



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

February 16, 2016

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

SUBJECT: NRC INSPECTION REPORT NO. 05000295/2015010(DNMS);
05000304/2015010(DNMS); AND 07201037/2015002(DNMS) – ZION NUCLEAR
POWER STATION

Dear Mr. Sauger:

On December 31, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed onsite inspection activities for October 1, 2015, through December 31, 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. Jack Rollins and other members of your staff on January 21, 2016.

During the inspection period, the NRC inspectors reviewed the following aspects of onsite activities: organization, management, and cost controls; self-assessments, audits and corrective actions; fire protection; decommissioning performance and status review; occupational radiation safety exposure; 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, observation of work activities, and interviews with personnel.

Based on the results of this inspection, the NRC identified one Severity Level IV violation of NRC requirements. However, because of the very low safety significance and because the issue was entered into your corrective action program (CAP), the NRC is treating the issue as a Non-Cited Violation (NCV), in accordance with Section 2.3.2 of the NRC's Enforcement Policy. No response is required for the NCV. However, if you contest this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region III; and the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001

J. Sauger

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In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any), will be made available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC's Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

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

Docket Nos. 050-00295; 050-00304;
072-01037
License Nos. DPR-39; DPR-48

Enclosure:
IR 05000295/2015010(DNMS);
05000304/2015010(DNMS);
07201037/2015002(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; 072-01037

License No: DPR-39; DPR-48

Report No: 05000295/2015010(DNMS)
05000304/2015010(DNMS)
07201037/2015002(DNMS)

Licensee: Zion*Solutions*, LLC

Facility: Zion Nuclear Power Station

Location: Zion, Illinois

Dates: October 1, 2015, through December 31, 2015

Inspectors: Bill C. Lin, Health Physicist
Peter J. Lee, Reactor Decommissioning Inspector, CHP, Ph.D
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, Unit 1 and 2 NRC Inspection Report 05000295/2015010(DNMS); 05000304/2015010(DNMS); AND 07201037/2015002(DNMS)

Zion Nuclear Power Station (ZNPS) is a permanently shut-down and defueled power reactor facility that was maintained in a safe storage (SAFSTOR) condition 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 licensee's ability to identify and correct problems, focusing on the overall effectiveness of the corrective action program (CAP). The inspectors also reviewed decommissioning activities related to the Unit 1 reactor vessel segmentation, Unit 1 and Unit 2 steam generator segmentation, effluent and environmental monitoring activities, fuel rack segmentation, and the licensee's technical justification for changes made in the environmental monitoring program.

Organization, Management and Cost Controls

- The licensee adequately implemented organization, management, and cost controls in accordance with regulatory requirements, license conditions, and the Technical Specifications (TSs). (Section 1.0)

Self-Assessment, Auditing, and Corrective Action

- From the samples reviewed, the implementation of the CAP at ZNPS was generally effective. The licensee had a low threshold for identifying problems and entering them into the CAP.
- Items placed in the CAP were screened and prioritized in a timely manner using established criteria and were generally evaluated commensurate with their safety significance.
- Corrective actions were implemented in a timely manner, commensurate with their safety significance.
- A basic Operating Experience (OE) program existed at the station, but was determined to have limited inputs from industry sources.
- Audits and self-assessments were performed at appropriate frequencies and at an appropriate level to identify issues. The assessments reviewed were thorough and effective in identifying site performance deficiencies, programmatic concerns, and improvement opportunities.
- From interviews conducted during the inspection, workers expressed freedom to enter safety concerns into the CAP or otherwise raise issues verbally through informal channels. The inspectors did not identify any impediments to the establishment of a safety conscious work environment (SCWE) at ZNPS. (Section 2.0)

Fire Protection Program

- The inspectors determined that the licensee maintained the fire protection program within requirements. The inspectors also verified that the licensee maintained the fire

protection equipment in sound material condition and was available for use as described in the fire plan. (Section 3.0)

Decommissioning Performance and Status Review

- The inspectors identified a Severity Level IV, non-cited violation (NCV) of TS 5.2 in NAC MAGNASTOR Certificate of Compliance (CoC) 1031, Amendment 3, Appendix A, for the failure to maintain a program for unloading fuel and components from Transportable Storage Canisters (TSCs) located in the Independent Spent Fuel Storage Installation (ISFSI). (Section 4.0)

Occupational Radiation Exposure

- Radiation Work Permits (RWPs) 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 5.0)

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 ALARA. (Section 6.0)

Solid Radioactive Waste Management and Transportation of Radioactive Materials

- Radioactive materials planned for shipment were classified and characterized appropriately in accordance with Title 10 of the *Code of Federal Regulations* (CFR) Parts 61.55 and 61.66 so as to meet low-level waste burial site criteria. (Section 7.0)

Report Details

Summary of Plant Activities

During the inspection period, the licensee continued numerous decommissioning activities. Specifically, the licensee continued, the Unit 1 reactor vessel segmentation, Unit 1 and Unit 2 steam generator segmentation, effluent and environmental monitoring activities, and fuel rack segmentation. The inspectors also reviewed the licensee's technical justification for changes made in the environmental monitoring program.

