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

May 19, 2014

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

SUBJECT: NRC INSPECTION REPORT 05000295/2014007(DNMS); 05000304/2014007(DNMS); 07201037/2014001(DNMS) – ZION NUCLEAR POWER STATION

Dear Mr. Sauger:

On March 14, 2014, the U.S. Nuclear Regulatory Commission (NRC) completed onsite inspection activities for the first calendar quarter of 2014 at the permanently shut-down Zion Nuclear Power Station in Zion, Illinois. The inspection continued with in-office review through April 24, 2014. 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 you and others of your staff on April 24, 2014.

During the quarterly inspection period, the NRC inspectors reviewed the licensee's execution of the site decommissioning project focusing on spent fuel transfer operations including initial cask loading and placement on the independent spent fuel storage installation (ISFSI) pad, aspects of the occupational radiation exposure control program, and implementation of the corrective action program. Also, the inspectors reviewed the licensee's plans plus associated engineering evaluations for modifications to the liquid radwaste processing and control systems in support of planned resumption of liquid radioactive effluent batch discharges from the site.

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 and with the conditions of your license. 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, independent radiation measurements, and interviews with personnel.

Based on the results of this quarterly inspection, the inspectors did not identify any violations of NRC requirements that were of greater than minor safety significance. Three violations of minor safety significance are described in the inspection report. No response to these violations is required.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter and the enclosed report will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Document Access and Management System (ADAMS), accessible from the NRC's website at http://www.nrc.gov/reading-rm/adams.html.

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

Sincerely,

/RA/

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

Docket Nos. 050-00295; 050-00304; 07201037
License Nos. DPR-39; DPR-48

Enclosure:
Inspection Report Nos. 05000295/2014007(DNMS);
05000304/2014007(DNMS); 07201037/2014001(DNMS)

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos.:	050-00295; 050-00304; and 072-01037
License Nos.:	DPR-39; DPR-48
Report Nos.:	050-00295/2014-007(DNMS) 050-00304/2014-007(DNMS) 072-01037/2014-001(DNMS)
Licensee:	Zion*Solutions*, LLC
Facility:	Zion Nuclear Power Station (permanently shut-down)
Location:	101 Shiloh Boulevard Zion, IL 60099
Dates:	Onsite Inspection on December 18 – 21 and 28 - 31, 2013; January 1 - 4, 7- 9, and 21 - 24, February 10 - 14 and 24 - 28, and March 13 - 14, 2014
NRC Inspectors:	Wayne Slawinski, Senior Health Physicist Matthew Learn, Reactor Engineer Rhex Edwards, Reactor Engineer Lionel Rodriguez, Reactor Engineer
Approved by:	Robert Orlikowski, Chief Materials Control, ISFSI, and Decommissioning Branch Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

Zion Nuclear Power Station, Units 1 and 2
NRC Inspection Report No. 050-00295/2014-007(DNMS); 050-00304/2014-007(DNMS); and No. 072-01037/2014-001(DNMS)

The Zion Nuclear Power Station 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. In 2011, active decommissioning began and continued to varying degrees throughout the inspection period. In late 2013, the spent fuel transfer campaign commenced and is scheduled to continue throughout 2014. This routine safety inspection reviewed the licensee's execution of the site decommissioning project focusing on spent fuel transfer operations, aspects of the occupational radiation exposure control program, implementation of the corrective action program, and plans for the control, monitoring and discharge of liquid radioactive waste effluents from the site.

Operation of an Independent Spent Fuel Storage Installation

- The dry fuel storage cask loading campaign was conducted in a methodical and overall safe manner. Operational challenges encountered during initial cask loading and preparation activities were successfully resolved by the licensee and issues dispositioned accordingly. Two violations of minor safety significance were identified for inadequate procedure development (Section 1.1).

- Radiological controls and work practices associated with the fuel transfer campaign aligned with industry standards sufficient to maintain radiation dose as-low-as-reasonably-achievable (ALARA). Workers complied with radiation work permit (RWP) requirements, radiation protection procedures and instructions provided by the radiation protection staff. Radiological barriers and postings conformed to regulatory standards and surveys demonstrated that spent fuel cask and cask storage pad conditions satisfied radiological requirements (Section 1.2).

Safety Review, Design Changes and Modifications

- Regulatory required safety evaluations, screenings and associated engineering design change evaluations were performed adequately to assess the impact of modifications to the liquid radwaste processing system with one exception, resulting in a violation of minor safety significance (Section 2.1).

Self-Assessments, Audits and Corrective Actions

- Issues were identified at an appropriately low threshold for fuel transfer operations and for radiological issues, and entered into the corrective action program. Issues were effectively screened and prioritized commensurate with safety significance. Licensee evaluations determined the significance of individual issues, while recurring issues were being evaluated through appropriate means (Section 3.1).

Decommissioning Performance and Status

- Workers followed radiation work permit instructions and were aware of the radiological conditions of the work area. Radiological barriers, postings and area controls satisfied regulatory requirements (Section 4.1).

Occupational Radiation Exposure – As Low As Is Reasonably Achievable (ALARA)

- Bases documents and implementing procedures were developed to meet the regulatory objectives of Title 10 of the *Code of Federal Regulations* (CFR) 20.1101(b), as provided in industry standards. However, the fundamental attributes of an ALARA program were not present throughout the site, in part, because an ALARA philosophy was not integrated into station culture (Section 5.1).

- Efforts of the ALARA staff resulted in appropriate dose mitigation despite the lack of detail in some work planning documents. Although dose projections were not always accurate, the licensee effectively implemented dose savings measures that satisfied the regulatory requirements of 10 CFR 20.1101 (Section 5.2).

- Adequate mechanisms were developed for tracking and trending dose, for adjusting exposure estimates and for work-in-progress ALARA reviews. However, tracking and trending processes were hampered by work scheduling issues which the licensee recognized and was taking actions to address (Section 5.3).

- Workers followed work plans and were aware of and followed radiological controls specified in radiation work permits. However, workers seldom discussed or practiced ALARA in daily interactions because it was not promoted throughout the site (Section 5.4).

- Radiological engineering controls were developed and deployed to the extent reasonably achievable. Work activities with the potential for generating airborne alpha (transuranic) radioactivity were evaluated to define the hazard and provide for adequate worker protection (Section 5.5).

