UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 E. LAMAR BLVD
ARLINGTON TX 76011-4511

January 21, 2016

Mr. Jeremy Browning, Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
1448 SR 333
Russellville, AR 72802-0967

SUBJECT: ARKANSAS NUCLEAR ONE, UNITS 1, 2, AND INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) – NRC INSPECTION REPORT 05000313/2015011, 05000368/2015011, AND 07200013/2015001

Dear Mr. Browning:

This letter refers to a routine inspection conducted on December 7-10, 2015, of the dry cask storage activities associated with your Independent Spent Fuel Storage Installation (ISFSI). The enclosed inspection report documents the inspection results which were discussed on December 10, 2015 with Mr. Terry Evans, General Manager of Operations, and other members of your staff.

The U.S. Nuclear Regulatory Commission (NRC) inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspection reviewed compliance with the requirements specified in the Holtec International HI-STORM 100 Certificate of Compliance No. 1014 and the associated Technical Specifications, the HI-STORM 100 Final Safety Analysis Report (FSAR), Energy Solutions VSC-24 Certificate of Compliance No. 1007 and associated Technical Specifications, Energy Solutions VSC-24 FSAR, and Title 10 of the Code of Federal Regulations (CFR) Part 72, Part 50, and Part 20. Within these areas, the inspection included a review of radiation safety, cask thermal monitoring, quality assurance (QA), your corrective action program, safety evaluations, observations of dry fuel loading activities, and changes made to your ISFSI program since the last routine ISFSI inspection that was conducted by the NRC.

NRC inspectors documented two violations of very low safety significance in this report. Both of these findings involved violations of NRC requirements and were determined to be Severity Level IV under the traditional enforcement process. Further, inspectors documented two licensee-identified violations which were also determined to be Severity Level IV violations of very low significance in this report. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the NRC Enforcement Policy.

If you contest the violations or significance of these NCVs, 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 IV; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC resident inspectors at Arkansas Nuclear One.

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

Should you have any questions concerning this inspection, please contact the undersigned at 817-200-1191 or Mr. Lee Brookhart at 817-200-1549.

Sincerely,

/RA/

Ray L. Kellar, P.E., Chief
Fuel Cycle and Decommissioning Branch
Division of Nuclear Materials Safety

Dockets: 50-313, 50-368, 72-13
Licenses: DRP-51 and NPF-6

Enclosure:
Inspection Report 05000313/2015011;
05000368/2015011; 07200013/2015001

w/attachments:
1. Supplemental Information
2. Loaded Casks at Arkansas Nuclear One ISFSI

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cc w/encl: Electronic Distribution

ML16021A485

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NAME	LBrookhart	ESimpson	RKellar		
SIGN	/RA/	/RA/	/RA/		
DATE	1/21/16	1/21/16	1/21/16		

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Letter to Jeremy Browning from Ray Kellar dated January 21, 2016

SUBJECT: ARKANSAS NUCLEAR ONE, UNITS 1, 2, AND INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) – NRC INSPECTION REPORT 05000313/2015011, 05000368/2015011, AND 07200013/2015001

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket:	05000313, 05000368, 07200013
Licenses:	DRP-51, NPF-6
Report Nos.:	05000313/2015011; 05000368/2015011, and 07200013/2015001
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Units 1, 2, and Independent Spent Fuel Storage Installation (ISFSI)
Location:	Junction of Hwy. 64 West and Hwy. 333 South Russellville, Arkansas
Dates:	December 7-10, 2015
Inspectors:	Lee Brookhart, RIV FCDB, Senior Inspector Eric Simpson, RIV FCDB, Inspector
Accompanied by:	Ray L. Kellar, P.E., Branch Chief
Approved By:	Ray L. Kellar, P.E., Chief Fuel Cycle and Decommissioning Branch Division of Nuclear Materials Safety

SUMMARY OF FINDINGS

IR 05000313/2015011, 05000368/2015011, and 07200013/2015001; 12/7–10/2015; Arkansas Nuclear One Units 1, 2, and Independent Spent Fuel Storage Installation (ISFSI); Routine ISFSI Inspection Report

The report covers an announced inspection by two regional inspectors. The significance of any Part 50 findings are indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." The cross-cutting aspect is determined using IMC 0310, "Components Within the Cross-Cutting Areas." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after the NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5, dated February 2014. In accordance with the NRC Enforcement Policy, all of the Part 72 ISFSI inspection findings follow the traditional enforcement process and are not dispositioned through the Reactor Oversight Process (ROP) or the Significance Determination Process.

NRC-Identified Findings and Self-Revealing Findings

- SL-IV. The inspectors reviewed a self-revealing non-cited violation of Certificate of Compliance (CoC) 1014 Technical Specifications (TS) Appendix B Table 2.1-1 I. D., for the licensee's failure to load fuel in accordance with the approved contents for the MPC-24 canister. Specifically, ANO loaded damaged fuel assemblies into MPC-24-060, which, were not authorized for loading into the MPC-24 canister. As a result, the licensee's Control Room Emergency Ventilation System (CREVS) activated due to the detection of noble gas (Krypton-85) from a damaged fuel assembly that had been loaded into a MPC-24 canister.

  The licensee's failure to load fuel in accordance with the license conditions is a violation of NRC requirements. Consistent with guidance in Section 2.2 of the NRC Enforcement Policy, ISFSIs are not subject to the significance determination process. Therefore, the violation was dispositioned per the traditional enforcement process. The inspectors used the NRC Enforcement Policy to evaluate the significance of this violation. Consistent with Section 6.0 of the NRC Enforcement Policy, the licensee failed to implement adequate controls over processes that are important to safety. This finding was determined to have a very low safety significance since subsequent evaluations demonstrated the MPC-24-060, containing the damaged fuel, will continue to meet all thermal, structural, criticality, retrievability and radiation protection requirements of 10 CFR Part 72 and the offsite dose limit requirements of 10 CFR Part 20. In accordance with Section 2.3.2.a. of the Enforcement Policy this Severity Level IV violation was treated as a non-cited violation. Since traditional enforcement was used to disposition the violation, there is not a cross-cutting aspect.

- SL-IV. The inspectors identified a non-cited violation of Certificate of Compliance 1014 Appendix B Section 3.5.2.2 for licensee's failure to perform inspections on their mobile lift device in accordance with license requirements. Specifically, ANO failed to perform frequent and annual inspections of the, important to safety, Vertical Cask Transporter (VCT) in accordance with ASME B30.5 "Mobile and Locomotive Cranes" requirements. As a result, the licensee utilized their mobile lifting device (VCT) to handle four canisters/casks from December 2014 through August 2015 without the performance of an annual or frequent crane inspection in accordance with ASME B30.5 requirements per the Certificate of

Compliance.

The licensee's failure to inspect their mobile lifting device in accordance with the license conditions is a violation of NRC requirements. Consistent with guidance in Section 2.2 of the NRC Enforcement Policy, ISFSIs are not subject to the significance determination process. The inspectors used the NRC Enforcement Policy to evaluate the significance of this violation. Consistent with Section 6.0 of the NRC Enforcement Policy, the licensee failed to implement adequate controls over the examination processes of equipment that is important to safety and the required annual inspections had not been placed into the licensee's procedures and never been performed prior to identification of the issue. This finding was determined to have a low safety significance since the licensee performed the required inspections, after the identification of the issue and the licensee did not identify any adverse conditions with the VCT. In accordance with Section 2.3.2.a. of the Enforcement Policy this Severity Level IV violation was treated as a non-cited violation. Since traditional enforcement was used to disposition the violation, there is not a cross-cutting aspect.

Licensee-Identified Violations

Two violations of very low significance, Severity Level IVs were identified by the licensee and had been reviewed by the inspectors. Corrective actions planned or taken by the licensee have been entered into the licensee's corrective action program. These violations and related corrective action tracking numbers are listed in Section 4OA7 of this report.

PLANT AND ISFSI STATUS

Arkansas Nuclear One's (ANO) Independent Spent Fuel Storage Installation (ISFSI) stored twenty-four Energy Solutions Ventilated Storage Cask (VSC) VSC-24 casks that had been loaded from 1996 to 2003. On the north side of the VSC-24 pad, ANO had loaded and stored 45 Holtec cask systems with room on the pad to store 3 more. For the Holtec casks, two canister designs were used at ANO. The Multi-Purpose Canister (MPC) MPC-24 canister stored a maximum of twenty-four assemblies. The MPC-32 canister stored a maximum of thirty-two assemblies. All Unit 1 spent fuel assemblies were stored in the MPC-24 canisters. Unit-2 spent fuel assemblies were stored in both the MPC-24 and MPC-32 canisters. The licensee used two versions of the Holtec HI-STORM concrete storage cask overpack designs at the ISFSI. The first twelve Holtec casks placed on the ISFSI pad utilized HI-STORM 100S overpacks (with nine MPC-24 canisters and three MPC-32 canisters). Since then, the HI-STORM 100S Version C overpacks have been used (containing 15 MPC-24 canisters and 18 MPC-32 canisters).

REPORT DETAILS

4. OTHER ACTIVITIES

4OA5 Other Activities

.1 Operations of an Independent Spent Fuel Storage Installation at Operating Plants (60855.1)

a. Inspection Scope

(1) Quality Assurance (QA) Audits and Surveillances

NRC inspectors performed an on-site review of ISFSI related QA audit, vendor audit, and QA surveillance reports issued since the last inspection at ANO in December 2013. Since the last NRC ISFSI inspection, the licensee had issued one ISFSI QA audit report, two follow-up surveillance reports, and participated in one Nuclear Procurement Issues Committee (NUPIC) audit of Holtec International and its facilities.