1.0 Organization, Management, and Cost Controls at Permanently Shutdown Reactors (Inspection Procedure (IP) 36801)

1.1 Inspection Scope

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

- Procedures and processes the licensee established to resolve employee and safety concerns, and to assess the licensee's effectiveness at resolving identified problems;
- Implementation of CAP procedures;
- Future licensee plans for decommissioning organization and staffing would continue to meet regulatory requirements;
- Licensee appropriately implemented Quality Assurance Program requirements and commitments;
- Licensee continued implementation of regulatory requirements that remained applicable as described in NRC Bulletins, Generic Letters, and Orders; and
- Verified that licensee programs and procedures were appropriately implemented by licensee staff. In addition, the inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

1.2 Observations and Findings

The inspectors determined through direct licensee observation; reviews of established licensee programs and procedures; corrective action documents; and interviews with licensee personnel that the appropriate regulatory requirements and commitments were followed.

No findings were identified.

1.3 Conclusions

The licensee adequately implemented organization, management, and cost controls in accordance with regulatory requirements and license conditions.

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

2.1 Effectiveness of Problem Identification

a. Inspection Scope

The inspectors interviewed over 20 individuals involved in licensed activities throughout all levels of the site organization to ascertain their views on the problem identification process associated with the ZNPS decommissioning project. The inspectors reviewed the licensee's CAP governing procedures and also attended CAP meetings to assess both the development and implementation of the program. Specifically, the inspectors determined whether licensee and contractor personnel identified issues at the proper threshold, entered issues into the CAP in a timely manner, and whether the licensee assigned timely and appropriate prioritization for issue resolution. Additionally, the inspectors reviewed condition reports (CRs) that encompassed a variety of activities and departments to determine the extent that problems were identified and entered into the CAP.

b. Observations and Findings

The inspectors determined that issues were being identified at a low threshold and typically entered into the CAP. The inspectors determined that workers were familiar with the CAP and felt comfortable raising concerns. A computer database was used in most instances for creating individual CAP documents, although handwritten inputs were also accepted as an alternate means of CR generation. Additionally, means were available for employees to submit concerns anonymously should they desire. The inspectors noted that issues identified by external organizations, such as the NRC or contractors, were likewise captured into the CAP for resolution. The inspectors noted that the licensee also used the CAP to document instances where previous corrective actions were ineffective or were inappropriately closed.

Through interviews, the inspectors determined that non-supervisory craft workers preferred to verbally raise issues through their foreman and not personally generate a CR for a variety of reasons. This was similar to what the inspectors found during the 2013 problem identification and resolution inspection. Some individuals believed the CAP process was excessive for dealing with lesser significant problems and others believed it was used as a motivational tool to achieve a desired behavior, although sometimes in a negative manner. However, the inspectors concluded that, overall, the CAP was being utilized to address problems as intended.

No findings were identified.

c. Conclusions

Issues were being identified at a reasonably low threshold throughout all levels of the licensee's onsite organization and generally were entered into the CAP system.

2.2 Effectiveness of Prioritization and Evaluation of Issues

a. Inspection Scope

The inspectors reviewed the licensee's methods and practices to screen issues, assess their actual or potential significance and to determine if an evaluation was warranted. The inspectors assessed the licensee's characterization of issues to determine whether the appropriate investigation method was used consistent with the licensee's procedures based on risk significance. The inspectors selectively reviewed CAP evaluation products completed between 2013 and 2015, which consisted of apparent cause evaluations, common cause evaluations, and issue reviews (IRs). The reviews focused on the scope and depth of the licensee's evaluations to determine whether the fundamental cause of an issue was identified to allow corrective actions to be properly targeted.

b. Observations and Findings

The inspectors concluded that the licensee was generally effective at prioritizing issues commensurate with their safety significance. The inspectors found that the majority of issues were not safety significant and were either closed to actions taken or characterized at a level appropriate for an IR evaluation. In most instances, issues were appropriately screened during daily Management Review Committee (MRC) meetings. Weekly MRC meetings were collegial, generally thorough, and maintained a focus on safety concerns. Members of the MRC discussed issues in sufficient detail and challenged conclusions and recommendations as appropriate.

Overall, the inspectors found the scope and depth of CAP evaluations were adequate in that the apparent cause and contributing cause were determined as appropriate. The licensee's evaluations determined the significance of issues, assessed regulatory compliance and reporting, and assigned effective remedial actions for most issues. However, the inspectors disagreed with several of the licensee's significance classification using the issue screening criteria provided in licensee procedure AD-8, Attachment 2, "Significance Level Guidance." Regardless of these observations, the inspectors agreed with the licensee's assessment of the cause of the issues and concluded a different significance level would not have changed the corrective actions.