Occupational Radiation Exposure – Radioactive Material Control

- Radiation work permits were adequately developed to address radiological hazards and provide instruction for hazard control. However, challenges to RWP compliance were identified for waste storage in Unit-1 which the licensee planned to address (Section 6.1).

Liquid Effluent Treatment, Monitoring and Control

- Conforming changes to the Offsite Dose Calculation Manual were being made to reflect modifications to the liquid radwaste processing system consistent with the licensee's design change packages (Section 7.1).

- Implementing procedures associated with the modified liquid effluent discharge system aligned with system design and were sufficiently detailed to allow for proper valve lineup, sampling and response to abnormal conditions (Section 7.2).

- Instrumentation and control equipment associated with the modified liquid effluent processing system matched technical bases information provided in the licensee's engineering design change packages and included the necessary pedigree (Section 7.3).

Report Details

Summary of Plant Activities

During the quarterly inspection period, active decommissioning work was ongoing at the site and consisted of continued segmentation of the Unit-1 and Unit-2 reactor vessel internals, waste packaging and shipment preparation activities, and various efforts to re-baseline project scheduling. Spent fuel transfer operations commenced in late 2013, and continued throughout the inspection period.

1.0 Spent Fuel Transfer and Independent Spent Fuel Storage Installation (ISFSI) Operations (IP 60855.1)

1.1 Fuel Building and ISFSI Operations

a. Inspection Scope

The inspectors evaluated various fuel transfer operation (FTO) activities associated with loading, preparation and transfer of the first canister in the spent fuel storage campaign to determine compliance with the Cask Certificate of Compliance, Technical Specifications (TSs), regulations, and associated procedures.

The inspectors evaluated loading of spent fuel assemblies from the spent fuel pool (SFP) into the transportable storage container (TSC). The inspectors observed heavy load movements inside the fuel handling building (FHB) including: lifting of the TSC lid and placement onto the TSC within the SFP, lifting the TSC within the transfer cask (MTC) from the SFP to the cask preparation area, lifting of the TSC within the MTC from the cask preparation area to the canister transfer location within the FHB, and transfer of the TSC from the MTC to the vertical concrete cask (VCC) while in a stacked and restrained configuration.

The inspectors evaluated TSC processing operations including: decontamination and surveying, TSC welding, visual weld testing, liquid penetrant weld testing, helium mass spectrometer leak detection weld testing, hydrostatic pressure weld testing, TSC draining, vacuum drying and helium backfilling. Additionally, the inspectors observed heavy load operations outside of the FHB including: transfer of the VCC from within the FHB to outside of the FHB on a low profile cask rail transfer cart, and transfer of the VCC to the independent spent fuel storage installation (ISFSI) pad using a vertical cask transporter.

The inspectors monitored the licensee's ISFSI performance throughout the quarterly inspection period which included onsite assessment of activities associated with loading, preparation and transfer of the 5th and 6th canisters.

The inspectors evaluated the licensee's implementation of FTO procedures, supervisory oversight, communication and coordination between and amongst the work groups involved. The inspectors reviewed loading and monitoring procedures and evaluated the licensee's adherence to these procedures. The inspectors also interviewed licensee staff and management to assess knowledge of and compliance with regulatory requirements. The inspectors completed walkdowns of the licensee's ISFSI pad to assess the material condition of the pad and loaded storage casks. The inspectors attended pre-job briefs and in-field briefs to assess the licensee's ability to identify critical steps of the evolution, potential failure scenarios, and the use of tools to prevent errors.

b. Observations and Findings

On December 18, 2013, the licensee began loading spent nuclear fuel into the first canister. The first storage cask was successfully placed on the ISFSI storage pad on January 10, 2014.

During initial cask loading, the licensee encountered a number of operational challenges that were successfully resolved. These issues are described below:

Hardware Issues

The structural components of the spent fuel baskets are comprised of carbon steel that is plated with nickel. Neutron absorber panels and stainless steel retainer plates are installed along the basket cells. The neutron absorber panels run the length of the inside of a fuel cell wall. The retainer plate is a thin sheet of stainless steel that covers the neutron absorber panels. Spot welds located about an inch below the top of the retainer plate secure the retainer to the neutron panel and basket. The design basis function of the retainer is to ensure the neutron absorber panel is not damaged during loading.

During initial fuel loading, the bottom of a fuel assembly was not precisely aligned over the fuel basket and contacted the stainless steel retainer while being lowered into the basket. The top portion of the retainer plate above the spot weld bent slightly and exposed a portion of the neutron absorber panel. The licensee unloaded the fuel assembly and repaired the retainer plate. Visual inspections verified that neither the fuel assembly nor the neutron absorber panel was damaged. Fuel loading resumed after the licensee fabricated a tool that was used during subsequent loading to ensure alignment of the fuel assembly into the canister basket shell to prevent contact with the retainer plate. The licensee entered the issue into its corrective action program and generated a non-conformance report.

Welding Issues

The licensee encountered a number of issues with initial cask welding activities. For example, power supply cables for the canister weld machine overheated because the cables selected for use by the licensee were not compatible with the heat loads of the welding equipment. Also, argon purge gas flow was not maintained by the licensee at a constant rate due to conflicting procedural guidance. Additionally, port cover welds were identified by the licensee to extend beyond that specified in design drawings and necessitated grinding of the port cover. The licensee entered all these issues into their corrective action program and implemented adequate corrective actions. Similar issues did not reoccur with the subsequent welding activities conducted during the inspection period.

SFP Water Turbidity Issues

Underwater filter and demineralizer systems were used for turbidity control to maintain SFP water clarity and allow continued operations. However, SFP water was clouded with particulate matter as the first canister was loaded and processed, which worsened during final pump down of the first TSC to the SFP.

The licensee identified that nominal corrosion of the TSC basket had occurred because that basket was immersed in the SFP water for an extended period of time as it was also used during dry-run exercises leading up to initial loading. The licensee determined through water analysis that the particulate matter was comprised of iron and nickel oxides which originated from a combination of the carbon steel components of the TSC basket and its electroless nickel (EN) plating. The nickel plating was intended to limit potential corrosion of the carbon steel baskets and thereby control water clarity; however, the fuel basket design included small welded regions that were not coated and other areas with reduced plating. As a result, small areas of carbon steel oxidized because it was subject to prolonged immersion in the SFP water.