A QA audit of ISFSI operations was performed from August to October of 2014. Audit Report QA-20-2014-ANO-01 was issued on October 17, 2014. The QA audit report looked into ISFSI elements of licensing, design, fuel selection, campaign, operational surveillance, corrective action, and organizational effectiveness (leadership and management). Nine condition reports (CRs) and one quality assurance finding were issued as a result of the QA audit. A few of the more noteworthy conditions identified in the QA audit were inadequate receipt, inspection, and storage of ISFSI components; inadequate review of license basis document changes received from the dry fuel storage vendor (Holtec, Int'l.) as required by procedure; and the loss of records documenting helium drying and backfill for one loaded cask on the ISFSI pad (see Section 40A7.1 for additional details). NRC inspectors reviewed the condition reports along with the audit identified problems and determined that ANO properly categorized the issues based on their safety significance and applied adequate corrective actions (CAs) to address the concerns. Overall, the licensee did not identify any findings that were classified as

significantly adverse to quality and none of the conditions identified individually or in aggregate were determined to be indicative of significant programmatic weaknesses that would impact the effectiveness of ISFSI quality related activities. The QA audit determined that the overall rating for the dry fuel storage program at ANO was marginally effective.

In addition to the quality assurance audit, two quality assurance surveillances were conducted. Surveillance Report QS-2015-ANO-022, dated May 28, 2015 and Surveillance Report QS-2015-ANO-032, dated September 15, 2015 provided follow-up reports on a previously identified quality assurance finding. Both Surveillance Reports were performed in response to the QA audit identified problems with receipt, inspection, and storage of ISFSI components. QS-2015-ANO-022 found that the finding was being adequately dispositioned and that appropriate corrective actions had been assigned. However, at the time of the first surveillance, only ten of the original 13 related CAs had been closed. QS-2015-ANO-032 was performed as an additional follow-up to the same QA finding. It concluded that appropriate CAs had been implemented to ensure long-term effectiveness and no additional follow-up beyond routine oversight would be required. In the end, 20 CAs had been assigned to address the problem and all 20 were closed.

The NRC inspectors reviewed one NUPIC vendor audit that Entergy (ANO's parent company) had participated in since the last NRC inspection. NUPIC Joint Audit of Holtec International, Marlton, NJ, (NUPIC Audit #23509) was issued on January 17, 2014. That vendor audit was performed on Holtec International from October to December 2013 and included its Marlton, NJ; Turtle Creek, PA; Orrville, OH; and Nanotech facilities in Lakeland, FL. During the audit, only one administrative issue was noted which affected items procured for use at ANO in the construction of their cask transfer facility.

The QA audit reports, surveillances, and vendor surveillances resulted in several CRs. NRC inspectors reviewed the corrective actions resulting from the CRs to see whether the identified deficiencies were properly categorized based on their safety significance and properly resolved. All identified deficiencies had been properly categorized and resolved by the licensee.

(2) Radiological Conditions Related to Stored Casks

The ANO ISFSI was located approximately 800 feet northeast from the center of the two unit reactor site inside the reactor site's protected area (PA). There were three ISFSI pads, roughly 420 feet in combined length, aligned in a north/south orientation. The southernmost pad contained 24 Energy Solutions VSC-24 casks in a 3 by 8 array. The center and northernmost pads contained Holtec HI-STORM 100 casks. The northernmost pad held twelve casks in a 2 by 6 array. The central pad had 33 casks stored in an incomplete 3 by 12 array. The ISFSI boundary was properly posted as a Radiation/Radioactive Materials Area. No flammable or combustible materials, debris, or notable vegetative growth were observed on or in close proximity to the ANO ISFSI. Sixty-nine casks, total, were loaded with spent fuel at the time of the inspection. The current ISFSI loading campaign planned to add two additional casks to the pad this year, bringing the total to 71. The NRC inspectors found all 45 Holtec casks to be in excellent physical condition with few signs of degradation. The 24 VSC-24 casks were all intact, but many showed signs

of concrete weathering, including cracking, many with noticeable efflorescence staining around the cracks. The concrete weathering issues were being tracked and addressed by the licensee through CR-ANO-C-2012-0577 (see Section 8, "HI-STORM 100, VSC-24, and ISFSI Yearly Maintenance," for more discussion on the condition of the VSC-24 casks).

Inspectors reviewed the radiological conditions of the ANO ISFSI through documentation of the most recent radiological survey and three years of thermoluminescent dosimeter (TLD) area monitoring data from an area adjacent to the ISFSI. TLD monitoring locations for the ISFSI were equally spaced and aligned along the east side of the ISFSI boundary fence.

A radiation protection (RP) supervisor accompanied the NRC inspectors during a walk-down of the ANO ISFSI. A radiological survey was performed by one of the NRC inspectors using a Thermo Scientific RadEye-G Geiger-Mueller detector (NRC #46789G, calibration due 10/27/2016) to record gamma exposure rates in microroentgens per hour (μR[1]/h). Confirmatory survey measurements were taken at the ISFSI entry fence, around the perimeter of the three ISFSI pads, and at selected areas on the pad and between the stored casks.

General area gamma background outside of the ISFSI boundary was approximately 6 μR/h. Upon arrival at the ISFSI site entry location at its west fence, ambient radiation levels rose to near 330 μR/h. Radiation levels on the ISFSI pad storing the older Energy Solutions VSC-24 casks ranged from 150 μR/h at the outer corners of the pad to 900 μR/h between casks. The second ISFSI pad (center) that stored the more numerous and newer Holtec HI-STORM 100 casks ranged from 220 μR/h at its outer corner locations to 2.1 mR/h in central locations between loaded casks. Finally, the third pad, where twelve Holtec HI-STORM 100 casks were stored, ranged from 250 μR/h to 1.7 mR/h. Based on the exposure rates measured and the contents of the storage casks, the postings on the ISFSI met the requirements of 10 CFR Parts 20.1902(a) and 20.1902(e), posting requirements for radiation areas and radioactive material areas, respectively. The measurements taken by the NRC inspector confirmed the measurements recorded on the most recent ISFSI site survey. The radiological conditions in and around the ISFSI were typical for vertical storage casks of the age and heat-load of the 69 casks loaded at the time of the inspection.

The licensee provided personnel dose information associated with the casks loaded during the previous and current ISFSI loading campaigns of 2014 and 2015. The information provided was the aggregate dose accumulated per cask loaded, which included all functional activities involved in cask loading operations. The loading of the most recent eight casks presented occupational exposures that ranged from 0.242 to 0.625 person-rem per cask (see Attachment 2 of this report), averaging 0.451 person-rem. Personnel doses due to dry fuel storage operations have tended to stabilize at ANO, with no notable upward or downward trending. Looking at the

[1] For the purposes of making comparisons between NRC regulations based on dose-equivalent and measurements made in Roentgens, it may be assumed that one Roentgen equals one rem. (http://www nrc.gov/about-nrc/radiation/protects-you/hppos/qa96 html)

data presented on Attachment 2 of this report, shows a casual correlation between the heat load of the fuel and person-rem dose received. NRC inspectors observed during loading operations that radiation protection (RP) did a good job of keeping unnecessary personnel away from cask loading operations, which represents a good RP practice and adherence to as low as reasonably achievable (ALARA) standards.

(3) Environmental Radiological Monitoring Program

The primary purpose of the ANO Radiological Environmental Monitoring Program (REMP) was to evaluate the radiological impacts that reactor operations and stored radioactive materials had on the local environment. The REMP focused on measuring airborne (gaseous and particulate), liquid effluent, and direct radiation levels at or near the site boundary and at selected offsite locations. By design, there were no airborne or liquid effluents released from the ANO ISFSI. However, the ISFSI was responsible for measurable direct radiation levels produced on site.

The REMP monitored direct radiation impacts locally and offsite using TLDs. The ISFSI site was also monitored using TLDs along its eastern boundary. The monitoring data for the ISFSI and the REMP were handled by two different site programs for different purposes. The ISFSI-specific TLD monitoring was performed by the Area Monitoring Program to track radiological exposures at the ISFSI boundary and to ensure that NRC occupational limits for unmonitored individuals were not exceeded.

TLDs were placed at four monitoring locations on the ISFSI eastern outer fence, where they could be easily accessed outside of the ISFSI boundary. The TLDs were collected and replaced semi-annually. The monitoring results from 2012, 2013, 2014, and 2015 for those locations were reviewed by NRC inspectors. That data has been reproduced in Table 1, below.

Table 1 TLD Monitoring Results for ANO ISFSI Pad (mrem per 6 month period)

	TLDs Nearest the VSC-24 Casks		TLDs Nearest the HI-STORM Casks	
Time Period	**TLD #34**	**TLD #35**	**TLD #62**	**TLD #63**
1st semi-annual 2012	296	382	584	680
2nd semi-annual 2012	319	383	567	730
1st semi-annual 2013	262	348	474	611
2nd semi-annual 2013	281	355	527	754
1st semi-annual 2014	289	372	571	657
2nd semi-annual 2014	284	343	542	754
1st semi-annual 2015	300	364	576	671

The highest reported and measured dose rate was recorded at the TLD #63 location, which is the farthest north monitoring location along the eastern ISFSI fence. That location is associated with the newer HI-STORM casks, as can be seen in the Table 1 (above). The semi-annual values for this location was 754 mrem accrued over 4536 hours. This values then divides out to 0.17 mrem/h. Applying an occupational occupancy exposure duration of 2000 work hours per year

produces a worst case annual occupational dose of 340 mrem per year in that location. Even so, this shows that accessible areas of the ISFSI fall below the 10 CFR 20.1502(a)(1) limit for unmonitored individuals, which is 500 mrem per year.