Additionally, the licensee was not consistently evaluating for an extent of condition (EOC) as defined in procedure AD-8, revision 1. Specifically, AD-8 defines EOC as the "extent to which the actual conditions exist with other plant process, equipment, or human performance." However, the licensee typically performed a historical review to identify where a similar issue may have occurred in the past rather than where the issue may presently exist in other plant processes, equipment, or performance. The inspectors did not identify any actual concerns due to an inadequately performed extent of condition.

No findings were identified.

c. Conclusions

The licensee, in most instances, effectively screened and prioritized issues commensurate with their safety significance. The scope and depth of CAP evaluations were adequate in that the apparent cause and contributing cause were determined as appropriate. Evaluations generally determined the significance of the issues, assessed regulatory compliance and reporting, and assigned effective remedial actions. However, the inspectors found examples where the significance level of issues and extent of condition reviews did not match the licensee's procedural guidance. Despite these observations, no actual safety concerns were identified by the inspectors for not following the procedural guidance.

2.3 Effectiveness of Corrective Actions

a. Inspection Scope

The inspectors discussed the CAP with the respective managers and reviewed the *ZionSolutions* implementing procedures for the CAP to gain a general understanding of the program at the site and to review its effectiveness. The inspectors reviewed several open and closed condition reports and associated evaluations to determine the site's compliance with the CAP. The inspectors discussed some of these CAP products with members of the licensee's staff to assess the adequacy of the products. The inspectors also attended the daily and weekly MRC meetings to determine the effectiveness of the CAP.

b. Observations and Findings

The inspectors concluded that the licensee was generally effective in implementing corrective actions in a timely manner to address identified deficiencies commensurate with their safety significance. For individual issues, the licensee generally implemented adequate corrective actions to resolve the immediate concerns.

The inspectors met with members of the licensee to discuss corrective actions following several causal evaluations. On occasion, the inspectors concluded different apparent and contributing causes for an issue; however, the inspectors found that the licensee's corrective actions would still be adequate to address the inspector's concerns.

No findings were identified.

c. Conclusions

The licensee generally implemented effective corrective actions in a timely manner to address identified deficiencies commensurate with their safety significance.

2.4 Assessment of the Use of Operating Experience

a. Inspection Scope

The inspectors reviewed the licensee's implementation of the facility's OE program. Specifically, the inspectors interviewed the OE coordinator and reviewed implementing OE program procedures. The inspectors' review was to determine whether the licensee effectively integrated OE experience into the performance of daily activities, whether evaluations of issues were proper and conducted by qualified personnel, and whether the licensee's program was sufficient to prevent future occurrence of previous industry events. The inspectors also assessed if corrective actions, as a result of OE experience, were identified and effectively and timely implemented.

b. Observations and Findings

The inspectors concluded that the licensee's use of OE was relatively limited. Sources of OE were reduced as staffing has changed and involvement with the operating reactor industry has become more secluded. The licensee's procedure for processing OE, LS-JA-06, dated August 20, 2015, provided sources of potential information, but did not state specific industry sources of information. As such, the OE placed in the licensee's program, and reviewed by the inspectors, was limited to NRC generic communications. LS-JA-06 directed the OE coordinator to review and capture any OE that was relevant to the station. The information was then captured in an OE log and emailed to an applicable department at the station. The inspectors concluded that the use of email may not be a robust enough method to ensure relevant OE was captured and actions were taken. Additionally, the inspectors found that OE was often received through informal means by employees at the station with continued involvement in the industry. The LS-JA-06 procedure did not provide guidance to these employees to notify the OE coordinator of the information. Despite these observations, the inspectors did not identify any issues where OE could have prevented a similar occurrence at ZNPS.

No findings were identified.

c. Conclusions

The use of OE was limited at ZNPS. The licensee's sources for external OE and the tracking process for OE was limited. Despite these observations, the inspectors did not identify any issues where OE could have prevented a similar occurrence at ZNPS.

2.5 Assessment of Self-Assessments and Audits

a. Inspection Scope

The inspectors reviewed the licensee's self-assessment program and completed self-assessments and quality assurance audits to determine whether these evaluative tools were effectively managed, were of sufficient rigor to assess the subject areas, and to determine whether identified issues were captured in the CAP system and being addressed.

b. Observations and Findings

Self-assessments, audits, and other licensee assessments were typically effective at identifying issues and improvement opportunities. The inspectors concluded that audits and self-assessments were generally thorough, involved subject matter experts, or otherwise were completed by personnel knowledgeable in the subject area. Corrective actions associated with the identified issues were entered into the CAP at a low threshold and actions were assigned commensurate with their safety significance.

A recent audit was performed by the station and commented that numerous tools were being used at the station to assess performance. Tools, such as audits, surveillances, human performance reviews, focused self-assessments, management field observations, and independent assessments, were all found to be effective at the station. However, the audit recognized that a mechanism did not exist to look at the results of these assessments holistically and prioritize resources based on this information. The licensee captured this action in CR-2015-000470.

