



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION IV
1600 E LAMAR BLVD
ARLINGTON, TX 76011-4511

March 27, 2015

Randal K. Edington, Executive Vice President,
Nuclear/CNO
Arizona Public Service Company
P.O. Box 52034, Mail Stop 7602
Phoenix, AZ 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, 3, AND
INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)
INSPECTION REPORT 05000528/2015007, 05000529/2015007,
05000530/2015007, AND 07200044/2015001

Dear Mr. Edington:

This letter refers to a routine inspection conducted on February 22-26, 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 February 26, 2015 with Mr. Dwight Mims and other members of your staff.

The 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 NAC International (NAC) Universal Multi-Purpose Canister System (UMS) Certificate of Compliance No. 1015 and the associated Technical Specifications, the NAC-UMS Final Safety Analysis Report (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 U.S. Nuclear Regulatory Commission (NRC). The ISFSI facility was found to be in good physical condition. No violations of NRC regulations were identified.

In accordance with title 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Document Access Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal, privacy, or proprietary information so that it can be made available to the public without redaction.

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
Repository & Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Dockets: 50-528, 50-529, 50-530, 72-44
Licenses: NPF-41, NPF-51, NPF-74

Enclosure:
Inspection Report 05000528/2015007;
05000529/2015007; 05000530/2015007;
07200044/2015001

w/attachments:
1. Supplemental Information
2. Loaded Casks at Palo Verde Nuclear
Generating Station ISFSI

cc w/encl: Electronic Distribution

R. Edington

-2-

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DATE	03/19/2015	03/19/2015	03/27/2015		

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Letter to Randal Edington from R. Kellar, dated March 27, 2015.

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket: 05000528, 05000529, 05000530, 07200044

Licenses: NPF-41, NPF-51, NPF-74

Report Nos.: 05000528/2015007, 05000529/2015007, 05000530/2015007, and
07200044/2015001

Licensee: Arizona Public Service Company

Facility: Palo Verde Nuclear Generating Station Units 1, 2, 3, and
Independent Spent Fuel Storage Installation (ISFSI)

Location: 5951 South Wintersburg Road
Tonopah, AZ 85072-2034

Dates: February 22-26, 2013

Inspectors Lee Brookhart, Senior Inspector

Accompanying
Personnel: Eric Simpson, RIV RSFS, Inspector-in-Training

Approved By: Ray L. Kellar, P.E., Chief
Repository & Spent Fuel Safety Branch
Division of Nuclear Materials Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000528, 529, 530/2015007; and 07200044/2015001; 02/22–26/2015; Palo Verde Nuclear Generating Station Units 1, 2, 3, and Independent Spent Fuel Storage Installation (ISFSI); Routine ISFSI Inspection Report

The report covers an announced inspection by one regional inspector and one inspector-in-training. 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 4, dated December 2006. In accordance with the NRC Enforcement Policy, all of the Part 72 ISFSI inspection findings follow the traditional enforcement process and are not disposition through the Reactor Oversight Process or the Significance Determination Process.

A. NRC-Identified Findings and Self-Revealing Findings

No findings were identified.

B. Licensee-Identified Violations

None.

PLANT AND ISFSI STATUS

Palo Verde Nuclear Generating Station (PVNGS) Independent Spent Fuel Storage Installation (ISFSI) stored 124 loaded NAC International (NAC) vertical concrete casks (VCCs) at the time of the routine inspection. PVNGS was loading the 125th canister, which was the third canister in their nine cask loading campaign for the Unit 1 facility in this calendar year. Inspectors observed loading operations associated with cask number 125 at the time of the routine inspection. The licensee utilized a general Part 72 license in accordance with the NAC, Universal Multi-Purpose Canister System (UMS), approved under Certificate of Compliance (CoC) No. 1015, Amendment 5 and the NAC UMS Final Safety Analysis Report (FSAR), Revision 10. The version of the NAC UMS systems used by the licensee included the TSC-24, a 24 fuel bundle transportable storage canister (TSC), designed to hold 24 pressurized water reactor (PWR) fuel assemblies. The ISFSI at Palo Verde contained a large earthen berm within the ISFSI protected area which was outside the Part 50 protected area. The berm was 120 feet wide at the base, 12 feet wide at the top, and 18 feet tall. The earthen berm extended around the ISFSI pad on three sides, specifically on the east, west, and south. The ISFSI consisted of twelve large rectangular concrete storage pads. The concrete storage pads were approximately 285 feet long by 35 feet wide. Each storage pad was designed to accommodate 28 VCCs arranged in two parallel rows of 14 casks. The design capacity allowed for a total of 336 VCCs. The licensee had loaded the casks on the southernmost pads deepest into the earthen berm.