REMP monitoring was performed to provide an annual assessment of ANO's total impacts to the local environment. Those impacts included the direct radiation contributions of the ISFSI. The yearly results of the REMP were issued in the ANO Annual Radiological Environmental Operating Report (AREOR). The NRC inspectors reviewed the ANO AREORs for 2013 (ML14120A493), issued April 30, 2014 and 2014 (ML15132A129), issued May 12, 2015.

The ISFSI was located approximately 800 feet from the center of the two unit reactor site in the in the northeast REMP monitoring sector. There is one TLD monitor in that sector and two more in the adjacent sectors. To see whether the presence of the ISFSI is influencing radiological dose near the site boundary, inspectors reviewed the annual results for the three closest REMP TLD monitoring locations, TLD #146 in the NE sector, TLD #145 in the NNE sector, and TLD #147 in the ENE sector (see Table 2, below). Each of these monitoring locations were about 0.6 miles from the reactor site, but somewhat closer to the ISFSI pad.

Table 2, REMP Monitoring Results near ISFSI in mrem/yr

TLD	Station and Location	2013	2014
#145	North-northeast sector, 0.6 miles from reactors	33.3	32.3
#146	Northeast sector, 0.6 miles from reactors	34.4	31.8
#147	East-northeast sector, 0.6 miles from reactors	28.7	26.9
#7	South-southwest sector, 19 miles from reactors (control)	27.2	24.3

The most elevated REMP TLD measurement near the site boundary and in close proximity to the ISFSI in 2013 was TLD #146 in the NE sector, 34.4 mrem. The average background (control) dose measurement for 2013 was 27.2 mrem. Correcting TLD #146 for background yielded a net dose of 7.2 mrem for 2013. For 2014, the most elevated REMP TLD measurement near the site boundary and in close proximity to the ISFSI was TLD #145 in the NNE sector, 32.3 mrem. Performing a similar background subtraction for TLD #145 showed a net annual dose at the site boundary of 8 mrem. Both values were well below the 10 CFR 72.104 (a) dose standard, which limits total radiation from the ISFSI to less than 25 mrem per year above background at the owner controlled boundary.

It should be noted that for 2013 and 2014, ANO's AREORs concluded that indicator TLD measurements at site boundary locations continued to be similar to historical averages, including measurements recorded prior to plant or ISFSI operations. It can be concluded that offsite dose due to the radiological influence of the ISFSI, if any, were well below regulatory limits.

(4) Records Related to Fuel Stored in the Casks

NRC performed a review of the dry fuel storage records for nine casks loaded at ANO since the last full routine ISFSI inspection to determine whether adequate descriptions of the spent fuel were documented as a permanent record, as required by 10 CFR 72.212(b)(12). The spent fuel contents of the nine most recently loaded

HI-STORM casks (including the one loaded at the time of the current inspection), were reviewed by looking at records from two information sources: Entergy Procedure EN-DC-215, "Fuel Selection for Holtec Dry Cask Storage," Rev. 5 and a series of Excel spreadsheet where various fuel assembly data was compiled for each loaded cask. These documents contained MPC loading maps and fuel assembly specific information such as qualification data, identification, decay heat (kW), cooling time (years), average U-235 enrichment (%), burn-up values (MWd/MTU), and other information. A complete set of records was reviewed for nine of the 46 Holtec HI-STORM 100 casks loaded at ANO. Some of that fuel data is tracked along with other information on Attachment 2 of this inspection report.

The licensee was in compliance with all applicable Technical Specifications and FSAR requirements for spent fuel stored at their ISFSI and all regulatory requirements for retrievability of cask records.

(5) Cask Temperature Monitoring (TS 3.1.2 for HI-STORM and TS 1.3.1 for VSC-24)

For the Holtec casks, Technical Specification (TS) 3.1.2 of CoC No. 1014 required either a daily inspection of the inlet and outlet vents for blockage or daily verification that the temperature difference between the HI-STORM outlet temperature and the ISFSI ambient temperature was less than ≤ 155 degrees F for all casks loaded under CoC 1014, Amendment 5. None of the 45 HI-STORM 100 casks stored at ANO were equipped with temperature monitoring equipment. As such, the licensee performed daily vent inspections to comply with TS 3.1.2. For the Energy Solutions casks, Technical Specification 1.3.1 of CoC No. 1007 also required a daily inspection of the VSC-24 inlet and outlet vents for blockage to ensure adequate cooling. The vent inspection surveillances for both the HI-STORM and VSC-24 casks were verified by the NRC inspectors who reviewed randomly selected surveillance logs for the months of February 2014, January 2015, and July 2015. Of the three months selected for review, the surveillance requirement was met and no cask vents were reported as being blocked. No issues were identified and ANO was in compliance with the technical specification surveillance requirements for the Holtec HI-STORM 100 and Energy Solutions VSC-24 systems.

(6) Corrective Action Program

A list of condition reports, issued since the last NRC inspection conducted in December 2013, was provided by the licensee for ISFSI operations and the cask handling crane. Of this list, 49 CRs were selected by the NRC inspectors for further review. The conditions identified covered a broad range of issues. Based on the range of issues identified, the licensee demonstrated a suitably low threshold for placing issues into the corrective actions program. Corrective actions and final resolution of the issues were appropriate to the safety significance of the issue. No significant trends were identified during the review of the Corrective Action Program. Noted conditions were processed in accordance with Entergy Procedure EN-LI-102-ANO-RC, "Corrective Action Program," Rev. 1. No NRC safety concerns were identified related to the condition reports reviewed.

(7) Preparation for Loading Activities

The inspectors requested documentation related to maintenance of the fuel building cask handling crane, the annual maintenance of the licensee's special lifting devices, and the calibration of various gauges associated with the loading activities.

Documents were provided that demonstrated the fuel building cask handling crane was inspected on an annual basis in accordance with the requirements of the American Society of Mechanical Engineers (ASME) B30.2 prior to the 2015 loading campaign. ANO utilized Work Order (WO) 00167502-01 for the crane inspection, with a due date of January 5, 2015. The annual crane maintenance work was completed on December 17, 2014.

The annual maintenance as required by American National Standards Institute (ANSI) N14.6 for special lifting devices was completed for the following special lifting devices (SLDs): the HI-TRAC lifting trunnions, lift yoke, and the MPC lift cleats. Documentation reviewed included WO #52457295 and Procedure 3406.003, "Inspection and Test of Special Lifting Devices Utilized for Dry Fuel Storage Activities," Rev. 4. All tested equipment passed the visual inspection, the dimensional testing, and either the magnetic particle or liquid dye penetrant inspection.

Prior to NRC's arrival onsite, a condition report was written (CR-ANO-C-2015-04664) in response to the licensee discovering that they had not placed the HI-TRAC lift links and HI-STORM lift brackets used with the vertical cask transporter (VCT) into Procedure 3406.003 to be annually tested with the other SLDs in accordance with ANSI 14.6 requirements. Since they were not included in the procedure governing the annual testing, they had not been tested since they were qualified by the vendor in 2013. The CR corrected the procedure and the lift brackets were inspected and passed inspection satisfactorily (see Section 4AO7.2 for additional details).

During the inspection of heavy lift equipment's annual maintenance, the NRC inspectors identified that the Vertical Cask Transporter (VCT) had not received an annual inspection in accordance with TS 3.5.2. (see Section 4AO5 b.(2) for additional details).

(8) HI-STORM 100, VSC-24, and ISFSI Yearly Maintenance

Final Safety Analysis Report (FSAR), Section 9.2, "Maintenance Program," specified the HI-STORM annual maintenance schedule in Table 9.2.1. The maintenance schedule required an annual visual inspection of the storage cask's external surfaces and identification markings for signs of damage or degradation. ANO issued condition report CR-ANO-C-2014-02536 on October 1, 2014 to identify that ANO had issued Procedure 3406.004, "Exams/Tests of Loaded HI-STORM Overpacks during Storage Operations," Rev. 1 in 2003. This procedure outlined annual inspection criteria from the FSAR Table 9.2.1 for their Holtec HI-STORM 100 casks. However, Procedure 3406.004 had never actually been used at ANO. So the annual inspections had not taken place. The failure to follow the procedure to perform the annual visual inspections resulted in a minor violation of 10 CFR 72.150. Although this issue should be corrected, it constitutes a violation of

minor significance that is not subject to enforcement action in accordance with Section 2 of the NRC Enforcement Policy. The licensee identified the shortcoming and issued a CR to address the unmet FSAR requirements. Corrective actions (CAs) included (1) determination of the correct vehicle to ensure that the annual external visual inspections are accomplished; (2) to revise or delete Procedure 3406.004, Rev. 0; (3) ensuring that an appropriate scheduling tool was used to accomplish the required inspections; and (4) issuance of an additional CR to document the missed annual inspections. The first annual inspection of the Holtec HI-STORM 100 casks is scheduled for January 25, 2016.