No findings were identified.

c. Conclusions

Self-assessments, audits, and other licensee assessments were typically effective at identifying issues and improvement opportunities. Corrective actions associated with the identified issues were entered into the CAP system at a low threshold and actions were assigned commensurate with their safety significance.

2.6 Assessment of Safety Conscious Work Environment

a. Inspection Scope

The inspectors reviewed the licensee's safety culture and Safety Conscious Work Environment (SCWE) surveys to assess if there were any organizational issues or trends that could impact the licensee's safety performance. The inspectors reviewed the licensee's associated CR and proposed corrective actions for licensee-identified survey issues of concerns related to SCWE.

The inspectors assessed the licensee's establishment of a SCWE through the reviews of the Employee Concerns Program (ECP) implementing procedures, discussions with the ECP manager, and interviews with managers and supervisors from various departments. In addition, the inspectors attended licensee plan-of-the-day meetings, and daily and weekly MRC meetings related to CR review and disposition.

To further assess the ZNPS site's current safety culture and SCWE, the inspectors interviewed a representative sample of station employees during the inspection.

b. Observations and Findings

On June 17, 2015, the licensee generated CR-2015-000358 to document the 2014 SCWE survey results and on July 11, 2013, CR-2013-000730 documented the 2013 SCWE survey results. In both surveys, the licensee concluded that the surveys indicated overall improvements, but there were areas needing attention. Following both surveys,

corrective actions were assigned to address the areas needing attention. As was found in the 2013 NRC inspection of safety culture (ADAMS Accession No. ML13077A139), the inspectors found that senior site management demonstrated an expectation for a strong safety culture and SCWE. Additionally, management demonstrated an understanding of the importance of the CAP and encouraged its use by employees. The licensee reinforced the importance of safety during plan of the day meetings and encouraged a questioning attitude during daily and weekly MRC meetings related to conditions adverse to quality. Through interviews, the licensee's staff was found to be aware and generally familiar with the CAP and other station resources, including the ECP, through which concerns could be raised. All employees interviewed noted that they felt comfortable raising any safety issue to supervisors and safety significant issues were being corrected. However, employees raised concerns that communication was not always timely and well understood regarding how safety concerns was being addressed at the station.

No findings were identified.

c. Conclusions

No issues were identified by the inspectors that would impede the establishment and existence of an SCWE at the ZNPS. The Zion staff expressed a willingness to challenge actions or decisions that they believed were unsafe. All employees interviewed noted that any safety issue could be freely communicated to supervision and safety significant issues were being corrected. Interviews did not reveal that workers were reluctant to raise safety issues. Additionally, individuals were aware of the different processes available for raising safety concerns, including the stations CAP, raising concerns to supervisors, and the station's ECP. Based on a number of interviews of station employees, the inspectors concluded that there were no significant concerns with the site SCWE.

3.0 Fire Protection Program (IP 64704)

3.1 Inspection Scope

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

- Verify that the licensee had developed technically adequate procedures to implement the fire protection program;
- Verify the proper installation, operability, and maintenance of fire protection systems and equipment; and
- Review adequacy and implementation of the quality assurance program for fire protection.

3.2 Observations and Findings

The inspector toured the Unit 2 containment, auxiliary building, fuel handling building, turbine building, and plant general areas to verify the licensee was adhering to fire protection requirements and good housekeeping practices. The inspectors verified, in the above listed areas, that all fire protection equipment, including extinguishers, hose stations, and alarms, were in good working order and located as described in the fire

plans. Procedures were reviewed to assess how the licensee was controlling hot work and performing tours in areas where the potential for radiological fires existed. The inspectors verified a number of changes, performed pursuant to 10 CFR 50.48(f), did not result in a decrease in effectiveness of fire protection requirements at the station. A letter of agreement existed with the Zion Fire Department for which the inspectors verified the licensee maintained the conditions of the agreement. Through the quality assurance program, the licensee conducted (and the inspectors reviewed) audits of the fire protection program performed in 2013 and 2014. Where deficiencies were identified, the licensee entered the issues into the CAP.

No findings were identified.

3.3 Conclusions

The inspectors determined that the licensee maintained the fire protection program within requirements. The inspectors also verified that the licensee maintained the fire protection equipment in sound material condition and was available for use as described in the fire plan.

4.0 **Decommissioning Performance and Status Reviews (IP 71801)**

4.1 Inspection Scope

The inspectors reviewed documents, attended licensee meetings, made observations in the plant, and interviewed plant personnel to assess the licensee's performance as it related to 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 activity report;
- Operability and functionality of systems necessary for safe decommissioning were assessed through plant walkdowns of the following systems: radioactive effluent monitoring, radiation protection monitors and alarms, and equipment important to emergency preparedness;
- 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; and
- Observed in progress field work to verify activities were conducted in accordance with approved work instructions and workers were knowledgeable of tasks.