The inspectors found that vendor water immersion tests and other supporting analyses bounded the conditions present and demonstrated that the basket was not subject to corrosion effects detrimental to the safety of the spent fuel storage system. To support the vendor's analyses, the licensee had an independent laboratory analyze a representative sample of the pool water present in the TSC which confirmed that the integrity of the neutron absorber material was not compromised. As a result, the licensee demonstrated that the cloudiness of the water was due to formation of iron and nickel oxides through anticipated corrosion mechanisms within the design basis of the cask.

<u>Other Issues</u>

During initial cask loading, the inspectors identified two violations of 10 CFR 72.150, "Instructions, Procedures, and Drawings" associated with the adequacy of FTO procedures related to cask helium backfill and cask contamination control. Specifically, the licensee failed to prescribe activities that potentially affected quality through procedures that included the appropriate quantitative or qualitative acceptance criteria. The violations are dispositioned as violations of minor safety significance in accordance with Section 2.3 of the Enforcement Policy because: (1) no actual safety consequence resulted from the inadequate procedures; and (2) potential consequence of the procedure issues was minimal given other established barriers and controls over the activities. Adequate actions were taken by the licensee to correct the violations.

The inspectors identified that procedure ZS-FT-402, "TSC Closure Operations," Revision 2, step 6.11.8 did not provide appropriate upper and lower helium backfill limits to ensure compliance with NAC MAGNASTOR Technical Specification (TS) 3.1.1, "MAGNASTOR System Integrity – TSC." Technical Specification 3.1.1 provides limits on the quantity of helium to be placed into the TSC following vacuum drying. The NAC Operating Manual for the MAGNASTOR System, Revision 8, prescribed that the helium backfill tolerance be established at 283 liters above the target volume to ensure compliance with the TS 3.1.1 requirement. In contrast, the procedure step specified that the tolerance be established at 653 liters relative to the target volume. The inspectors reviewed helium backfill data for the affected casks and determined that the licensee backfilled helium within 1 liter of the target volume; therefore, TS compliance was achieved. The licensee revised the procedure to ensure it matched the limiting value of the technical specification.

The inspectors identified that procedure ZS-FT-403, “VCC Loading Operations,” and ZS-RP-105-001-004, “MTC Radiation Survey,” directed the licensee to perform contamination surveys in a manner that did not ensure compliance with TS 3.3.2, “TSC Surface Contamination.” The technical specification prescribes limits on the amount of removable contamination that can be present on the outer shell (exterior surface) of the TSC. The procedure directed that contamination surveys be collected only in areas above the upper removable seal and bottom lid and not in other accessible areas of the cask. As a result, the licensee failed to take additional surveys in areas below the upper removable seal after the seal was deflated and removed. The licensee assumed the contamination levels on all exterior surfaces of the TSC would be consistent with those obtained on the upper surface and bottom lid without validating the assumption with actual survey data. The licensee initiated a procedure change to correct the deficiency. Since the inspectors identified the issue as the first cask was being processed and steps were immediately taken to address the issue, technical specification compliance was achieved.

No violations of significance were identified.

c. Conclusions

The initial dry fuel storage cask loading campaign was conducted in a methodical and overall safe manner. Operational challenges encountered during initial cask loading and preparation activities were successfully resolved and issues dispositioned accordingly.

1.2 Radiation Protection During ISFSI Operations

a. Inspection Scope

The inspectors reviewed the radiological controls implemented during fuel loading, cask preparation and transfer, and the controls associated with ISFSI pad operations following cask placement. The review was performed to assess compliance with the radiation protection requirements of 10 CFR Part 20 and Part 72, and those provided in the licensee’s procedures.

b. Observations and Findings

The inspectors determined that coverage of radiological work provided by the radiation protection staff aligned with industry practices and was sufficient to maintain worker radiation dose ALARA. Workers involved in FTO activities demonstrated appropriate ALARA practices in most instances but occasionally failed to maximize opportunities to reduce dose by maintaining their distance from the radiation source.

The inspectors found that contamination and radiation levels for the TSC, MTC, and VCC satisfied regulatory, TS and administrative limits throughout loading, processing and transfer activities. The inspectors also found that ISFSI pad surveys and VCC air vent surveillances were completed as required. However, ISFSI survey documentation deficiencies and a procedural issue were identified by the inspectors, brought to the licensee’s attention and are being corrected. In particular, compliance with the administrative limit that the licensee established for the neutron site dose rate specified in procedure ZS-RP-105-001-006 was not achievable based on neutron instrument detection capabilities. Instead, compliance was demonstrated through fixed dosimetry that was appropriately positioned at the perimeter of the cask storage pad. The licensee planned to revise the procedure to address the issue. The inspectors performed radiation surveys around the ISFSI pad boundary and of the loaded storage casks on the pad to independently validate that regulatory limits were met.

During observations of work performed in the field, the inspectors noted that the licensee utilized human performance tools effectively. For example, three way communications, peer and self-check, circle/slash for procedural tracking, and two-minute drills were routinely used. The inspectors observed the licensee consistently make conservative decisions to address issues that arose during the loading campaign. The inspectors noted that the licensee performed work and controlled activities using appropriate health physics practices. The licensee maintained sufficient communications between radiation protection and the work groups involved in fuel transfer operations.

No findings of significance were identified.

c. Conclusions

Radiological controls and work practices associated with the fuel transfer campaign aligned with industry standards sufficient to maintain radiation dose ALARA. Workers complied with RWP requirements, radiation protection procedures and instructions provided by the radiation protection staff. Barriers, postings, storage cask and ISFSI pad conditions satisfied radiological requirements.