Energy Solutions CoC No. 1007, Technical Specification 1.3.2, “Exterior VSC Surface Inspection,” required an annual inspection of the 24 concrete VSCs for damage such as chipping or spalling of the concrete on the outer surface of the cask. If defects larger than ½ inch in diameter and deeper than ¼ inch were found, repair of the defect was required by re-grouting. The most recent annual inspection was reviewed. The 2015 inspection was performed using WO #52565606-01 and completed on June 25, 2015. Of the twenty-four casks, 5 had some level of grout repair completed for pop-out defects meeting the aforementioned criteria. The status of several cracks were also reviewed that had been previously identified. Cracks that ≤ 1/16 inch were noted and labeled as "shrinkage cracking." All 24 VSC-24 casks had some level of shrinkage cracking taking place. Casks with cracks > 1/16 inch were designated as experiencing "deterioration by cracking." Six out of 24 casks were deteriorating by cracking.

All of the VSC-24s exhibited external concrete salt/mineral staining from efflorescence. Efflorescence staining in and of itself does not influence the integrity of concrete. The licensee was concerned, however, that the efflorescence noted on the VSC-24 casks was evidence of decalcification of the concrete, which may weaken the casks.

Condition Report CR-ANO-C-2015-02297 was issued on June 30, 2015 to document that six VSC-24 casks had shown indications of crack growth since the inspection of the previous year. This CR was closed to a previously issued condition report, CR-ANO-C-2012-0577, that was opened in response NRC Information Notice IN-2011-20, "Concrete Degradation by Alkali-Silica Reaction (ASR)," issued by the NRC for licensees to investigate the possibility of alkali-silica reactions in plant concrete structures. The licensee determined that the VSC-24 casks showed signs that they were strong candidates for possible ASR reactions due to their cracking and degradation patterns. Part of the corrective actions associate with CR-ANO-C-2012-0577 included nondestructive testing for ASR on the VSC-24 casks. Non-destructive tests were performed and the results were inconclusive. Destructive testing would have definitively determined whether ASR was a problem with the casks, but the concrete needs to remain intact to perform its functions. Additional corrective actions (CAs) were indicated, included sealing the casks against further water intrusion. CAs also included other steps to mitigate the progress of the ASR degradation. Those additional steps had not been decided at the time of the NRC inspection, but will likely become part of the long term aging management plan for the VSC-24s. This VSC-24 degradation CR remains open.

(9) Fuel Loading Issues

The NRC inspectors reviewed issues that ANO experienced in loading campaigns performed in 2014 and 2015. During the 2014 campaign, ANO discovered that one or more of the fuel assemblies loaded into MPC-24-060 contained a fuel assembly with a defect assumed to be larger than a pinhole leak or hairline crack (see Section 4A05 b.(1) for additional details).

A similar issue occurred on August 21, 2015, when ANO's process radiation monitor for Unit 2 Spent Fuel Area Exhaust received a trip. This alarm occurred during the process of decreasing the helium from phase 1 operations (54 psi) to phase 2 operations (14 psi) during the Forced Helium Dehydration drying of canister, MPC-32-275. ANO initiated a Condition Report (CR-ANO-2-2015-02402). ANO's chemistry group obtained a gas sample from the condensate discharge line to the spent fuel pool just above water level, which the licensee stated was representative of the MPC atmosphere. The sample was characterized and detected fission product gas Krypton 85 (Kr-85). ANO's reactor engineering group verified the MPC-32-275 only contained fuel assemblies that were either discharged after operating in a failure-free cycle or were in-mast sipped to confirm no fuel contained defects and all assemblies had been visually examined for evidence of cladding damage. The licensee forwarded the fuel data to their corporate office for an additional review, which confirmed that based on fuel operating records, in mast sipping records, and visual observations, the fuel would be classified as intact fuel. The licensee's fuel analysis group concluded that if the failure was from a cycle declared failure-free, there was still a potential that a very tight (pinhole) fuel failure could be missed by the radio-chemistry. Larger failures would be much more readily detectable and not likely to have been missed. Larger cladding failures, which would classify the fuel as damaged, would be much more easily detectable by the sipping. Hence, any failure missed by the in-mast sipping would be expected to be very tight (pinhole). The licensee concluded, any failure from a declared failure-free cycle or missed by in-mast sipping would be expected to be a pinhole leak. The Holtec license (CoC 1014) defines intact fuel assemblies as fuel without known or suspected cladding defects greater than pinhole leaks or hairline cracks and can be handled by normal means. Based on their review, ANO concluded, that MPC-32-275 met the license conditions and contained intact fuel assemblies. The condition discovered did not affect the physical or structural integrity of the MPC and the canister was still capable of performing its design function.

On September 3, 2015, the US NRC Region IV and NRC Headquarters' Division of Spent Fuel Management (DSFM) staff held a teleconference with ANO representatives to discuss the event (ML15279A503). ANO representatives explained the situation and provided the NRC with the in-mast sipping results from the assemblies placed into the canister. The NRC questioned the licensee to determine if ANO had conducted an adequate evaluation and if the fuel met the license conditions for intact fuel. The licensee clarified that the sipping results were provided by the fuel vendor. The staff requested the sipping traces for all assemblies loaded into the cask for further review. The licensee further clarified that an analysis on cumulative Kr-85 release was not performed, as the licensee relied on fuel selection data, such as fuel cycle chemistry and sipping data, to determine if fuel met CoC technical specifications. The licensee also stated that inlet/outlet temperature indicators were within the according procedures with no indication of anomalous

temperatures spikes.

After review of the information provided by the licensee, DSFM and Region IV staff discussed the information on September 14, 2015. NRC fuel experts from the DSFM concluded that the licensee had provided sufficient evidence for the Agency to conclude that any defects present on the fuel cladding of assemblies loaded into MPC-32-275 would be no larger than a pinhole leak or a hairline crack. Additionally, the licensee confirmed that the canister had remained under a helium atmosphere, which would limit the potential for the fuel cladding to undergo unanticipated oxidation. Per the licensee's description of temperatures measured from drying inlet/outlet readouts, there was no evidence that peak cladding temperatures exceeded those defined in the design bases, consistent with guidance in Interim Staff Guidance (ISG) -11, Rev. 3. The staff reviewed the sipping traces of all assemblies and confirmed no anomalies in the data that would contradict the licensee's conclusions on fuel selection. In conclusion, Agency representatives from DSFM and Region IV found sufficient documentation to conclude that the fuel in MPC-32-275 met the Certificate of Compliance 1014 requirements for "intact" fuel and that the canister was suitable for storage under the licensee's general Part 72 license without the need for the licensee to request an exemption request.

(10) Cask Loading Observations

Due to operational delays and equipment malfunctions in dry cask storage operations, NRC inspectors only observed a minimal number of dry cask processing evolutions during the routine inspection at ANO. ANO was in the process of performing closure and drying operations on a canister that was to be installed in HI-STORM 100 cask #46. This cask would increase the total number of casks stored on the ANO ISFSI to 70.

When NRC arrived onsite, ANO was in the process of performing the hydrostatic pressure testing of the Holtec MPC. The automated welding of the lid to canister shell had already occurred. NRC Inspectors observed the pressure test and the post-hydro liquid dye penetrant examination for weld defects. The inspectors were also present during phase-1 of the forced helium dehydration (FHD) for the fuel contents of the MPC. FHD was taking longer than usual because of equipment malfunctioning. As a result, the inspectors had exited the site long before the MPC was downloaded into the HI-STORM overpack and made its way onto the ISFSI pad. Holtec HI-STORM 100 cask #46 was eventually placed onto the ISFSI pad on December 18, 2015.

b. Findings

(1) Failure load fuel in accordance with Certificate of Compliance 1014 requirements

Introduction: The inspectors reviewed a self-revealing, Severity Level IV, non-cited violation (NCV) of Certificate of Compliance (CoC) 1014 Technical Specifications (TS) Appendix B Table 2.1-1 I. D., for the unauthorized loading of a damaged fuel assembly into a MPC-24 canister. As a result, the licensee's Control Room Emergency Ventilation System (CREVS) was activated due to the detection of noble gas (Krypton-85) from a damaged fuel assembly that had been loaded into a MPC-24 canister.

Description: On September 12, 2014, ANO was in the process of drying the loaded canister, MPC-24-060, when the licensee's CREVS actuated. The licensee's investigation into the cause of the CREVS actuation led to the sampling of the helium circulating through the MPC as part of the Forced Helium Dehydration (FHD) drying process. Sample results indicated the presence of Krypton-85 (Kr-85). Kr-85 is a fission product, which indicates that one, or more, of the fuel assemblies that were loaded into the MPC were damaged.

ANO was using FHD operations to dry a 15 kW heat load MPC-24 canister loaded with ANO Unit 1 fuel. During the FHD drying process, helium was processed through the MPC in a closed loop arrangement to dry the fuel and remove all moisture. As drying continues, FHD pressure is lowered (from 50 psig to 15 psig) and the small amount of collected moisture from an accumulator tank is removed by venting the closed system into a drain. ANO drained this excess moisture/gaseous mixture into the Spent Fuel Area floor drain which is part of the reactor plant's liquid collection system. The floor drain used for venting the FHD system was in close proximity to the ventilation radiation monitor which actuated the licensee's CREVS. The radiation monitor alarmed at just slightly above its set-point (300 counts). Background radiation levels in the area were typically 80-100 counts and the monitor alarmed at 310 counts. Based on the very small amount of radioactivity detected, personnel radiation exposure was not of concern and all radioactivity was confined within the reactor facility. The licensee took two samples from the MPC system as part of the alarm investigation. Kr-85 levels within the samples were found to be 1.54 E-3 µci/ml and 3 E-4 µci/ml.