4.2 Observations and Findings

a. Unit 1 Reactor Vessel Segmentation

The inspectors determined through plant tours and observations that the licensee was performing the reactor vessel segmentation in accordance with the approved licensee procedures and regulatory requirements. Also, the inspectors noted that the licensee personnel had the proper personal protection equipment (PPE) and dosimetry and implemented the applicable ALARA practices.

b. Unit 1 and Unit 2 Steam Generator Segmentations

The inspectors determined through plant tours and observations that the licensee was performing the steam generators segmentation in accordance with the approved licensee procedures and regulatory requirements. Also, the inspectors noted that licensee personnel had the proper PPE and dosimetry and implemented the applicable ALARA practices. The inspectors also observed that licensee's RP personnel performed the proper radiation and contamination surveys after each piece of the steam generators was segmented.

c. Fuel Rack Segmentation

The inspectors determined through plant tours and observations that the licensee was performing the fuel rack segmentation in accordance with the approved licensee procedures and regulatory requirements. Also, the inspectors noted that licensee personnel had the proper PPE and dosimetry. RP personnel performed the appropriate radiation and contamination surveys during the fuel rack segmentation process.

d. Independent Spent Fuel Storage Installation

The inspectors identified a Severity Level IV, NCV, of TS 5.2 in NAC MAGNASTOR CoC 1031, Amendment 3, Appendix A, for the failure to maintain a program for unloading fuel and components from the TSC located in the ISFSI.

The licensee utilized the NAC MAGNASTOR spent fuel storage cask system for storage of spent nuclear fuel in an ISFSI. A total of 65 dry storage casks have been placed on the ISFSI pad, 61 of which contain spent fuel and 4 of which contained Greater than Class C waste. The 61 casks storing spent fuel were loaded to Amendment 3 of the NAC MAGNASTOR CoC, Docket Number 072-001031.

TS 5.2, "TSC Loading, Unloading, and Preparation Program," in CoC 1031, Amendment 3, Appendix A, states in part, "a program shall be established and maintained to implement the FSAR, Chapter 9 requirements for loading fuel and components into the TSC, unloading fuel and components from the TSC, and preparing the TSC and CONCRETE CASK for storage." The programs required in TS 5.2 are applicable during loading operations, unloading operations, transport operations, transfer operations and storage operations, as applicable. As stated, TS 5.2 requires the licensee to establish and maintain a program to implement Chapter 9 of the FSAR for unloading fuel and components from the TSC during storage operations. Chapter 9, "Operating Procedures," of the MAGNASTOR System FSAR, Revision 5, provides general procedural guidance for the loading, unloading, and recovery of the MAGNASTOR system. Chapter 9 states, in part, that "user personnel shall use this information to prepare the detailed, site-specific procedures for loading, handling, storing, and unloading MAGNASTOR."

After the licensee removed all spent fuel from the spent fuel pool, the NRC granted a license amendment for each of the two reactor units on January 14, 2015. These amendments, Amendment No. 188 to License No. DPR-39 for Zion Unit 1 and Amendment No. 175 to License No. DPR-48 for Zion Unit 2, included a revision to the TSs of the facility. In these amendments, TS 4.2.4 was revised to state, "Spent fuel shall not be stored in the spent fuel pool." This TS revision was implemented on March 5, 2015, at which time the spent fuel pool was no longer available for unloading fuel from the TSC. When all fuel was removed from the spent fuel pool, the licensee archived the spent fuel pool unloading procedures and failed to update their unloading program as required per CoC 1031, TS 5.2.

Upon identification by the inspectors, the licensee entered this issue into their CAP as CR-2015-000724. Upon review of the issue, the licensee and the NRC inspectors determined that there was no immediate safety concern as the licensee had no present need to perform unloading operations and there were no credible normal, off-normal, or accident scenarios that would require unloading operations. As part of the licensee's corrective actions, the CoC holder submitted a request to the NRC on December 11, 2015, to amend the NAC MAGNASTOR CoC 1031 which would make changes to TS 5.2. At the time of this report, the NRC was still reviewing this amendment request.

The inspectors determined that the licensee's failure to follow TS 5.2 requirements to maintain an unloading program was a performance deficiency. TS 5.2, "TSC Loading, Unloading, and Preparation Program," of the NAC MAGNASTOR CoC 1031, Amendment 3, Appendix A, states in part, "a program shall be established and maintained to implement the FSAR Chapter 9 requirements for loading fuel and components into the TSC, unloading fuel and components from the TSC, and preparing the TSC and CONCRETE CASK for storage." The licensee did not meet this requirement to maintain a program for unloading fuel and components from the TSC when the spent fuel pool was no longer able to store fuel.

This violation was determined to be of more than minor significance using the September 2013 Enforcement Manual, Appendix E, "Examples of Minor Violations," example "Minor Changes to Requirements" in that the licensee's failure to follow TS 5.2 resulted in an amendment request by the CoC holder that requires NRC approval.