2.0 Safety Reviews, Design Changes and Modifications (IP 37801)

2.1 Liquid Effluent Processing, Monitoring and Control System Modifications

a. Inspection Scope

The inspectors reviewed the licensee’s evaluation and supporting documentation for modifications to the plant liquid radwaste processing, monitoring and control systems. The evaluation was performed to satisfy the requirements of 10 CFR 50.59. Similarly, the inspectors reviewed technical review documents including engineering change evaluations and 10 CFR 50.59 screenings related to mechanical and hardware changes to the liquid radwaste system, changes to the electrical system, installation of a flood barrier in the processing tank room and improvements to the primary holdup tank level indication. The inspectors reviewed the details of the licensee’s evaluations to determine whether safety judgments were appropriate and whether key considerations were effectively evaluated. The inspectors determined whether the licensee appropriately considered the potential impact of the modifications, and inter-relationships between the modifications and other systems potentially affected.

b. Observations and Findings

In December 2013, the licensee completed various engineering design changes and associated evaluations including a 10 CFR 50.59 evaluation for a new liquid radwaste processing, control and monitoring system. The new system was intended to replace portions of the existing radwaste processing (cleanup) system which had been abandoned while the plant was in a SAFSTOR dormancy condition. Batch release of liquid effluents had ceased during much of the SAFSTOR period but are planned to resume in 2014.

The new processing system consisted of portable filter and demineralizer vessels, temporary storage tanks to provide interim collection between existing (original) plant design holdup and batching tanks along with various pumps, valves and flow monitors which direct effluent flow as needed. Liquid effluent sampling, analysis and monitoring capabilities including effluent monitor alarm and automatic isolation function were retained, as provided in the Defueled Safety Analysis Report (DSAR) and Offsite Dose Calculation Manual (ODCM). However, although the isolation function was retained, the inspectors found that its capability was reduced because the isolation valve was repositioned in closer proximity to the effluent monitor compared to the original plant design. As a result, if the effluent radiation monitor alarmed, a portion of the liquid effluent discharge that caused the alarm could potentially be released to the environment before the isolation occurred.

The inspectors determined that the licensee's initial 10 CFR 50.59 for the radwaste system changes did not fully address system isolation capabilities compared to the existing design. The existing plant design ensured isolation of the entire discharge volume because the isolation valve was physically positioned hundreds of feet downstream of the radiation monitor. In contrast, the modified design did not allow for complete isolation of the effluent discharge to preclude any portion of the release that caused the alarm to reach the environment. Consequently, the inspectors identified that the licensee's initial evaluation was incomplete and in violation of the requirements of 10 CFR 50.59. Subsequently, the licensee put measures in place to ensure sufficient service water dilution was maintained throughout a liquid effluent discharge, and revised its 10 CFR 50.59 evaluation to resolve changes with existing plant design and function. A corrective action program document (CR No. 2014-000264) was generated to capture the issue.

The violation was categorized as a violation of minor safety significance as provided in Section 2.3 of the Enforcement Policy because: (1) the engineering design change to the ODCM and DSAR did not require NRC approval; (2) no radiological impact to the environment occurred; and (3) the potential radiological impact would be minimal given other controls limiting the concentration of radioactive material contained in each liquid effluent discharge.

No findings of significance were identified.

c. <u>Conclusions</u>

The licensee performed adequate safety evaluations or screenings, completed design change evaluations and properly assessed the decommissioning impact of modifications to the liquid radwaste processing and control systems with one exception determined to be a violation of minor safety significance.

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

3.1 <u>Identification, Resolution and Prevention of Problems</u>

a. Inspection Scope

The inspectors reviewed self-assessments, quality assurance (QA) surveillance and QA audit reports related to the ALARA program conducted by the licensee in 2012 and 2013, to determine whether these evaluative mechanisms were sufficient to assess the subject areas, and to determine whether identified issues were captured in the corrective action program (CAP) and addressed.

The inspectors reviewed fuel transfer campaign CAP documents and the associated follow-up actions generated since the NRC's pre-operational testing inspection completed on December 17, 2013 (Inspection Report Nos. 050-00295/13-013(DNMS); 050-00304/13-013(DNMS); 072-01037/12-002(DNMS). Additionally, the inspectors reviewed a variety of other CAP documents that were generated during the quarterly inspection period to determine if a sufficiently low threshold for problem identification existed, to determine the quality of follow-up evaluations including extent of condition, and to determine whether the licensee assigned timely and appropriate prioritization for issue resolution. Repetitive issues and those with the potential for safety or regulatory significance were evaluated further by the inspectors to determine whether apparent and/or common cause evaluations were being pursued by the licensee.

b. Observations and Findings

The inspectors found that the licensee's assessment of their ALARA program were generally thorough, performed by personnel knowledgeable of the subject matter and reached conclusions that were supported by the detailed assessment results with one possible exception. The exception was resolved through discussions with the licensee's assessment staff. Corrective actions were taken for certain assessment identified issues while other actions were being formulated to address fundamental problems with the ALARA program described in Section 5.1.

The inspectors determined that individual issues were identified by the licensee at an appropriate threshold and entered into the CAP. Issues were effectively screened and prioritized through the management review committee process and evaluated commensurate with safety significance. For individual issues, the licensee implemented adequate actions to resolve the immediate concern. The inspectors also found that the scope and depth of evaluations for identified problems was adequate in that they addressed the significance of issues and assigned a course of corrective action.

The inspectors noted that recurring issues with FTO identified by the licensee as a potential trend was pursued through a common cause evaluation initiated during the latter stages of the first quarter of 2014. The inspectors noted that the licensee took a conservative approach to address the potential trend because the licensee temporarily suspended the fuel transfer campaign until safety was ensured.

No findings of significance were identified.

c. Conclusions

Issues were being identified at appropriate thresholds of the licensee's organization and entered into the CAP. Issues were effectively screened and prioritized commensurate with safety significance. Licensee evaluations determined the significance of individual issues, while recurring issues were being evaluated through appropriate means.

4.0 Decommissioning Performance and Status Review (IP 71801)

4.1 Plant Tours/Walkdowns

a. Inspection Scope

The inspectors conducted plant tours throughout the inspection period to observe field conditions, discuss job safety with workers, and to assess the impact of work activities on safe decommissioning. Walkdowns were conducted in the Containment Buildings, the Auxiliary Building and in select outdoor areas where radioactive materials or waste was stored. During these walkdowns, the inspectors evaluated material condition and housekeeping, area radiological conditions, radiological access control and associated posting/labeling, and reviewed the overall condition of systems, structures and components that support decommissioning. Independent radiation measurements were made by the inspectors in areas toured to determine if those areas were controlled properly and posted as prescribed in 10 CFR Part 20.

b. Observations and Findings

The inspectors found that controls associated with work in Unit-1 & Unit-2 Containment Buildings included those required to prevent unauthorized entry into contaminated areas, high radiation areas and for purposes of control over radioactive material quantities of concern (RAMQC).