Holtec Certificate of Compliance Appendix B Table 2.1-1 I. D only authorizes intact fuel assemblies to be loaded into a MPC-24 canister. Intact fuel is fuel without known or suspected cladding defects greater than pinhole leaks or hairline cracks, and can be handled by normal means. ANO screened fuel for damage using fuel sipping results or if the fuel was older (before the era of sipping results) passed an ultrasonic testing (UT) examination. Additionally, ANO visually inspects all fuel assemblies with remote operated underwater cameras for indications of rod damage prior to loading each assembly into a canister. ANO precludes any assembly from dry cask loading if that assembly does not pass either the fuel sipping test, the UT test, or the visual examination.

The licensee placed this issue into their corrective action process (CR-ANO-1-2014-01484). Corrective actions included operations to continue placing the canister into a safe an analyzed condition. ANO completed the drying, helium backfill, and welding operations and left the canister within the Fuel Handling Building. In accordance with CoC TS Appendix A Section 2.2, ANO notified the NRC Operations Center within 24 hours of the issue (Event Notification# 50454) and submitted a special report to the NRC within the 30 day time limit (ML14286A037).

Since ANO violated the conditions of the Holtec CoC, the sealed canister, MPC-24-60, remained in the licensee's Fuel Building until it was either unloaded by the licensee or ANO received a license exemption to allow the canister to be stored at the site's ISFSI. ANO chose to request a NRC license exemption and submitted that request to the NRC on October 2, 2015 (ML14279A46). ANO received the exemption request on December 19, 2014 (ML14351A261).

Although ANO tested all fuel assemblies with acceptable methods (in-mast sipping and

UT examination), and were visually inspected for indications of rod damage and other potential issues before being loaded into the canister, due to the presence of noble gas, ANO concluded that a fuel assembly with a defect greater than a pinhole leak or hairline crack may had been loaded into MPC-24-60. ANO attributed the damaged assembly to a failure of ultrasonic testing, which has a lower percentage of accuracy of identifying leaking fuel assemblies than the in-mast sipping method. ANO analysis stated the most likely source of the Kr-85 gas was from a single breached rod in one fuel assembly and was unlikely that the cladding defects would allow fuel pellets to be release into the canister cavity. Nevertheless, evaluations were submitted that addressed the thermal, criticality, and shielding conditions of a MPC with multiple breached fuel rods and fuel pellets released into the canister cavity. Applicable structural and accident evaluations were also submitted to the NRC for review. Based on NRC's review, the staff concluded that the MPC-24-060 loaded with fuel assemblies classified as having defects greater than pinhole leaks and hairline cracks will continue to meet the thermal, structural, criticality, retrievability and radiation protection requirements of 10 CFR Part 72 and the offsite dose limits of 10 CFR Part 20. Therefore, the NRC staff concluded that the exemption request by the licensee to store MPC- 24-060 in its as-loaded configuration will not endanger life or property or the common defense and security. However, even though, ANO was granted this exemption (ML14351A261) for storage of the canister, a licensee must verify the contents of a canister are appropriate under a Part 71 transportation license prior to shipment of that canister off-site. So far, damaged fuel assemblies not placed in a damaged fuel can prior to being inserted into a MPC have not been authorized as approved contents for transportation by any Part 71 Certificate of Compliance.

Analysis: The licensee's failure to load spent fuel assemblies in accordance with the approved contents, as required by Certificate of Compliance 1014 Appendix B Table 2.1-1 I. D was determined to be a Severity Level IV violation of the NRC requirements. Consistent with guidance in Section 2.2 of the NRC Enforcement Policy, ISFSIs are not subject to the significance determination process. Therefore, the violation was dispositioned per the traditional enforcement process using Section 2.3 of the Enforcement Policy. The inspectors used the NRC Enforcement Policy to evaluate the significance of this violation. Consistent with Section 6.0 of the NRC Enforcement Policy, the licensee failed to implement adequate controls over processes that are important to safety. This finding was determined to have a very low safety significance since evaluations demonstrated the MPC-24-060 will continue to meet all thermal, structural, criticality, retrievability and radiation protection requirements of 10 CFR Part 72 and the offsite dose limits of 10 CFR Part 20. This finding was found to be more than minor because ANO's failure to load fuel in accordance with the approved contents impacted the regulatory process by the issuance of an exemption request. Since traditional enforcement was used to disposition the violation, there is not a cross-cutting aspect.

Enforcement: Certificate of Compliance 1014 Appendix B Table 2.1-1 I. D states, damaged fuel assemblies and fuel debris are not authorized for loading in the MPC-24. Contrary to the above, in September 2014, the licensee loaded one or more damaged fuel assemblies into MPC-24-060. As a result, the licensee's CREVS was activated due to the detection of noble gas (Krypton-85). NRC inspectors determined this violation to be a Severity Level IV violation of the NRC regulations. Because the licensee entered the issue into their corrective action program, the safety significance of the issue was very low, and the issue was not found to be repetitive or willful, this Severity Level IV

violation was treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. ANO's corrective actions (CR-ANO-1-2014-01484) taken to restore compliance included performing evaluations in support of a license exemption request; receiving an exemption request from the NRC to store MPC-24-060 under their general Part 72 license; providing the required notifications and special reports to the NRC; performed an Apparent Cause Evaluation; removed fuel assemblies from the approved list of assemblies that could be loaded into a MPC that had been examined for cladding damage based on UT measurements; added MPC-24-060 to the list of canisters that are not currently suitable for shipment off site without further evaluation; and made changes to the loading procedures and processes to vent the FHD system into the spent fuel pool to ensure adequate monitoring of Kr-85.

NCV 07200013/201501-01, "Failure load fuel in accordance with Certificate of Compliance 1014 requirements."

(2) Failure to inspect the Vertical Cask Transporter in accordance with Certificate of Compliance 1014 requirements

Introduction: The inspectors identified a, Severity Level IV, non-cited violation (NCV) of Certificate of Compliance (CoC) 1014 Appendix B Section 3.5.2.2, for licensee's failure to perform frequent and annual inspections of the, important to safety, Vertical Cask Transporter (VCT) in accordance with ASME B30.5 "Mobile and Locomotive Cranes" requirements. As a result, the licensee utilized their mobile lifting device (VCT) to handle four canisters from December 2014 through August 2015 without the performance of an annual or frequent crane inspections in accordance with ASME B30.5 requirements per the CoC.

Description: ANO's VCT is an important to safety piece of equipment, which performs the downloading of a loaded MPC from a HI-TRAC transfer cask to the HI-STORM 100 overpack and lifts the loaded HI-STORM 100 overpack out of the licensee's Cask Transfer Facility (CTF).

From December 2014 through August 2015, the licensee loaded four canisters/casks to the ANO ISFSI with the VCT without the performance of frequent or annual crane inspections in accordance with the Certificate of Compliance requirements. ANO had been using Procedure 3403.004 "HI-STORM 100 System Equipment Preparation," Revision 13, Supplement 4 "Vertical Cask Transport Operation," to perform pre-start checks/inspections on the VCT prior to use. NRC inspectors identified that the pre-checks/inspections contained within the procedure did not comply with the CoC by meeting the ASME B30.5 requirements for the frequent or annual inspection criteria.

Analysis: The licensee's failure to establish appropriate work instructions to inspect the VCT in accordance with the Certificate of Compliance was determined to be a Severity Level IV violation of the NRC requirements. Consistent with guidance in Section 2.2 of the NRC Enforcement Policy, ISFSIs are not subject to the significance determination process. Therefore, the violation was dispositioned per the traditional enforcement process using Section 2.3 of the Enforcement Policy. The inspectors used the NRC Enforcement Policy to evaluate the significance of this violation. Consistent with Section 6.0 of the NRC Enforcement Policy, the licensee failed to implement adequate controls over the examination processes of equipment that is important to safety and the required annual inspections had not been placed into the licensee's procedures

and never been performed prior to identification of the issue. This finding was determined to have a low safety significance since the licensee performed the required inspections, after the identification of the issue and the licensee did not identify any adverse conditions with the VCT. This finding was found to be more than minor since if left uncorrected, it would have the potential to lead to a more significant safety concern. Specifically, failure to perform inspections on important to safety equipment carrying loaded canisters/casks in accordance with the Certificate of Compliance requirements could result in the licensee failing to promptly correct an adverse condition with the mobile lifting equipment, which could lead to more significant consequences. Since traditional enforcement was used to disposition the violation, there is not a cross-cutting aspect.

Enforcement: Certificate of Compliance 1014 Appendix B Section 3.5.2.2, states in part, If mobile lifting device is used as the lifting device, it shall meet the guidelines of NUREG-0612, Section 5.1, conforming to meet the requirements of ASME B30.5 "Mobile and Locomotive Cranes," in lieu of the requirements of ASME B30.2, "Overhead and Gantry Cranes." NUREG-0612 Section 5.1.1.(d) requires cranes to be inspected, tested, and maintained in accordance with ASME B30.2. Contrary to the above, ANO failed to inspect their mobile lifting device in accordance with the Certificate of Compliance 1014 Appendix B Section 3.5.2.2 requirements. As a result, the licensee utilized their mobile lifting device (VCT) to handle four canisters from December 2014 through August 2015 without the performance of an annual or frequent crane inspections in accordance with ASME B30.5 requirements per the Certificate of Compliance. Because the licensee entered the issue into their corrective action program, the safety significance of the issue was low, and the issue was not found to be repetitive or willful, this Severity Level IV violation was treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. ANO's corrective actions (CR-ANO-C-2015-04905) taken to restore compliance included performing the required inspections on the VCT in accordance with ASME B30.5 requirements and revising the Procedure OP-3406.003 to incorporate the VCT annual inspection and Procedure 0P-3403.004 to incorporate the frequent inspection requirements.