Consistent with the guidance in Section 1.2.6.D of the NRC Enforcement Manual, if a violation does not fit an example in the Enforcement Policy Violation Examples, it should be assigned a severity level: (1) commensurate with its safety significance; and (2) informed by similar violations addressed in the Violation Examples

This violation was determined to be a Severity Level IV problem using the Violation Examples in the Enforcement Policy, dated February 4, 2015. The most informative example for this violation is Example 6.1.d.2 in the Enforcement Policy, as both this violation and the example violation are related to changes in the licensing basis that lead to conditions that have very low safety significance.

NAC MAGNASTOR CoC 1031, Amendment 3, TS 5.2, "TSC Loading, Unloading, and Preparation Program," states, in part, that "a program shall be established and maintained to implement the FSAR, Chapter 9 requirements for loading fuel and components into the TSC, unloading fuel and components from the TSC, and preparing the TSC and CONCRETE CASK for storage."

Contrary to the above, on March 5, 2015, through the inspection period, the licensee failed to establish and maintain a program for unloading fuel and components from the TSC when the spent fuel pool was no longer able to store fuel. Specifically, the licensee was noncompliant with TS 5.2 beginning on March 5, 2015, the implementation date of the Unit 1 and Unit 2 TS revisions, which no longer allowed the licensee to store spent fuel in the spent fuel pool.

Upon identification, the licensee entered the issue into the CAP (CR-2015-000724). The licensee evaluated the immediate safety significance and whether interim compensatory actions were needed; and the CoC holder submitted a request to the NRC on December 11, 2015, to amend the NAC MAGNASTOR CoC 1031, which would make changes to TS 5.2. The licensee determined, and the NRC reviewed, that there was not an immediate safety concern as the licensee had no present need to perform unloading operations and there were no credible normal, off-normal, or accident scenarios that would require unloading operations. This violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy (NCV 07201037/2015002-01; Failure to Maintain an Unloading Program).

4.3 Conclusions

The NRC inspectors identified a Severity Level IV, NCV, of TS 5.2 in NAC MAGNASTOR CoC 1031, Amendment 3, Appendix A, for the failure to maintain a program for unloading fuel and components from TSCs located in the ISFSI.

5.0 **Occupational Radiation Exposure (IP 83750)**

5.1 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;
- Effective implementation of the ALARA program;
- ALARA-related training was adequate and provided to appropriate personnel;

- Initiatives to implement operational methods and practices maintained doses ALARA; and
- Issues, events, or problems were identified, resolved, and prevent future problems in the area of radiological controls.

5.2 Observations and Findings

The inspectors determined through plant tours and observations that the licensee was performing the applicable ALARA practices. Dosimetry and personal PPE were all properly worn and available for use when necessary. Licensee's RP personnel followed the required licensee procedures for adequate control of radioactive materials during work evolutions and performed the required radiation and contamination surveys.

5.3 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, ALARA plans, and 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.

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

6.1 Inspection Scope

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance as it related to 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;
- The radiological environmental monitoring programs were effectively implemented to ensure effluent releases were being adequately performed as required to minimize public dose;

As part of the inspection, the inspectors verified that licensee programs and procedures were appropriately implemented by licensee staff. In addition, the inspectors verified that when issues were identified licensee personnel appropriately documented the issues in the CAP and adequate corrective actions were taken.

6.2 Observations and Findings

The inspectors noted during walkdowns of the radioactive effluent equipment and pathways that they were configured as described in the Offsite Dose Calculation Manual (ODCM) and were in good material condition. The inspectors also reviewed the licensee's calibration and the alarm setpoint procedures for the PR04 liquid effluent instrument; the gamma spectroscopy calibration procedures for the high purity germanium detector; and the procedures for the installation, calibration, and the alarm setpoint of the Unit 2 Ventilation Stack Monitor discussed in Inspector Follow-up Item (IFI) 05000295/2014010-01 and 05000304/2014010-01. For the review of the calibration and alarm setpoint for PR04, the inspectors determined that there were inconsistent calibration results due to low activity of the calibration source, which resulted in an error for the low alarm setpoint. The licensee revised the calibration procedure based on a high activity calibration source, which adjusted the current low alarm setpoint from 16,000 cpm to 8,000 cpm above background. Despite the error, the licensee remained in compliance with NRC requirements. For the gamma spectroscopy calibration procedures for the high purity germanium detector, the licensee used Laboratory Sourceless Calibration Software (LabSOCS) to perform mathematical efficiency calibration of the detector instead of using a standard source to perform the efficiency calibration. To verify the mathematical efficiency calibration for different sample container sizes for soil and liquid samples, the inspectors requested the licensee to count the old calibration standards as unknown samples then compare the results with the certificates of the standards. The results based on LabSOCS matched the certificates, which demonstrated the licensee used LabSOCS with proper geometry templates and physical sample parameters to perform sample analyses. For IFI 05000295/2014010-01 and 05000304/2014010-01, the inspectors reviewed the technical adequacy of the new Unit 2 Ventilation Stack Monitor for its monitoring range and the emergency assessment capability. The new Unit 2 Ventilation Stack Monitor was properly installed with adequate range of detection and emergency assessment capability. Based on the review, the inspectors closed IFI-05000295/2014010-01; 05000304/2014010-01.