During walkdowns, the inspectors found that work coverage provided by the radiation protection staff was adequate for the work observed. The inspectors also determined that personnel were aware of job controls specified in work instructions and demonstrated proper radiological awareness.

No findings of significance were identified.

c. Conclusions

Workers followed radiation work permit instructions and were aware of the radiological conditions of the work area. Radiological barriers, postings and area controls satisfied regulatory requirements.

5.0 Occupational Radiation Exposure – ALARA (IP 83750)

5.1 ALARA Program Development and Management Commitment

a. Inspection Scope

The inspectors reviewed the licensee's procedures, processes and the overall development of the program for maintaining individual and collective occupational radiation exposure ALARA. Station ALARA committee involvement, ALARA policy statement development, management commitment and support, and the integration of management's ALARA philosophy into site culture were all evaluated as part of the assessment. The review was conducted to determine whether the licensee had established an ALARA program that was commensurate with the radiological hazards associated with the site decommissioning project, as required by 10 CFR 20.1101.

b. Observations and Findings

The inspectors noted that the licensee had established an ALARA basis document in the form of procedure ZS-RP-103-000-000, "ALARA Program." The inspectors determined that the procedure aligned with industry standards consistent with Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable" and Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures ALARA." However, the inspectors determined that fundamental attributes of an ALARA program were not fully implemented at the site to coincide with the established basis. The inspectors found that an ALARA philosophy was not espoused as part of the management vernacular; therefore, ALARA concepts were not integrated into station culture. For example, a management endorsed ALARA policy statement had not been developed and issued to the site. Also, based on inspector interviews, work observations, participation in pre-job and heightened level of awareness (HLA) briefings, and in day-to-day interactions with licensee staff, the inspectors found that workers were not aware of management's ALARA philosophy and commitment, nor did workers understand how the ALARA concept was to be implemented in their daily jobs. The inspectors noted that ALARA initiatives and dose savings techniques were seldom discussed at job briefs and during daily planning meetings.

The inspectors noted that work groups did not promote ALARA within their departments. Also, neither departmental nor project based short term (daily, weekly or monthly) dose goals were routinely established, as is the practice at industry sites with similar dose expenditure. As a result, an effective ALARA measurement system could not be established as a means to determine if success was achieved compared to dose goals. Without an effective measurement system, meaningful departmental exposure reduction plans could not be formulated, tracked and compared. In addition, an ALARA incentive program had not been established and the ALARA suggestion program was not well advertised, endorsed or implemented since workers were either not aware that one existed or chose not to participate because it had minimal bearing on their daily work activities.

The licensee generated CR No. 2014-000253 to document the ALARA program issues identified by the inspectors. A number of actions were being considered to address the deficiencies and reinvigorate the ALARA program. Actions addressed by the CR also encompassed changes to the station ALARA committee since several senior managers that comprised the station ALARA committee had changed since late 2013.

No findings of significance were identified.

c. Conclusions

The licensee developed ALARA procedures that aligned with industry standards. However, fundamental attributes of an ALARA program were not present throughout the site, in part, because an ALARA philosophy was not integrated into station culture.

5.2 Radiological Work Planning

a. Inspection Scope

The inspectors reviewed the licensee's methods and practices for planning radiological work to achieve an ALARA outcome. The inspectors reviewed the planning information provided by work planners and schedulers, and explored the interactions between the ALARA organization and planners to assess the level of integration. The inspectors determined if ALARA reviews were generated for work activities at procedural specified dose thresholds. Procedures associated with ALARA planning were reviewed to determine whether they were developed consistent with industry standards and included thresholds for work-in-progress and post-job reviews, and for station ALARA committee involvement. The inspectors interviewed the ALARA staff to understand the approach and philosophy used to establish job specific ALARA initiatives and how initiatives were applied in the field.

The inspectors compared person-hour estimates provided by the work planners with the actual work activity time expenditures to evaluate the accuracy of time estimates. Reasons for inconsistencies between the projected versus actual time and dose accruals were discussed with the licensee.

b. Observations and Findings

The inspectors found that work packages varied greatly in detail depending on the rigor provided by the individual work planners. In general, the inspectors noted that planning information did not include a consistent level of detail and sometimes information was not provided with sufficient lead time to allow thorough ALARA planning and accurate dose estimates. While these flaws led to inaccurate dose projections, they did not significantly impact dose performance because reasonable dose savings measures were developed based on ALARA staff knowledge of the plant. When work plans lacked detail, dose projections were typically overestimated because time estimates were inflated. On the other hand, the inspectors determined that reasonably accurate ALARA dose projections were generated when detailed work planning information was provided to the ALARA staff.

The inspectors determined that ALARA plans included dose reduction measures appropriate for the work. These measures consisted of engineering controls such as water shielding, use of filtered ventilation systems, remote visual monitoring and teledosimetry, and use of respiratory protection devices when justified. Radiation work permits were used as the primary mechanism to inform workers of ALARA measures in the form of "worker instructions" and "special instructions" that were listed in the body of the RWP. Workers believed that if they followed the RWP, the work was ALARA and their obligation to minimize dose was met.

No findings of significance were identified.

c. Conclusions

The licensee's ALARA planning provided for appropriate dose mitigation features despite the lack of detail in some work planning documents. Although dose projections were not always accurate, the licensee effectively implemented an ALARA program that satisfied the regulatory requirements of 10 CFR 20.1101.

5.3 Dose Estimates, Exposure Tracking and Exposure Performance

a. Inspection Scope

The inspectors reviewed several ALARA work packages including the assumptions and basis (dose rate and person-hour estimates) for the collective exposure estimates to determine if they were accurate or otherwise were established with justified conservatism. The inspectors reviewed planning documents, ALARA procedures and discussed processes with ALARA staff to determine the methodology for projecting exposure.

The inspectors reviewed work activities of highest exposure significance performed in 2012 and 2013, and the dose status of jobs initiated early in 2014. For these activities, the inspectors evaluated dose projections, reviewed ALARA plans, and RWP packages in order to determine whether radiological work controls were based on sound radiation protection principles in order to achieve occupational exposures that were ALARA.

