, and Modifications at Permanently Shutdown Reactors (IP 37801)

1.1 Inspection Scope

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

- Whether the licensee's safety review process and procedures identified potential changes to Technical Specification (TS) resulting from proposed changes, tests, experiments, or modifications;
- Whether the licensee's safety review process committee was appropriately staffed and trained in accordance with requirements;
- Whether the licensee's training program effectively trained and assessed qualified personnel for performing safety evaluations;
- Changes to design basis documentation were updated consistent with design changes;
- Design changes or modifications were effectively evaluated to maintain safety (list the 3-5 design changes reviewed, and the 1-3 50.59 evaluations reviewed (if available));
- Maintenance and/or work activities appropriately considered whether the activity resulted in a change or modification and were assessed in accordance with 10 CFR 50.59 (list work activities reviewed); and
- The effectiveness of the safety review committee meetings.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

1.2 Observations and Findings

There were no safety reviews, design changes, and modifications activities at ZNPS during this inspection period. The licensee had completed all active decommissioning and were only performing discrete radioactive particle surveys.

No findings were identified.

1.3 Conclusions

Due to the completion of all active decommissioning activities at ZNPS, there were no applicable safety reviews, design changes, and modification activities taken place.

2.0 Problem Identification and Resolution at Permanently Shutdown Reactors (IP 40801)

2.1 Inspection Scope

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

- Effectiveness at preventing, detecting, and correcting issues;
- Identifying and evaluating potential 10 CFR Part 21, "Reporting of Defects and Non-Compliance Issues;"
- Audits and assessments evaluating the Corrective Action Program and Quality Assurance Program; and
- The licensee's safety culture.

2.2 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 also verified that there were no 10 CFR Part 21 issues.

The inspectors reviewed one CAP entry for follow-up. For example, the inspectors followed up on Condition Report (CR) 2023-0049. CR 2023-0049 documented the licensee's process for notifying the NRC when a small aerial drone flew over ZNPS controlled area. The inspectors reviewed the licensee's actions and after discussing with the licensee, the inspectors determined that the licensee had performed the appropriate follow-up actions. Due to the status of ZNPS, the majority of CRs generated during this inspection period were CRs regarding the independent spent fuel storage installation (ISFSI). 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 audited organization.

No findings were identified.

2.3 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.

3.0 Fire Protection Program at Permanently Shutdown Reactors (IP 64704)

3.1 Inspection Scope

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

- Fire protection program met Technical Specifications, Post Shutdown Activities Report (PSDAR), and fire hazard analyses requirements;
- Changes to the Fire Protection Program did not reduce the effectiveness of the program;
- Assessments were being performed in accordance with 10 CFR 50.48(f)(2);
- Fire protection detection and suppression systems were effectively maintained, surveillances were performed, and systems were capable of performing their intended function;
- Fire barriers were effectively maintained;
- Firefighting equipment was properly inventoried, inspected, tested, and maintained;
- Administrative controls were in place to minimize the occurrence of a fire; and
- Staffing and training requirements were consistent with the Fire Protection Program and Emergency Plan.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

3.2 Observations and Findings

The inspectors toured the ISFSI warehouse, where all the licensee's flammable materials were kept. The inspector observed that all flammable lockers stored the appropriate materials. There were no combustible materials next to the flammable lockers. The inspectors also observed that all flammable lockers were in good working condition and only appropriately trained personnel had access to these lockers. The inspectors also inspected the licensee's existing fire extinguishers. All fire extinguishers were in working conditions and the licensee had performed the appropriate maintenance and inspections of all firefighting equipment.

No findings were identified.

3.3 Conclusions

An effective decommissioning Fire Protection Program was maintained and implemented that reasonably prevented fires; provided the capability to rapidly detect, control, and extinguish fires that could result in radiological hazards; and ensured the risk of fire-induced hazards to the public, environment, and plant personnel were minimized.

4.0 Decommissioning Performance and Status Review (IP 71801)

4.1 Inspection Scope

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

- Site characterization was consistent with the strategy outlined in the PSDAR or License Termination Plan (LTP)
- Records important to decommissioning were kept consistent with 10 CFR 50.75(g)
- Commitments and requirements in the TSs, PSDAR, LTP, offsite dose calculation manual (ODCM), or Emergency Plan were effective and being met;
- Appropriate administrative and/or engineering controls were identified and implemented in work plans; and
- Organization and staffing were appropriately adjusted for changes in the status of decommissioning.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

4.2 Observations and Findings

All decommissioning activities were completed on site. The licensee was only performing discrete radioactive particles and final status surveys onsite. The licensee had appropriately trained staff on-site to perform the necessary work and all 10 Code of Federal Regulations 50.75(g) records were stored appropriately. The licensee was also maintaining the appropriate isolation and controls that had been final status survey.