REPORT DETAILS

4. OTHER ACTIVITIES

40A5 Other Activities

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

a. Inspection Scope

(1) Quality Assurance Audits and Surveillances

The Palo Verde Nuclear Assurance Department (NAD) had included ISFSI related activities in their audit and surveillance program. The licensee performed a focused audit of its ISFSI program once every two years. NAD ISFSI Audit Plan and Report 2014-010 (Audit Report), dated January 16, 2015, was reviewed during this inspection. The quality assurance (QA) audits performed by the licensee reviewed activities and documentation to determine the effectiveness of the dry fuel storage program to operate safely in accordance with the requirements in the NAC-UMS Certificate of Compliance, the FSAR, the QA program, and their 10 CFR Part 72 program.

The Audit Report reviewed five program elements and eight administrative elements of ISFSI operation, as well as providing follow up on deficiencies identified in the previous ISFSI audit. The program elements included program and licensing requirements, design control, operation, maintenance, and Special Nuclear Material (SNM). The administrative elements included organization and responsibilities,

department document control, QA records, task/job qualifications, corrective action, self-assessment, nuclear safety culture, and industry experience.

The licensee's QA audit determined that all five ISFSI program elements were being effectively implemented at PVNGS. Six of the eight administrative elements of ISFSI operation were found to be effective, and two were found to be deficient: QA records and corrective action. The QA records program element was found to be deficient because SNM inventory records were not turned over to Support Services within the specified time frame and previous corrective actions identified during the 2012 ISFSI Audit were found to be ineffective. The corrective actions program element was found to be deficient because of several failures to implement corrective actions in a timely manner, including nonconforming conditions associated with the Vertical Concrete Cask (VCC)

The 2014 Audit produced a total of ten Palo Verde Action Requests (PVARs). Three PVARs were associated with the QA audit of the ISFSI program elements and seven PVARs were associated with the QA audit of the administrative elements. All ten PVARs were entered into the licensee's Corrective Action Program. NRC inspectors reviewed the corrective actions related to the findings to ensure that 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.

The QA surveillance report issued since the last NRC ISFSI inspection was reviewed by the NRC inspectors. Arizona Public Service (APS) QA personnel led a Nuclear Utility Procurement Issues Committee (NUPIC) audit of the NAC International production facility in Norcross, GA. NUPIC is a partnership involving all domestic and several international nuclear utilities that evaluates suppliers furnishing safety-related components and services and commercial-grade items to nuclear utilities. The QA surveillance was documented in APS Audit Report Number: A-NAC1-14-06/NUPIC Audit No. 23744, dated July 9, 2014. The audit team reviewed the following activities: order entry, design, licensing, software quality assurance, procurement, fabrication/assembly activities, tests, inspections, calibration, document control, nonconforming items, corrective action, training, internal audits, and records. The audit team concluded that NAC International Inc. was effectively maintaining and implementing their Nuclear Quality program and complied with 10 CFR 72 Subpart G.

(2) Radiological Conditions Related to Stored Casks

The PVNGS ISFSI was located approximately 2,600 feet east of the Unit 2 reactor containment building outside of the site's Part 50 protected area (PA). The ISFSI consisted of 12 concrete pads, situated in three columns of four arranged east to west. Each pad was designed to hold 28 NAC-UMS storage casks configured in a two by 14 array. The Palo Verde ISFSI was protected on three sides by an earthen berm that exceeded the height of the spent fuel storage casks. The open side of the berm faces plant west. Outside of the berm, the ISFSI was protected on all sides by two exclusion fences. On the inside of the inner fence was a roped boundary facing the entrance to the ISFSI that was posted as a "Radioactive Materials Area." No flammable or combustible materials, debris, or excessive vegetative growth were observed inside the ISFSI area. One hundred twenty-four VCCs were loaded with spent fuel at the time of the inspection. The 124 VCCs

completed four of the 12 pads and almost half of a fifth pad. VCC number 125 was being loaded at the time of the NRC ISFSI inspection. The inspector found the 124 NAC-UMS casks to be in good physical condition.

Radiological conditions at the Palo Verde ISFSI were determined from the most recent radiological survey (dated January 22, 2015) and records from the previous three years of thermoluminescent dosimeter (TLD) monitoring results. There were eight TLD monitoring locations that were positioned outside of the ISFSI exclusion area fence, two TLDs per side.