The inspectors assessed whether the licensee had established measures to track, trend and if necessary to reduce worker dose. The inspectors evaluated whether exposure trigger points or other appropriate criteria were established to prompt additional review, require additional ALARA planning or to suspend work.

b. Observations and Findings

The inspectors determined that the licensee had developed mechanisms for tracking and trending dose and for adjusting exposure estimates when unexpected changes in scope or higher than expected radiation levels occurred. The inspectors also determined that the licensee performed ALARA work-in-progress reviews at established thresholds and completed post job reviews when feasible.

However, the inspectors noted that dose tracking and trending could not be effectively implemented throughout the plant because of impediments created by work scheduling issues. For example, while specific tasks in the auxiliary building, some areas of the containment building and in the balance of plant were routinely developed, planned to varying degrees and scheduled, it was not uncommon for work to commence but then be delayed or cancelled to address other priorities. As a result, the licensee could not routinely establish realistic departmental dose goals or short-term (daily, weekly or monthly) dose goals that could be successfully measured. For these reasons, departmental or work crew dose reduction plans were not established. Instead, dose goals were set at the RWP level based on anticipated work scope. These deficiencies lead to a work force that was not engaged in ALARA.

The licensee agreed with the inspectors that an effective measurement system was not established to monitor success against ALARA goals and objectives as was intended by the licensee's procedures. In January 2014, the licensee suspended decommissioning activities throughout the balance of plant to address self-identified scheduling issues. The licensee expects the self-imposed work stoppage to continue for several months as the schedule is re-baselined. The licensee expects tangible ALARA benefits from these re-baseline efforts.

No findings of significance were identified.

c. Conclusions

The inspectors determined that the licensee had developed mechanisms for tracking and trending dose, for adjusting exposure estimates and for work-in-progress ALARA reviews. However, tracking and trending processes were hampered by work scheduling issues which the licensee recognized and was taking actions to address.

5.4 Radiation Worker ALARA Awareness and Performance

a. Inspection Scope

The inspectors attended several pre-job, HLA and ALARA briefings during the inspection period, observed radiation worker and radiation protection technician performance during various work activities, and discussed the ALARA program during frequent worker interactions. The inspectors evaluated whether workers demonstrated ALARA practices consistent with the instructions listed in the RWP. The inspectors evaluated radiation worker performance to determine whether workers followed fundamental ALARA practices and demonstrated adherence to work planning documents.

b. Observations and Findings

During work observations, the inspectors noted that workers generally followed ALARA practices and special instructions provided in RWP instructions. The inspectors noted that radiation protection staff focused worker attention on radiological conditions during job briefings. During walkdowns, the inspectors found that work coverage provided by the radiation protection staff was adequate for the work observed. The inspectors determined that personnel were aware of job controls specified in work instructions and demonstrated proper radiological awareness. Workers in high contamination areas involved in segmentation equipment maintenance used respiratory protection equipment, face shields and wore other protective gear as appropriate for the work and the conditions.

Inspector discussions with workers revealed that ALARA was not integrated into station culture as it was seldom discussed in departmental meetings or during daily worker interactions. Workers could not articulate how ALARA was to be implemented in their daily work activities other than to follow the RWP. Workers expressed that ALARA was mentioned mostly by RP staff during job briefings. Workers did not know if station management had developed an ALARA Commitment or ALARA Policy Statement and most were generally unaware whether an ALARA suggestion program existed.

No findings of significance were identified.

c. Conclusions

Workers followed work plans and were aware of and followed radiological controls specified in RWPs. However, an ALARA philosophy was not integrated into the plant culture given that workers seldom discussed or practiced ALARA in daily interactions.

5.5 Engineering Controls

a. Inspection Scope

The inspectors reviewed radiological evaluations and associated ALARA planning documents for jobs of greatest radiological risk (i.e., high contamination areas, high dose rate areas, areas with alpha contamination and work projected to accrue greater than one person-rem). For these high risk jobs, the inspectors determined whether the licensee's planning included appropriate dose mitigation features, considered alternative features and defined reasonable dose goals.

b. Observations and Findings

The inspectors found that the licensee routinely used engineering controls as a means to reduce the potential for worker intakes. Work areas were decontaminated or fixative applied to reduce the potential for airborne radioactivity. Contaminated items removed from cavity pools were routinely power-washed before handling as specified in RWPs and ALARA Plans. Fixed and portable HEPA filtered ventilation systems were judiciously used as a supplemental means to control airborne radioactivity. The inspectors determined that areas were evaluated for the presence of alpha radioactivity and controls/monitoring were established consistent with industry standards provided in EPRI document "Program Considerations for Addressing Alpha Emitting Radionuclides at Nuclear Power Plants."

The inspectors reviewed the methods and practices for performing total effective dose equivalent ALARA evaluations (i.e., respirator use evaluations) and determined they were performed in a technically sound manner.

No findings of significance were identified.

c. Conclusions

Radiological engineering controls were developed and deployed to the extent reasonably achievable. Work activities with the potential for generating airborne alpha (transuranic) radioactivity were evaluated to define the hazard and provide for adequate worker protection.

6.0 Occupational Radiation Exposure – Control of Radioactive Material (IP 83750)

6.1 Radiation Work Permits

a. Inspection Scope

The inspectors reviewed radiological surveys and RWPs for selected activities that presented the greatest radiological risk to workers. The review was performed to determine if the licensee developed appropriate measures to identify hazards and provided means to mitigate consequences. Radiation work permits were evaluated to determine whether the controls, instructions and special provisions provided in the permits were adequate to address the radiological hazards present or that could emerge. During plant walkdowns, the inspectors observed work activities to assess whether the controls implemented aligned with the RWP and were adequate to control and therefore minimize worker radiation exposure.

b. Observations and Findings

Overall, the inspectors determined that RWPs were sufficiently developed to address the radiological hazards associated with work activities when used in conjunction with the additional controls specified in ALARA plans. The inspectors found that controls for radiologically risk-significant activities were adequately prescribed in RWPs. However, challenges to RWP compliance were previously documented in recent NRC correspondence (Inspection Report No. 05000295/2013-009; 05000304/2013-009 and No. 05000295/2013-013; 05000304/2013-013) while other challenges emerged during the quarterly inspection period. Specifically RWP 2014-1-1016, "Operate and Maintain Water Filtration Systems…" provided special instruction for the storage of radioactive waste including waste filters based on dose rate condition. The current challenge to RWP compliance arose because the licensee had accumulated over 250 spent waste filters without the capacity for shielded storage in appropriate waste containers, as was intended by the RWP. As a result, alternate makeshift filter storage locations were developed in Unit-1. The licensee agreed that waste filters had accumulated in excess of storage capacity without an effective plan to rectify the problem.