No findings were identified.

4.3 Conclusions

The inspectors determined that decommissioning activities were in accordance with the regulations and license requirements. Decommissioning staffing, qualifications, and training were appropriate to the requirements and current decommissioning status. The material condition of structures, systems and components supported the safe storage of spent fuel and conduct of safe decommissioning.

5.0 Occupational Radiation Exposure at Permanently Shutdown Reactors (IP 83750)

5.1 Inspection Scope

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

- Changes made to organization, personnel, facilities, instrumentation, equipment, and programs that impact occupational radiation protection;
- Training and qualifications of members of the radiation protection organization;
- Radiological hazards and worker protection in work activities

- Radiological controls, postings, and material conditions inside the radiological control area; and
- The characterization of the radiation type and energies were appropriate to the surveys and work practices.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

5.2 Observations and Findings

During the inspection period, the licensee had no changes to the site's radiation protection (RP) personnel. The licensee had appropriately trained RP personnel and everything was documented in accordance with the approved procedures. The inspectors reviewed the licensee's radiation and contamination surveys, and source inventory. The inspectors verified that the licensee's radiation instruments were appropriately calibrated, and source checked and confirmed that for each type of survey the licensee performed, they used the appropriate survey instrument to perform these surveys and verified that the licensee was updating its source term that is currently onsite due to source decay.

No findings were identified.

5.3 Conclusions

Adequate protection of worker health and safety from exposure to radiation and radioactive material was provided. 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.

6.0 Inspection of Remedial and Final Surveys (IP 83801)

6.1 Inspection Scope

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

- Whether radiological instruments used in support of FSS were calibrated to detect the radionuclides of concern (ROC), appropriate for the ROC action levels and Derived Concentration Guideline Levels, and sufficient to detect Minimum Detectable Concentrations (MDCs), action level concentrations, and scan MDCs;
- Reviewed changes, as applicable, made to the LTP that did not require prior NRC approval; and
- Whether the licensee performed FSSs consistent with LTP, was performed by qualified individuals, and was conducted in accordance with the survey plan under required quality controls.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

6.2 Observations and Findings

The NRC inspectors were on-site in the months June, July, and August of 2023 to perform an in-depth confirmatory survey of the ZNPS decommission areas. The purpose of the confirmatory survey was to verify that the FSS survey results that the licensee submitted to the NRC were performed with the appropriate survey plan and under required quality controls. The result of the confirmatory surveys performed by the NRC will be documented in the final Safety Evaluation Report and will be made publicly available through the associated Federal Register Notice. After the NRC confirmatory surveys, the inspectors performed additional walkdown of the ZNPS powerblock footprint. The inspectors also observed the licensee perform additional DRPs and FSS surveys and determined that the licensee performed the surveys with qualified individuals and in accordance with the survey plan under required quality controls.

No findings were identified.

6.3 Conclusion

The inspectors determined that the licensee performed the DRPs and FSS survey with qualified individuals and in accordance with the survey plan under the required quality controls.

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

7.1 Inspection Scope

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

- Changes made to the Offsite Dose Calculations Manual (ODCM) or liquid, gaseous, and solid radwaste system design and operation were within the licensing basis and regulations;
- Effluent monitoring ventilation and discharge system configurations, flow paths, and operations were consistent with the licensing basis and procedures;
- Effluent monitors were calibrated;
- Radioactive liquid and gaseous waste discharge permits projected doses to members of the public that were based on representative samples in the discharge pathway and were within 10 CFR Part 50, Appendix I, and Technical Specification limits. Specifically, the following discharge permits were reviewed (list the 1 to 3 discharges and dates reviewed consistent with the IP);
- The annual effluent release report was submitted as required, and any anomalous results, unexpected trends, or abnormal releases were identified and entered into the Corrective Action Program;
- Environmental monitoring equipment was properly located, calibrated and maintained, and environmental samples were adequately collected;
- Whether the Groundwater Protection Initiative program was implemented as intended;
- Whether potential leakage or spills were appropriately added to records as required by 10 CFR 50.75(g);

- The licensee's annual radiological environmental monitoring report was submitted as required, and any anomalous results, unexpected trends, or abnormal environmental impacts were identified and entered into the Corrective Action Program; and
- Meteorological instruments were operable, calibrated, and maintained in accordance with the Final Safety Analysis Report.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

7.2 Observations and Findings

The licensee effluent and environmental and groundwater monitoring no longer exists. The site has currently completed active decommissioning and no longer have any radioactive liquid and gaseous waste discharges. There were no 10 CFR 50.59 evaluations. The licensee had completed all necessary environmental and ODCM submittals to the NRC.