A PVNGS radiation protection (RP) technician accompanied the NRC inspector during the walk-down of the ISFSI pad area. Radiological measurements were taken by the RP technician with a Geiger-Mueller detector to record gamma exposure rates. The NRC inspector carried an NRC issued Ludlum Model 19 scintillation detector (NRC number 016337, calibration due date of 7/21/2015) that was capable of measuring low level gamma radiation exposure rates in micro-Roentgens per hour ($\mu\text{R/h}$). Survey measurements were taken at ISFSI area fence locations, around the perimeter of the ISFSI pad, and at selected areas between VCCs.

A gamma background reading outside the power plant prior to entry into the ISFSI pad area was approximately 10 $\mu\text{R/h}$. Radiation readings taken along the fence-line showed radiation levels ranging from 17 to 41 $\mu\text{R/h}$. General area measurements inside the berm and on the storage pads ranged from 32 $\mu\text{R/h}$, at the far empty side of the ISFSI to 1 mR/h in areas adjacent to and between loaded casks. The radiological conditions of the ISFSI were as expected for the age and heat-load of the 124 loaded spent fuel storage casks. The licensee was properly posting and controlling the ISFSI pad area consistent with 10 CFR Part 20 requirements.

(3) Environmental Radiological Monitoring Program

The primary purpose of the Palo Verde Radiological Environmental Monitoring Program (REMP) was to evaluate the radiological impacts that reactor operations and stored radioactive materials may have on the local environment. The REMP was focused on measuring airborne (gaseous and particulate), liquid effluent, and direct radiation levels onsite, at the site boundary, and at offsite locations. The REMP monitored direct radiation impacts using TLDs. The licensee had established 50 REMP TLD monitoring stations for measuring and recording dose rates continuously throughout the year. Sixteen of those monitoring locations formed an inner ring at the site boundary, one in each meteorological sector. By design, there were no airborne or liquid effluents released from the Palo Verde ISFSI. NRC received the Annual Radioactive Effluent Release Reports for 2012 (ML13128A007) and 2013 (ML14125A295) for PVNGS, which confirmed that the ISFSI did not produce any effluent radioactive releases during 2012 or 2013.

The PVNGS ISFSI was monitored for direct radiation using TLDs that included direct gamma and neutron dose. The ISFSI TLDs were mounted on polymer phantoms to simulate the presence of a human body. This allowed for a more accurate neutron dose assessment. REMP TLDs only measured direct gamma dose. The TLD data for the ISFSI and the TLD data for the REMP were handled by different programs at PVNGS for different purposes. The ISFSI TLD monitoring

was performed by the Palo Verde Area Monitoring Program to track radiological exposures near the ISFSI boundary to ensure that NRC occupational limits for unmonitored individuals were not exceeded. The REMP monitoring was conducted by APS for PVNGS to provide an annual assessment of the licensee's total impacts to the environment, which includes contributions from the ISFSI.

ISFSI TLDs were placed at eight monitoring locations outside the outer exclusion fence. The TLD monitoring results from 2012, 2013, and 2014 were reviewed by NRC inspectors (see Table 1, below). The TLDs were collected and replaced each quarter of the year.

Table 1: PVNGS ISFSI Pad TLD Monitoring Data in $\mu\text{rem/h}$

ISFSI TLD Location #	Location (outside of fence)	2012	2013	2014	3-Year Average
51	South Fence SW TLD (gamma)	13.7	13.8	13.9	13.8
	(neutron)	0.6	0	0	0.2
	(total)	14.3	13.8	13.9	14.0
52	South Fence SE TLD (gamma)	21.6	24.1	23.8	23.2
	(neutron)	7.9	9.8	4.6	7.4
	(total)	29.5	33.9	28.4	30.6
53	East Fence SE TLD (gamma)	21.0	22.2	21.9	21.7
	(neutron)	7.3	8.1	4.0	6.5
	(total)	28.3	30.3	25.9	28.2
54	East Fence NE TLD (gamma)	20.0	20.6	21.5	20.7
	(neutron)	8.2	8.7	3.4	6.8
	(total)	28.2	29.3	24.9	27.5
55	North Fence NE TLD (gamma)	18.3	19.0	19.4	18.9
	(neutron)	7.1	6.5	3.4	5.7
	(total)	25.4	25.5	22.8	24.6
56	North Fence NW TLD (gamma)	15.0	14.4	15.3	14.9
	(neutron)	2.0	1.8	0.3	1.4
	(total)	17.0	16.2	15.6	16.3
57	West Fence NW TLD (gamma)	14.3	13.8	14.6	14.2
	(neutron)	0	0.8	0	0.3
	(total)	14.3	14.6	14.6	14.5
58	West Fence SW TLD (gamma)	13.6	14.0	14.4	14.0
	(neutron)	0.3	0.3	0	0.2
	(total)	13.9	14.3	14.4	14.2