No findings of significance were identified.

c. Conclusions

Radiation work permits were adequately developed to address radiological hazards and provide instruction for hazard control. However, challenges to RWP compliance were identified for waste storage in Unit-1 which the licensee planned to address.

7.0 Liquid Effluent Treatment, Monitoring and Control (IP 84750)

7.1 Offsite Dose Calculation Manual and Defueled Safety Analysis Report Review

a. Inspection Scope

The inspectors reviewed the DSAR and applicable chapters of the ODCM related to processing, sampling and monitoring radioactive liquid effluents from the site. Modifications to the liquid effluent processing and monitoring system described in Section 2.1 were compared to plant design basis to determine whether the changes planned potentially compromised the effluent control program. Anticipated changes to the DSAR and ODCM were discussed with the licensee to determine whether the proposed modifications were justified and aligned with the engineering change package.

b. Observations and Findings

The inspectors found that proposed changes to the liquid effluent processing and control system satisfied the performance requirements of General Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50. As such, the modified system satisfied regulatory performance requirements so as to maintain effluents ALARA. The inspectors determined that the changes did not depart from the design bases provided in the DSAR and the ODCM other than as described in Section 2.1, which the licensee rectified. The inspectors determined that the technical basis for the changes being made to the ODCM correlated with regulatory guidance in NUREG 1301 and Regulatory Guides 1.109, 1.21 and 4.1.

The inspectors walked-down selected components of the new and existing liquid processing and monitoring system and discussed system operation with licensee staff. The inspectors determined that system configuration was as described in the design change packages, adequate to maintain liquid effluent discharges ALARA.

No findings of significance were identified.

c. Conclusions

Modifications being made to the ODCM were consistent with the licensee's design change packages and satisfied the performance requirements of 10 CFR 50 Appendix A so as to maintain effluents ALARA.

7.2 Procedures and Processes

a. Inspection Scope

The inspectors reviewed various procedures associated with the licensee's modified liquid effluent processing and monitoring system to determine whether the procedures provided for proper system lineup, sampling, and service water dilution flow and for abnormal situations such as loss of offsite power or effluent monitor alarm.

b. Observations and Findings

The inspectors found that implementing procedures aligned with the design of the modified system as valve lineups, pumps, flow monitors and sampling locations matched system configurations. Detailed standard operating instructions articulated system operations to limit the possibility of error in valve lineups. Procedures provided for adequate effluent sampling prior to discharge including provisions for waste stream analyses to account for hard-to-detect radionuclides through a process equivalent to 10 CFR Part 61.

No findings of significance were identified.

c. Conclusions

Implementing procedures associated with the modified liquid effluent discharge system aligned with system design and were sufficiently detailed to allow for proper valve lineup, sampling and response to abnormal conditions.

7.3 <u>Instrumentation and Equipment</u>

a. <u>Inspection Scope</u>

The inspectors reviewed the instrumentation and control capabilities for the modified liquid effluent system to determine whether capabilities matched the technical bases provided in the licensee's engineering design change packages and included the necessary pedigree. System walkdowns were performed to compare instrumentation and equipment to that described in the engineering change packages.

b. <u>Observations and Findings</u>

Inspector walkdowns confirmed that effluent radiation monitoring and flow measurement devices matched design bases documents. Manufacturer documents demonstrated that newly purchased flow monitors were capable of accurately measuring the range of flow intended and had the necessary calibration credentials.

The inspectors determined that the licensee's technical basis for the alarm setpoint of the effluent monitor was consistent with the methodology in the SAFSTOR. Monitor alarm setpoint calculations established the alarm at a value that conformed to the limits of 10 CFR 20, Appendix B, for the most limiting radionuclide in the effluent mix. However, the licensee contemplated revising the setpoint to provide additional, conservative margin based on discussion with the inspectors. The effluent monitor had not yet been calibrated by the end of the quarterly inspection period.

No findings of significance were identified.

c. <u>Conclusions</u>

Instrumentation and control capabilities for the modified liquid effluent system aligned technical bases information provided in the licensee's engineering design change packages and included the necessary pedigree.

8.0 Exit Meeting

The inspectors presented the results of the inspection to Mr. Sauger and other licensee staff during an onsite meeting on April 24, 2014. The licensee acknowledged the results presented and did not identify any of the documents reviewed by the inspectors as proprietary.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

*J. Sauger, Site Vice President and General Manager
G. Bouchard, Vice President, Engineering, Operations & Nuclear Security
B. Wood, Vice President, Dry Cask Storage
*G. Myers, Projects Manager
*D. Hillyer, Fuels Manager
*D. (Nick) Williams, Vice President, Radiological and Environmental Controls
*G. Van Noordennen, Vice President, Regulatory Affairs
*T. Orawiec, Operations Manager
*D. Roth, Director, Engineering
*R. C. Keene, Director, Radiation Protection
*M. (Shawn) Miller, Manager, Fuel Transfer Operations
*A. Bejma, Manager, Quality Assurance
R. Williams, Manager, Fuel Engineering
*P. Hoppe, ALARA Manager
*S. Wholers, Regulatory Affairs

*Participated in exit meeting on April 24, 2014.