No findings were identified.

7.3 Conclusions

The licensee submitted the ODCM reports in according to NRC regulatory requirements. Changes to the effluent and environmental monitoring program were consistent with regulatory requirements.

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

8.1 Inspection Scope

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

- Radioactive waste storage areas were appropriately controlled, labelled, posted and secured against unauthorized removal;
- Containers of radioactive material were inventoried, and their material condition was monitored;
- Sealed sources are accounted for and were appropriately leak tested;
- Shippers of radioactive material were adequately trained and met TS, 10 CFR 71.5 and Department of Transportation (DOT) 49 CFR Part 172, Subpart H, requirements;
- Changes in organization, personnel, facilities, equipment, programs, and procedures affecting waste management and transportation of radioactive materials;
- Shipments of radioactive material were appropriately surveyed as well as marked, labeled, and placarded consistent with the shipping documentation; and
- Shipments were appropriately characterized, classified, and prepared in accordance with procedures.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

8.2 Observations and Findings

During a walkdown of the facility, the inspectors verified radioactive waste was appropriately controlled, labeled, posted, and secured against unauthorized removal. Since all the active decommissioning activities were completed, there are no waste and temporary waste processing systems. The inspectors also reviewed the licensee's sealed source inventories and the appropriate leak tests. The licensee performed the inventory and leak test in accordance with the approved procedures. Currently, the licensee performed two radioactive waste shipments. The NRC inspectors did review the licensee's shipping paperwork and the licensee's hazmat training records. The training for licensee personnel were current with their DOT training.

No findings were identified.

8.3 Conclusions

The licensee effectively processed, handled, stored, and transported radioactive material.

9.0 **Exit Meeting**

The inspectors presented the results of the inspection to Justin Wheat and other members of the ZNPS staff at an exit meeting on October 05, 2023. 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

J. Wheat, Regulatory Affairs Director
R. Yetter III, LT/FSS Project Manager
A. Hazelhoff, SVP of Regulatory Affairs

INSPECTION PROCEDURES (IPs) USED

IP 37801 Safety Reviews, Design Changes, and Modifications at Permanently Shutdown Reactors
IP 40801 Problem Identification and Resolution at Permanently Shutdown Reactors
IP 64704 Fire Protection Program at Permanently Shutdown Reactors
IP 71801 Decommissioning Performance and Status Reviews at Permanently Shutdown Plants
IP 83750 Occupational Radiation Exposure
IP 83801 Inspection of Remedial and Final Surveys
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.

- Zion Offsite Dose Calculation Manual; Rev 12; January 30, 2020
- ZS-LT-300-001-003; Rev 7; Special Surveillance Surveys; October 03, 2022
- ZS-LT-300-001-003; Rev 7; Special Surveillance Surveys; March 15, 2022
- Zion Personnel Hazmat training records
- Zion Survey Instrument Inventory
- Zion Source Decay Chart

- ZS-2023-018; Confirmatory Survey Extend of Condition Review for the ZNPS; September 8, 2023
- Response to Summary of May 4, 2023, Clarification Meeting Regarding the Partial Site Release Request for the Zion Nuclear Power Station, Units 1 and 2; August 25, 2023
- ES-ZION-CR-2023-0049; Drone Spotted in Zion property; July 19, 2023
- Zion Dose Evaluation; July 10, 2023
- Zion email dated; July 5, 2023

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access and Management System
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CR	Condition Report
DOT	Department of Transportation
DRPs	Discrete Radioactive Particles
DRSS	Division of Radiological Safety and Security
FSS	Final Status Survey
IP	Inspection Procedure
IR	Inspection Report
ISFSI	Independent Spent Fuel Storage Installation
LTP	License Termination Plan
MDCs	Minimum Detectable Concentrations
NRC	U.S. Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
ROC	Radionuclides of Concern
PSDAR	Post Shutdown Activities Report
RP	Radiation Protection
TS	Technical Specifications
ZNPS	Zion Nuclear Power Station