NCV 07200013/201501-02, "Failure to inspect the Vertical Cask Transporter in accordance with Certificate of Compliance 1014 requirements."

.2 Review of 10 CFR 72.212(b) Evaluations at Operating Plants (60856.1)

a. Inspection Scope

Changes to the 72.212 Evaluation Report since the last NRC inspection were reviewed to verify site characteristics were still bounded by the Holtec HI-STORM 100 design basis and the Energy Solutions VSC-24 design basis.

The current version of the VSC-24 72.212 Evaluation Report was Revision 3. No revisions had been completed to the VSC-24 72.212 Evaluation Report since the last NRC inspection. ANO's HI-STORM 100 10 CFR 72.212 Evaluation Report at the time of the inspection was Revision 7, dated January 11, 2014. One revision had been performed to this 72.212 Evaluation Report since the last NRC routine ISFSI inspection and that revision was reviewed during the inspection. The associated 10 CFR 72.48 screening for the revision was also reviewed.

Revision 7 was a significant re-write of the site's HI-STORM 100 72.212 report because of the inclusion of changes associated with moving stack-up evolutions from the Auxiliary Building to the Cask Transfer Facility (CTF) and related equipment and plant changes; updated information for the last dry fuel storage campaign; and other miscellaneous changes. No issues were identified with the 10 CFR 72.48 screening/evaluation that was performed for that revision.

b. Findings

No findings were identified.

.3 Review of 10 CFR 72.48 Evaluations (60857)

a. Inspection Scope

Arkansas Nuclear One's 10 CFR 72.48 screenings and evaluations for ISFSI program changes since the last NRC routine ISFSI inspection were reviewed to determine compliance with regulatory requirements. Entergy sites evaluate their 10 CFR 72.48 screenings and evaluations using Procedure EN-LI-100, “Process Applicability Determination [PAD]," Revision 17. Arkansas Nuclear One had written one new procedure and performed twelve procedure revisions since the last ISFSI inspection. NRC inspectors reviewed the thirteen proposed activities/procedure changes. Of the thirteen, four of the procedure changes resulted in going through additional PAD process reviews to determine whether 50.59/72.48 screening reviews would be required. If a 72.48 screening review determined that a full evaluation was required, the licensee would have utilized Procedure EN-LI-112, "10 CFR 72.48 Evaluations," Rev. 11. None of the PADs led to a full 10 CFR 72.48 safety evaluation. All screenings were determined to be adequately evaluated.

As part of the safety review inspection scope, the NRC inspectors documented that the licensee had made no 10 CFR 50.59 screenings or evaluations associated with the fuel building cask handling crane since the last inspection.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On December 10, 2015 the inspectors presented the inspection results to Mr. Terry Evans, General Manager of Operations, and other members of the licensee staff. The licensee acknowledged the inspection details presented. The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

4OA7 Licensee-Identified Violations

The following violations of very low significance, Severity Level IV, were identified by the licensee and are violations of NRC requirements which meet the criteria of the NRC

Enforcement Policy for being dispositioned as a non-cited violations.

.1 Federal Regulations 10 CFR 72.174 requires that each licensee maintain sufficient records to furnish evidence of activities affecting quality. Records pertaining to the design, fabrication, erection, testing, maintenance, and use of structures, systems, and components important to safety must be maintained by or under the control of the licensee until the NRC terminates the license. Contrary to the above, it was discovered by the licensee on September 4, 2014, that ANO failed to maintain records for loading activities associated with MPC-24-055 that was placed on the ISFSI pad in August of 2014. ANO discovered this issue during a licensee Quality Assurance audit. The audit documented that the completed records for the canister's drying and helium backfill per Technical Specification (TS) 3.1.1. were lost. ANO identified the issue and placed it into their corrective action program (CR-ANO-C-2014-02319). The canister drying and helium backfill pressure TS were reconstituted based on operator memory. ANO reconstituted the requirements by conducting interviews with cask loading personnel and concluded that there was no evidence to suggest that canister operations did not comply with the licensee's procedures and the licensed TSs. This violation did not have any safety impact because all fuel assemblies met the requirements for burn-up, decay heat, and cooling time and the licensee's documents demonstrated that the canister integrity was intact based on the helium leak test records. All the fuel inside the canister and the cask remain in a safe condition. This finding was reviewed by NRC Headquarters Division of Spent Fuel Management's Spent Fuel Licensing Branch. Based on the reconstituted records and interviews with the dry fuel loading staff, the NRC found no evidence to demonstrate that the canister did not meet the required license conditions for drying and helium backfill and as such, found the canister acceptable for continued storage under ANO's general Part 72 license. However, even though, the NRC found this canister to be acceptable for storage, the licensee must track this issue to identify that further analyses may be required for this canister to meet all applicable Part 71 requirements to be acceptable for transportation.

In accordance with the NRC Enforcement Policy Section 2.2 and IMC 0612 Section 03.23, Part 72 ISFSI inspection findings follow the traditional enforcement process and are not dispositioned through the Reactor Oversight Process or the Significance Determination Process. The violation was determined to be a Severity Level IV violation of the NRC requirements. Consistent with Section 6.0 of the NRC Enforcement Policy and IMC 0612 Appendix E 1. b., the licensee failed to establish, maintain, or implement adequate controls over procurement, construction, examination, or testing processes that are important to safety and the required records were irretrievably lost. Because the licensee identified the issue, entered the issue into their corrective action program (CR-ANO-C-2014-02319), the safety significance of the issue was low, and the issue was not found to be repetitive or willful, this Severity Level IV violation was treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. Corrective actions for this issue included reconstitution of the missing documents, conducting interviews with the dry cask loading personnel, providing training to the staff involved, and changing the processes and responsibilities associated with tracking and control of ISFSI documentation.

.2 Federal Regulations 10 CFR 72.150 requires each licensee shall prescribe activities affecting quality by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall require that these instructions, procedures, and drawings be followed. The instructions, procedures, and drawings must include

appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. FSAR Section 2.2.1 “Handling” required lifting attachments and special lifting devices (SLDs) shall meet the requirements of ANSI N14.6. ANSI N14.6 Section 6.3.1 required each special lifting device to either be load tested or go through a visual, dimensional, and NDE examination on an annual, not to exceed 14 month, basis. Contrary to the above, ANO’s Procedure 3406.003 “Inspection and Testing of SLD utilized for Dry Fuel Storage,” failed to specify annual testing requirements for ANO’s HI-TRAC Lift Links and ANO’s HI-STORM Lifting Brackets which were purchased for use at ANO after the construction of the Cask Transfer Facility. ANO’s HI-TRAC Lift Links and HI-STORM Lifting Brackets are important to safety components that are utilized to lift and carry a loaded HI-TRAC transfer cask and loaded HI-STORM 100 overpack. These SLDs initial proof test for ANSI N14.6 certification expired in November 2014. Subsequently, 4 canisters/casks were handled and transported with these SLDs, without current annual inspections, from December 2014 through August of 2015. ANO identified this violation and placed it into their corrective action program (CR-ANO-2015-04664). The NRC inspectors evaluated this violation as having low safety significance since all special lifting devices subsequently passed ANSI N14.6 visual, dimensional, and non-destructive examinations, following the issue identification in December 2015.

In accordance with the NRC Enforcement Policy Section 2.2 and IMC 0612 Section 03.23, Part 72 ISFSI inspection findings follow the traditional enforcement process and are not dispositioned through the Reactor Oversight Process or the Significance Determination Process. The violation screened as Severity Level IV violation of the NRC requirements. Consistent with Section 6.0 of the NRC Enforcement Policy, the licensee failed to implement adequate controls over the examination processes of equipment that is important to safety and the required annual inspections had not been placed into the licensee’s procedures and never been performed prior to identification of the issue. Because the licensee identified the issue, entered the issue into their corrective action program (CR-ANO-C-2015-04664), the safety significance of the issue was very low, and the issue was not found to be repetitive or willful, this Severity Level IV violation was treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. Corrective actions for this issue included performing the ANSI N14.6 annual inspections on the HI-TRAC Lift Links and HI-STORM Lifting Brackets and revising the Procedure OP-3406.003 to include the required inspections.

SUPPLEMENTAL INSPECTION INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

R. Clark, Specialist, Regulatory Assurance
D. Eichenberger, Contractor
R. Pace, Superintendent, Site Projects
A. Palmer, Sr. Project Manager, Projects & Maintenance Services
B. Preston, Waste Control Operator
S. Pyle, Manager, Regulatory Assurance
J. Schlittenhart, Sr. Project Manager, Projects & Maintenance Services
R. Starkey, Supervisor, Radiation Protection

INSPECTION PROCEDURES USED

IP 60855.1	Operations of an ISFSI at Operating Plants
IP 60856.1	Review of 10 CFR 72.212(b) Evaluations at Operating Plants
IP 60857	Review of 10 CFR 72.48 Evaluations

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

NCV 07200013/201501-01, "Failure load fuel in accordance with Certificate of Compliance 1014 requirements."

NCV 07200013/201501-02, "Failure to inspect the Vertical Cask Transporter in accordance with Certificate of Compliance 1014 requirements."

Discussed

None

Closed

NCV 07200013/201501-01, "Failure load fuel in accordance with Certificate of Compliance 1014 requirements."

NCV 07200013/201501-02, "Failure to inspect the Vertical Cask Transporter in accordance with Certificate of Compliance 1014 requirements."