INSPECTION PROCEDURES (IPs) USED

IP 60855.1	Operation of an Independent Spent Fuel Storage Installation
IP 37801	Safety Reviews, Design Changes and Modifications
IP 40801	Self-Assessment, Auditing and Corrective Action
IP 71801	Decommissioning Performance and Status Review
IP 83750	Occupational Radiation Exposure
IP 84750	Radioactive Waste Treatment and Effluent Monitoring

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened & Closed	Type	Summary
None		

PARTIAL LIST OF DOCUMENTS REVIEWED

RWP 2014-1-1016, Operate and Maintain Water Filtration Systems Including Tri-Nuke System, Chip Collection System, Sludge Filtration & Resin Demineralization Systems, Revision 0

CR 2014-000206, Unexpected Interference With polar Crane Travel of Unit 2 Lower Internals, dated February 17, 2014

CR 2014-000264, Distance between Discharge Valve and Monitor in Liquid Waste Disposal System, dated March 3, 2014

CR 2014-000247, Previously Unaccounted for SNM in Unit 1 Containment, dated February 26, 2014

CR 2014-000253, ALARA Program Review, dated February 26, 2014

RWP 2014-0-0021 and ALARA Review, Waste Operations, Security, RP, D&D and Crane Support for Transfer of Liners, Revision 0

ALARA Review 11-0006, Segment and Package Unit 2 Reactor Internals, Revision 1

RWP 2014-1-1005/2014-2-2005, Operate, Maintain, Repair, Modify, Decontaminate All Segmentation Equipment, Revision 0

ALARA Review 2014-1-1016, Operate and Maintain All Water Filtration Systems in Unit 1, Revision 4

ZS-RP-103-001-001, ALARA Planning, Revision 1

ZS-RP-103-000-000, ALARA Program, Revision 2

ZS-RP-104-000-000, Radiological Work Control Program, Revision 4

ZS-RP-104-001-001, Radiation Work Permits, Revision 2

ZS-RP-105-001-005, Vertical Concrete Cask Radiation Survey, Revision 2

ZS-RP-105-001-006, Independent Spent Fuel Storage Installation Radiation Survey, Revision 2

QA Surveillance Report S-13-056, ALARA Program, dated November 26, 2013

Report of FASA No. 2012-008, Radiation Work Permits and Radiologically Controlled Area Access, dated May 9, 2012

Report of FASA Entitled ALARA Planning, dated July 16, 2013

Quality Audit Report No. A-13-001, Important to Defueled Condition Programs and Other Requirements

Non-Standard Lift Plan for Moving & Rotating the Unit 2 Lower Internals from the Maintenance Stand to the VRS Stand, Revision 2

ZRP-5821-50, Documentation and Control of Radiation Monitor Setpoints, Revision 11

Engineering Change No. 392999 and DSAR Change No. 2012-06, Liquid Waste Systems, Revision 11

50.59 Evaluation No. 2013-222, Liquid Waste Systems, Revision 0

Engineering Change No. 393000, Liquid Waste Release System, dated June 27, 2013
Engineering Change No. 00393659, Liquid Waste System Discharge Pumps, dated July 25, 2013

Engineering Change No. 396307, Flood Barrier Installation, dated December 3, 2013

Engineering Change No. 394539, HUT Level Indication, dated July 18, 2013

ZCP-421-1, Zion Station Liquid Release Documentation, Revision 25

SOI-3-APP D, Radwaste Water Processing System Valve Lineup, Revision 0

SOI-3H-1, Lake Discharge System Operations for Lake Release Tanks 1 & 2, Revision 0

SOI-3G, Radwaste Water Treatment System Operations, Revision 0

50.59 ZAP 510-19; Administrative Limitation on Raising and Lowering the Main Hoist in Specific Locations; Revision 2

CR-2013-001373; TSCDR-15 Closure Ring

CR-2013-001408; FTO- Discrepancy Between Water Totalizers During TSC Blowdown

CR-2014-000048; TSCDF-13 Closure Lid Seal Abnormality; Dated January 13, 2014

DVT-ZS-NMC; Direct Visual Inspection; Revision 5981-00

FHI-19; Handling Fuel with Spent Fuel Handling Tool; Revision 18

FHI-22 Fuel Handling Building Overhead Crane; Revision 20

HTPT-ZS-NMC; High Temperature Liquid Penetrant Examination; Revision 5981-00

Letter; Analysis to Address Wheel Equalization Issue in Zion Crane; Dated January 6, 2014

Letter; Liquid Penetrant Qualification at Nonstandard Temperatures: Qualification Number PT-1001

Letter; Rust Indications in HZ TSCDR-15; Dated January 3, 2013

NCR 2014-001; TSCDF-15 Outer Port Covers; Dated January 6, 2014

NCR-2013-014; TSCDF-15, Cell #13 Boral Retainer; Revision 0

STPT-ZS-NMC; Standard Temperature Liquid Penetrant Examination; Revision 5981-00

ZS-FT-200; General Welding Standard; Revision 1

ZS-FT-201; Welding Procedure Specifications and Qualifications; Revision 0

ZS-FT-2013-0015; Cask Loading Requirements Memorandum/General Information for Loading of 61 Fuel Cask at Zion; Revision 1

ZS-FT-2013-0035; Cask Loading Plan Data for Zion ISFSI Campaign; Revision 0

ZS-FT-202; Welder and Welding Operator Qualifications; Revision 1

ZS-FT-203; Weld Filler Material Control; Revision 1

ZS-FT-210; MAGNASTOR Canister Welding Standard; Revision 1

ZS-FT-400; Transportable Storage Canister Receipt Inspection; Revision 5

ZS-FT-401; TSC Loading Operations; Revision 0

ZS-FT-402; TSC Closure Operations; Revision 3

ZS-FT-403; VCC Loading Operations; Revision 0

ZS-FT-404; Site Transportation; Revision 0

ZS-FT-405; FTO Contingency Plans; Revision 2

ZS-FT-406; VCC Unloading Operations; Revision 0

ZS-FT-407; TSC Unloading Operations; Revision 0

ZS-FT-408; Dry Cask Storage Special Lifting Device Inspections; Revision 0

ZS-FT-409; Fuel Transfer Operations Lift Plans; Revision 0

ZS-FT-410; Vertical Cask Transporter Operation; Revision 2

ZS-FT-411; Annulus Circulating water System Operation; Revision 0

ZS-FT-412; Vertical Concrete Cask Pre-Use Inspections; Revision 3

ZS-RP-105-001-004; MTC TSC Radiation and Contamination Surveys; Revision 0

ZS-RP-105-001-005; VCC Radiation Survey; Revision 0

ZS-RP-105-001-006; ISFSI Radiation Survey; Revision 0