No findings were identified.

6.3 Conclusions

The licensee maintained effluent monitoring and control systems as required. The effluent flow paths and monitoring systems reviewed aligned with descriptions in the ODCM and were functional. The effluent monitors reviewed were functional, calibrated, and alarm set points met regulatory requirements.

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

7.1 Inspection Scope

The inspectors reviewed documents, interviewed personnel, and observed the licensee's classification and characterization of a planned waste shipment to determine:

- 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;
- Whether the licensee used updated and audited procedures when scaling factors or correlation factors are used to quantify the concentration of hard-to-detect radionuclides; and
- Whether shipments made by the licensee were in compliance with NRC and Department of Transportation regulations.

7.2 Observations and Findings

The inspectors discussed the proposed methods for determining the activities produced from neutron activation of the fuel rack for the radioactivity characterization of the fuel rack. The proposed method ensured the ratio of activation to fission products from the fuel rack were properly determined resulting in an accurate Dose-to-Curie measurement for the fuel rack. After review of the licensee's methods for determining the activities of the fuel rack, the inspectors then were able to review the licensee's waste manifest for one fuel rack shipment. The licensee had properly classified, packaged, and labeled the fuel rack shipment in accordance with the applicable regulations and requirements.

No findings were identified.

7.3 Conclusions

The licensee adequately implemented its solid radioactive waste and transportation programs in accordance with all applicable regulations.

8.0 **Exit Meeting**

The inspectors presented the results of the inspection to Mr. Jack Rollins and other members of your staff at an onsite exit meeting on January 21, 2016. 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
T. Orawiec, Plant Manager
C. Keene, RP Director
J. Jaros, Manager for Industrial Safety and Health
B. Yetter, Characterization/License Termination Manager
R. Flahive, CAP Manager
J. Ashley, Licensing Engineer
L. Chou, Licensing Specialist
J. Smith, Radiological Engineer

INSPECTION PROCEDURES (IPs) USED

IP 36801 Organization and Management Controls at Permanently Shutdown Reactors
IP 40801 Self-Assessment, Auditing and Corrective Action at Permanently Shutdown Reactors
IP 64704 Fire Protection Program
IP 71801 Decommissioning Performance and Status Reviews at Permanently Shutdown Plants
IP 83750 Occupational Radiation Exposure
IP 84750 Radioactive Waste Treatment, and Effluent and Environmental Monitoring
IP 86750 Solid Radioactive Waste Management and Transportation of Radioactive Materials

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

07201037/2015002-01 NCV Failure to Maintain an Unloading Program

Closed

07201037/2015002-01 NCV Failure to Maintain an Unloading Program
05000295/2014010-01 IFI Evaluate Capability of Unit 2 Vent Stack Effluent
05000304/2014010-01 Monitor

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.

- Fire Protection Report; Amendment 14
- Fire Protection Report; Amendment 15
- FP-1; ISFSI Fire Protection Program; Revision 1
- FP-4; Firefighting Preplans; Revision 1
- FP-5; Fire Alarms; Revision 1
- ZAP-900-01; Station Fire Protection Program; Revision 23
- ZAP-100-06 Attachment F; 50.59 Screening Form; Revision 25; Activity/Document No: EC 37368
- ZAP-510-02C Attachment A; Operability (O) and Closeout (CO) Checklist; Revision 17; Exempt Change No. 37368
- Audit No.: A-13-001; Quality Audit Report; January 23, 2014
- Audit No.: A-14-001; Quality Audit Report; June 8, 2014
- TR-027-2015; Technical Review Letter; October 6, 2015
- 50.59 Review FPR CR2015-01; FPR Change: Disconnect Underground Ring Header; September 30, 2015
- 10CFR50.48(f) Effectiveness Determination Form; FPR 2.6.4 Fire Suppression; September 30, 2015
- IM-OR-PRO-04; Channel Calibration and Channel Function Test on ORT-PR04; Revision 30
- Technical Support Document 15-004; Liquid Effluent Cmpc Calculation; PR04 Monitor Efficiency, PR04 Canister Activity; Revision 3
- ZRP 5821-50; Documentation and Control of Radiation Monitor Setpoints; Revision 17
- Zion Station 2014 Annual Radioactive Effluent Report
- NEP-08-01; Engineering Change Notice; Revision 1; ECN No 37368
- ZS-LT-300-001-001; Characterization/License Termination Procedure; Revision 1
- Surveys of Lube Oil Room of the Turbine Building
- AD-8; Corrective Action Program; Revision 1
- AD-9; Equipment Operability and Functionality Assessment; Revision 2
- CAP-JA-04; CR Process Flow Chart; Revision 0
- CAP-JA-05; CR Evaluation Level Guidance; Revision 0
- CAP-JA-06; Quick Human Performance investigation (QHPI); Revision 0
- CAP-JA-07; Effectiveness Review; Revision 0
- CAP-JA-08; Apparent Cause Evaluation; Revision 0
- LS-JA-06; Permanently Defueled Operating Experience Lessons Learned; Revision 0
- QA-1; Quality Program Administration; Revision 1
- QA-2; Quality Assessments; Revision 0
- QA-3; Quality Inspection Program; Revision 0
- CR-2014-000054; Snagging Damage to Unit 1 Polar Crane; January 12, 2014
- ZS-SH-PG-600; Hoisting and Rigging Program; Revision 0
- CR-2015-000493; Truck Alarmed Monitor During Plant Exit; August 18, 2015
- CR-2015-000624; Scrape Vendor's Roll Off Not Properly Surveyed Before Leaving Site
- CR-2015-000663; NRC Contact; November 12, 2015
- CR-2015-000665; Fire Patrol Times Not Documented – NRC Identified; November 13, 2015