LIST OF DOCUMENTS REVIEWED

The following is a 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.

4OA5.1 Other Activities

Drawings

NUMBER	TITLE	DATE
DF ANO-1505-0421	Survey – High Level Waste Storage Pad	05/19/2015
DF ANO-1508-0560	Survey – High Level Waste Storage Pad	08/20/2015
N/A	TLD Location Map	N/A
C-2017 Sheet 25	ISFSI Pad Reinforcing Plan & Section	Revision 0
C-2017 Sheet 24	Turning Pad Reinforcing Plan & Section	Revision 0

Procedures

NUMBER	TITLE	REVISION
EN-LI-102-ANO-RC	Corrective Action Program	Revision 1
EN-LI-100	Process Applicability Determination	Revision 17
EN-LI-112	T10 CFR 72.48 Evaluations	Revision 11
1015.003B	Unit Two Operations Logs	Revision 77
3403.004	HI-STORM 100 System Equipment Preparation (completed)	Revision 13
3403.005	HI-STORM 100 System Loading Operations	Revision 34
3406.003	Inspection and Test of Special Lifting Devices for Dry Fuel Storage Activities	Revision 4
3406.005	HI-STORM and HI-TRAC Transport Operations Using LPT, VCT, and Holtec Railcar	Revision 11
3406.006	Forced Helium Dehydration System Operations	Revision 7
3406.007	Supplemental Cooling System Operations	Revision 5
3401.001	DFS Administration of Purchasing, Procurement, and Planning	Revision 0
3406.004	Exams/Tests of Loaded HI-STORM Overpacks During Storage Operations	Revision 1
N/A	VSC-24 and HI-STORM 100 Daily Vent Surveillance Records (numerous)	N/A
EN-DC-215	Fuel Selection for Holtec Dry Cask Storage (for multiple loaded casks)	Revision 5

Design Basis Documents

NUMBER	TITLE	REVISION
	10 CFR 72.212 Evaluation Report for ISFSIs Utilizing the Holtec International HI-STORM 100 Cask System	Revision 8

	Appendix B, "ANO Specific Information"	Revision 7
	Certificate of Compliance 72-1007 VSC-24	Amendment 6
	VSC-24 FSAR	Revision 7
	10 CFR 72.212 Licensing Basis Document, ANO VSC-24	Revision 3
	Holtec International Final Safety Analysis Report for the HI-STORM 100 Cask System	Revision 7
	Certificate of Compliance 72-1014 HI-STORM 100 Cask System	Amendment 5

Miscellaneous Documents

NUMBER	TITLE	REVISION / DATE
1000.006B	Procedure/Work Plan Approval Request	Multiple
QS-2015-ANO-022	ANO Quality Assurance Surveillance Report	05/28/2015
QS-2015-ANO-032	ANO Quality Assurance Surveillance Report	09/15/2015
23509	NUPIC Joint Audit of Holtec International, Marlton, NJ	01/0172014
QA-20-2014-ANO-01	Quality Assurance Audit Report ISFSI	07/29/2014
N/A	2013 Annual Radiological Environmental Operating Report	04/30/2014
N/A	2014 Annual Radiological Environmental Operating Report	05/12/2015
N/A	ISFSI – PA Expansion Work Order Matrix	N/A
N/A	L-3 Work Order List	N/A
N/A	List of Cask Doses	N/A
N/A	Review of 2015 First Half Area Monitoring Results	10/03/2015
N/A	Review of 2014 Second Half Area Monitoring Results	02/20/2015
N/A	Max Assy BU-MPC-24-055 – Excel Spreadsheet	N/A
N/A	Max Assy BU-MPC-24-056 – Excel Spreadsheet	N/A
N/A	Max Assy BU-MPC-24-057 – Excel Spreadsheet	N/A
N/A	Max Assy BU-MPC-24-060 – Excel Spreadsheet	N/A
N/A	Max Assy BU-MPC-32-238 – Excel Spreadsheet	N/A
N/A	Max Assy BU-MPC-32-239 – Excel Spreadsheet	N/A
N/A	Max Assy BU-MPC-32-275 – Excel Spreadsheet	N/A
N/A	Max Assy BU-MPC-24-058 – Excel Spreadsheet	N/A
INVOICE	Wire Rope - Westinghouse Electric Compnay	02/28/2013
N/A	Wire Rope - Certificate of Conformance	03/01/2013
NCR #13187	Wire Rope - Nonconformance Report	02/07/2013
	Commercial Grade Dedication Report Supply and Delivery of Concrete ISFSI Expansion ANO	12/11/2014
EC No. 45044	Engineering Change	Revision 0
EC No. 45045	ANO ISFSI Facility Expansion	Revision 0
EC No. 45046	ANO ISFSI Facility Expansion	Revision 0

72.48 Screenings and Evaluations (PADs/ Procedure Updates)

NUMBER	PROCEDURE TITLE	REVISION / DATE
3401.001	Dfs Administration of Purchasing, Procurement, and Planning	Revision 0
3403.004	HI-STORM Equipment Preparation	Revision 12

NUMBER	PROCEDURE TITLE	REVISION / DATE
3403.004	HI-STORM Equipment Preparation	Revision 13
3403.005	HI-STORM 100 System Loading Operations	Revision 31
3403.005	HI-STORM 100 System Loading Operations	Revision 32
3403.005	HI-STORM 100 System Loading Operations	Revision 33
3403.005	HI-STORM 100 System Loading Operations	Revision 34
3403.006	HI-STORM 100 System Unloading Operations	Revision 5
3406.004	Exams/Tests of Loaded HI-STORM Overpacks During Storage Operations	Revision 1
3406.005	HI-STORM and HI-TRAC Transport Operations Using LPT, VCT, and Holtec Railcar	Revision 9
3406.005	HI-STORM and HI-TRAC Transport Operations Using LPT, VCT, and Holtec Railcar	Revision 10
3406.005	HI-STORM and HI-TRAC Transport Operations Using LPT, VCT, and Holtec Railcar	Revision 11
3406.006	Forced Helium Dehydration System Operation	Revision 7

Work Orders

WO 52457295-02	WO 52358233-01	WO 52457295-01	WO 00167502-03
WO 00167502-01	WO 00167502-05	WO 00167502-04	WO 00167502-02
WO 00355209-01	WO 00355210-01	WO 00355213-01	WO 00355209-01

CRs

CR-ANO-1-2014-01173	CR-ANO-1-2014-01484	CR-ANO-1-2015-01226
CR-ANO-1-2015-02330	CR-ANO-2-2014-02353	CR-ANO-2-2015-01994
CR-ANO-22015-02230	CR-ANO-2-2015-02402	CR-ANO-2-2015-03848
CR-ANO-C-2012-00577	CR-ANO-C-2013-03133	CR-ANO-C-2014-00029
CR-ANO-C-2014-00691	CR-ANO-C-2014-00869	CR-ANO-C-2014-00899
CR-ANO-C-2014-00938	CR-ANO-C-2014-00969	CR-ANO-C-2014-00976
CR-ANO-C-2014-01003	CR-ANO-C-2014-01005	CR-ANO-C-2014-01090
CR-ANO-C-2014-01171	CR-ANO-C-2014-01232	CR-ANO-C-2014-01740
CR-ANO-C-2014-01891	CR-ANO-C-2014-01893	CR-ANO-C-2014-01932
CR-ANO-C-2014-01966	CR-ANO-C-2014-02264	CR-ANO-C-2014-02277
CR-ANO-C-2014-02278	CR-ANO-C-2014-02280	CR-ANO-C-2014-02319
CR-ANO-C-2014-02320	CR-ANO-C-2014-02325	CR-ANO-C-2014-02369
CR-ANO-C-2014-02476	CR-ANO-C-2014-02503	CR-ANO-C-2014-02536
CR-ANO-C-2014-03010	CR-ANO-C-2014-03089	CR-ANO-C-2015-00017
CR-ANO-C-2015-00849	CR-ANO-C-2015-00918	CR-ANO-C-2015-01183
CR-ANO-C-2015-02297	CR-ANO-C-2015-04660	CR-ANO-C-2015-04664
CR-HQN-2014-00696		

LIST OF ACRONYMS

ADAMS	Agency-wide Documents Access and Management System
ANO	Arkansas Nuclear One
AREOR	Annual Radiological Environmental Operating Report
ASME	American Society of Mechanical Engineers

CAP	Corrective Action Program
CFR	Code of Federal Regulations
CR	Condition Report
DNMS	Division of Nuclear Material Safety
ENE	East-northeast
F	Fahrenheit
FSAR	Final Safety Analysis Report
IMC	Inspection Manual Chapter
IP	inspection procedure
ISFSI	Independent Spent Fuel Storage Installation
kW	killo-watt
mR	milliRoentgen
micro(μ)R/h	microRoentgen per hour
MPC	multipurpose canister
mrem	milliRoentgen equivalent man
MWD/MTU	megawatt days/metric ton uranium
NDE	Non-destructive examination
NE	Northeast
NNE	North-northeast
NRC	U.S. Nuclear Regulatory Commission
PA	Protected Area
QA	quality assurance
RCA	Radiological Controlled Area
REMP	Radiological Environmental Monitoring Program
RP	radiation protection
TLD	thermoluminescent dosimeter
TS	Technical Specification
VCT	Vertical Cask Transporter
WO	work order

ATTACHMENT 2:

LOADED VSC-24 CASKS AT THE ANO ISFSI

LOADING ORDER	VCC ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
1	24-01	Unit 1	12/17/96	5.2	19,905	2.07	0.185
2	24-03	Unit 1	01/28/97	10.7	32,599	3.19	0.384
3	24-05	Unit 2	04/02/97	4.2	20,318	1.93	0.291
4	24-06	Unit 2	04/06/97	6.2	30,149	2.94	0.469
5	24-12	Unit 2	09/23/98	10.8	34,938	3.38	0.900
6	24-11	Unit 2	10/01/98	8.0	33,075	2.94	0.553
7	24-07	Unit 2	10/21/98	8.0	34,891	3.33	0.567
8	24-02	Unit 2	10/30/98	8.1	34,773	3.34	0.483
9	24-04	Unit 1	04/13/99	9.1	33,051	3.06	0.236
10	24-08	Unit 1	04/27/99	9.2	33,255	3.06	0.231
11	24-09	Unit 1	05/18/99	9.1	33,194	3.21	0.189
12	24-13	Unit 1	06/16/99	7.3	33,066	3.05	0.112
13	24-14	Unit 1	07/14/99	10.7	34,646	3.21	0.383
14	24-10	Unit 2	04/18/00	12.2	40,211	3.37	0.602
15	24-15	Unit 2	06/06/00	9.86	40,220	3.37	0.603

LOADING ORDER	VCC ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
16	24-16	Unit 1	07/25/00	13.37	40,180	3.21	0.528
17	24-18	Unit 1	01/21/01	14.67	38,794	3.45	0.628
18	24-17	Unit 2	06/06/01	14.23	41,188	4.01	0.695
19	24-19	Unit 2	06/26/01	14.17	41,193	4.01	0.659
20	24-20	Unit 2	07/25/01	14.24	41,204	4.01	0.554
21	24-21	Unit 2	08/14/01	14.26	40,931	4.01	0.666
22	24-22	Unit 1	08/30/02	14.69	38,909	3.46	0.407
23	24-23	Unit 1	09/11/02	14.66	38,981	3.46	0.567
24	24-24	Unit 2	06/12/03	9.36	36,021	3.49	0.296

NOTES:
- Heat load (kW) is the sum of the heat load values for all spent fuel assemblies in the cask
- Burn-up is the value for the spent fuel assembly with the highest individual discharge burn-up
- Fuel enrichment is the spent fuel assembly with the highest average “initial” enrichment per cent of U-235

Unit 1: 11 casks loaded, average heat load = 10.8 kW; average man-hours to load = 1374 hrs; average dose = 0.350 person-rem
Unit 2: 13 casks loaded, average heat load = 10.3 kW; average man-hours to load = 1477 hrs; average dose = 0.564 person-rem
Note: Unit 2 fuel is 18 inches longer than Unit 1 fuel

ATTACHMENT 3:

LOADED HI-STORMS CASKS AT THE ANO ISFSI

LOADING ORDER	MPC Serial #	HI-STORM 100S No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
1	Serial No. 24-3	Serial No. 44	Unit 1	12/13/03	16.4	41,045	3.50	0.525
2	Serial No. 24-4	Serial No. 23	Unit 1	01/13/04	16.7	41,130	3.50	0.755
3	Serial No. 24-2	Serial No. 24	Unit 1	01/21/04	17.5	41,044	3.50	0.707
4	Serial No. 24-1	Serial No. 43	Unit 1	02/15/04	15.5	39,807	3.50	0.667
5	Serial No. 24-5	Serial No. 45	Unit 1	02/23/04	12.1	38,697	3.50	0.267
6	Serial No. 24-6	Serial No. 46	Unit 1	03/05/04	10.5	37,751	3.50	0.277
7	Serial No. 24-10	Serial No. 52	Unit 2	09/10/04	14.4	42,043	4.02	0.498
8	Serial No. 24-14	Serial No. 47	Unit 2	09/19/04	17.7	45,798	4.02	0.745
9	Serial No. 24-43	Serial No. 48	Unit 2	09/25/04	18.6	47,116	4.02	0.492
10	Serial No. 32-1	Serial No. 49	Unit 2	11/16/04	18.3	43,960	4.02	0.430
11	Serial No. 32-2	Serial No. 50	Unit 2	11/20/04	18.6	42,934	4.02	0.355
12	Serial No. 32-9	Serial No. 51	Unit 2	12/03/04	21.0	43,903	4.01	0.511
13	Serial No. 32-3	Serial No. 96	Unit 2	12/12/04	18.2	43,840	4.01	0.422

LOADING ORDER	MPC Serial #	HI-STORM 100S No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
14	Serial No. 24-44	Serial No. 97	Unit 1	07/01/05	18.02	40,158	3.50	0.755
15	Serial No. 24-45	Serial No. 98	Unit 1	08/09/05	19.99	45,141	3.49	0.776
16	Serial No. 24-46	Serial No. 99	Unit 1	08/18/05	19.31	45,007	3.50	0.624
17	Serial No. 32-19	Serial No. 114	Unit 2	09/17/05	25.38	52,294	4.01	1.001
18	Serial No. 32-26	Serial No. 115	Unit 2	11/14/05	23.33	46,788	4.02	0.624
19	Serial No. 32-49	Serial No. 113	Unit 2	11/21/05	23.39	51,778	4.02	0.378
20	Serial No. 32-16	Serial No. 229	Unit 2	04/05/06	23.50	51,542	4.01	0.331
21	Serial No. 32-24	Serial No. 230	Unit 2	04/10/06	25.91	50,363	4.02	0.376
22	Serial No. 32-25	Serial No. 243	Unit 2	05/19/06	25.57	50,465	4.02	0.358
23	Serial No. 24-47	Serial No. 245	Unit 1	08/05/06	11.51	43,171	3.45	0.274
24	Serial No. 24-48	Serial No. 246	Unit 1	11/10/06	12.54	43,386	3.46	0.189
25	Serial No. 24-49	Serial No. 247	Unit 1	02/11/07	9.74	36,982	3.21	0.079
26	Serial No. 32-67	Serial No. 244	Unit 2	07/27/07	27.64	52,088	4.16	0.665
27	Serial No. 32-66	Serial No. 248	Unit 2	08/04/07	26.67	54,078	4.02	0.485
28	Serial No. 24-50	Serial No. 61	Unit 1	08/24/07	18.16	46,101	3.89	0.409
29	Serial No. 24-51	Serial No. 62	Unit 1	09/01/07	14.31	44,919	3.90	0.182

LOADING ORDER	MPC Serial #	HI-STORM 100S No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
30	Serial No. 24-52	Serial No. 105	Unit 1	05/04/09	23.21	44,801	4.06	0.499
31	Serial No. 32-84	Serial No. 104	Unit 2	05/29/09	26.59	52,605	4.32	0.493
32	Serial No. 32-85	Serial No. 325	Unit 2	11/05/09	26.01	54,232	4.32	0.616
33	Serial No. 24-53	Serial No. 324	Unit 1	12/10/09	10.86	41,358	4.05	0.095
34	Serial No. 24-54	Serial No. 326	Unit 1	09/29/10	10.99	41,478	4.06	0.141
35	Serial No. 32-159	Serial No. 474	Unit 2	10/20/10	26.36	49,952	4.30	0.645
36	Serial No. 32-163	Serial No. 475	Unit 2	10/28/10	26.15	48,000	4.30	0.473
37	Serial No. 32-164	Serial No. 476	Unit 2	11/03/10	26.46	47,778	4.29	0.420
38	Serial No. 32-239	Serial No. 531	Unit 2	01/28/14	22.45	43,274	4.29	0.493
39	Serial No. 24-057	Serial No. 529	Unit 1	07/29/14	14.43	44,835	4.06	0.375
40	Serial No. 24-055	Serial No. 530	Unit 1	08/23/14	15.53	44,977	4.06	0.267
41	Serial No. 24-056	Serial No. 616	Unit 1	09/04/14	15.45	44,752	4.06	0.242
42	Serial No. 24-060	Serial No. 619	Unit 1	12/30/14	15.38	44,921	4.05	0.440
43	Serial No. 32-237	Serial No. 617	Unit 2	07/28/15	21.72	44,758	4.41	0.612
44	Serial No. 32-238	Serial No. 618	Unit 2	08/20/15	21.85	43,789	4.41	0.552
45	Serial No. 32-275	Serial No. 620	Unit 2	08/28/15	24.19	44,817	4.43	0.625

NOTES:
- Heat load (kW) is the sum of the heat load values for all spent fuel assemblies in the cask
- Burn-up is the value for the spent fuel assembly with the highest individual discharge burn-up
- Fuel enrichment is the spent fuel assembly with the highest average “initial” enrichment per cent of U-235

HI-STORM Casks # 1 through 9 were loaded to 1014 CoC Amendment 1, FSAR Revision 1
HI-STORM Casks # 10 through 13 were loaded to 1014 CoC Amendment 1, FSAR Revision 2
HI-STORM Casks # 14 through 22 were loaded to 1014 CoC Amendment 2, FSAR Revision 3
HI-STORM Casks # 23 through 29 were loaded to 1014 CoC Amendment 2, FSAR Revision 4
HI-STORM Casks # 30 through 45 were loaded to 1014 CoC Amendment 5, FSAR Revision 7
Use of the Forced Helium Dehydrator (FHD) commenced with HI-STORM Cask #7
The first two digits in the serial number under the column “MPC Serial #” indicates whether the cask is a MPC-24 or a MPC-32
Unit 2 is Combustion Engineering fuel and is 18 inches longer than the Unit 1 Babcock & Wilcox fuel