- CR-2015-000668; Compressed Gas Cylinder Storage Area; November 13, 2015
- CR-2014-001147; Actual Dose Rates on Intermodal Were High; October 17, 2014
- CR-2015-000337; ANI Inspection LR 15-04; June 11, 2015
- CR-2015-000470; Audit Recommendation to Improve; August 10, 2015
- CR-2015-000515; Rigging Failure; September 1, 2015
- CR-2014-001007; TBell Failure Inside Unit 1 Containment; September 8, 2014
- CR-2014-001026; Poor Communication; September 12, 2014
- CR-2013-001178; Rigging Failure During Move; October 31, 2013
- CR-2015-000421; U2 Polar Crane Runs Over Live DC Leads; July 19, 2015
- CR-2015-000531; Contractor on a Suspended Load; September 3, 2015
- CR-2015-000411; Dropped Object From Unit 1 Containment; July 13, 2015
- CR-2015-000518; April 2012 SCWE Survey Indicated Negative Results; December 3, 2012
- CR-2013-001270; Adverse Trend in Rigging Events; November 26, 2013
- CR-2015-000469; Safety Concerns Inside Unit 1 Containment; August 10, 2015
- CR-2014-001074; Contamination Identified on the Ground; September, 24, 2014
- CR-2015-000048; Crane made Contact with Aerial Lift; January, 21, 2015
- CR-2015-000205; Fall from Height; April 8, 2015
- CR-2015-000176; Safety Hazard identified in the Unit 2 Track; March 26, 2015
- CR-2015-000569; Follow-Up on Questions Regarding a Completed Issue Review (IR); September 30, 2015
- CR-2012-001081; Personnel Contamination Events; October 12, 2012
- CR-2013-001228; NRC NOV Level IV-Failure to perform an Adequate Radiological Survey; November 19, 2013
- CR-2014-000527; First Aid Injury; May 16, 2014
- CR-2013-000592; ISFI Construction "SUNSI" Drawings Board; June 11, 2013
- CR-2013-000753; Two Uncontrolled SGI Drawings; July 17, 2013
- CR-2013-000766; Uncontrolled SGI Information; July 22, 2013
- CR-2014-000839; H2 Monitoring Initiated after Welding Began; July 28, 2014
- Non Standard Lift Plan for Moving the Hemispherical Bottom Head; July 16, 2015
- SAF-29; Hoisting and Rigging Program; Revision 1
- SAF-30; Training and Qualification of Personnel; Revision 1
- SAF-31; Safe Use and Inspection of Rigging Equipment; Revision 0
- 2014 SCWE Survey Report
- 2013 SCWE Assessment

LIST OF ACRONYMS USED

ALARA	As Low As Is Reasonably Achievable
CFR	Code of Federal Regulations
CAP	Corrective Action Program
CoC	Certificate of Compliance
CR	Condition Report
DNMS	Division of Nuclear Materials Safety
EOC	Extent of Condition
ECP	Employee Concerns Program
FSAR	Final Safety Analysis Report
IFI	Inspector Follow-up Item
IR	Issue Review
ISFSI	Independent Spent Fuel Storage Installation

LabSOCS	Laboratory Sourceless Calibration Software
MRC	Management Review Committee
NCV	Non-Cited Violation
NRC	U.S. Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
OE	Operating Experience
PPE	Personal Protection Equipment
RP	Radiation Protection
RWP	Radiation Work Permit
SAFSTOR	Safe Storage
SCWE	Safety Conscious Work Environment
TS	Technical Specification
TSC	Transportable Storage Canister
ZNPS	Zion Nuclear Power Station