NRC Inspectors verified the radiation exposure rates at each TLD monitoring location during the ISFSI walk-down. The highest average annual dose rate, approximately 270 mrem per year (30.6 $\mu\text{rem/h}$), was measured at the TLD #52 location. The three-year average of all ISFSI TLD monitoring locations has been trending upward as compared to the results of the previous three-year average (2010 – 2012) documented in the inspection report dated April 2, 2013 (ML13094A435). All accessible areas near the PVNGS ISFSI boundary, however, were below the 10 CFR 20.1502(a)(1) limit, of 500 mrem per year for unmonitored workers.

The yearly results of the REMP were compiled in an Annual Radiological Environmental Operating Report (AREOR). NRC reviewed the PVNGS AREORs for 2012 (ML13128A006), issued April 26, 2013 and 2013 (ML14129A007), issued May 2, 2014. The AREORs did not include the TLD direct radiation monitoring results for the ISFSI, but provided reporting and analyses for the REMP TLD monitoring results.

The PVNGS ISFSI was located 4,000 feet (0.8 miles) from the nearest site boundary monitoring location in the east sector. The REMP TLD monitoring site at the site boundary in closest proximity to the ISFSI was TLD #17. TLD monitoring locations #6 and #44 were control monitoring stations located 31 miles south-southeast and 35 miles east-northeast, respectively, from PVNGS. These TLDs can be treated as radiological backgrounds and have been averaged for this purpose (see Table 2, below).

Table 2, PVNGS Site Boundary TLD Result near ISFSI in mrem/yr

TLD Site	Station and Location	2012	2013
#17	E Sector, 4,000 feet east of ISFSI	98.2	96.9
#6 (control)	SSE Sector, 31 miles from PVNGS	94.8	99.7
#44 (control)	ENE Sector, 35 miles from PVNGS		

Table 2 (above) shows that direct radiation from the ISFSI and Part 50 activities had a negligible impact on site boundary ambient radiation levels. REMP results show that the site boundary dose at TLD #17 was slightly above background for 2012 and slightly below background in 2013. Correcting the 2012 value for background yielded a net annual dose of 3.4 mrem. This was well below the 10 CFR 72.104(a)(2) requirement of less than 25 mrem annual dose equivalent to any real individual located beyond the site controlled area. The radiological influence of the ISFSI on this site boundary location was minimal.

(4) Records Related to Fuel Stored in the Casks

A review of dry fuel storage records for canisters 102 through 125 were selected to determine whether adequate descriptions of the spent fuel stored in each cask was documented as a permanent record as required by 10 CFR 72.212(b)(12). In addition, the fuel contents of these casks were verified against NAC CoC 1015 Technical Specification requirements for PWR fuel assemblies loaded into a TSC-24 canister. The spent fuel contents of the 24 selected casks were recorded in Analysis Report Numbers RE-02-C18-2013-003, RE-03-C17-2013-012, RE-03-C17-013, RE-02-C18-2013-003, RE-03-C18-2014-003, RE-C18-2014-010, RE-02-C19-2014-011, RE-01-C-19-2015-002, and RE-01-C19-2015-003. These reports included the TSC loading maps and fuel assembly qualification data, including fuel assembly identifiers, decay heat (kW), cooling time (years), initial assembly average U-235 enrichment (%), burn-up values (MWd/MTU), and other fuel assembly characterization information. Select fuel data is tracked by cask on Attachment 2 of this inspection report. PVNGS was in compliance with all applicable license and FSAR requirements for the fuel stored at the ISFSI and met retrievability requirements for storage of spent fuel records.

(5) Technical Specification 3.1.6, Cask Temperature Monitoring

Technical Specification 3.1.6 required the cask's heat removal system to be operable during storage on the ISFSI pad. Surveillance Requirement 3.1.6.1 required the licensee to verify daily the difference between the ISFSI ambient temperature and the average outlet air temperature as ≤ 102 degrees F or visually verify all four air inlet or outlet screens were unobstructed once each day. All casks in storage on the ISFSI pad were equipped with temperature monitoring equipment. The licensee performed daily temperature monitoring for compliance with Technical Specification 3.1.6.1. Whenever the temperature monitoring equipment was malfunctioning or not in operation for a cask, the licensee performed daily vent inspections for that particular cask.

The licensee utilized Procedure 40ST-9ZZM1 "Operations Mode 1 Surveillance Logs," Revision 63, during normal operations to comply with the Technical Specification 3.1.6. The procedures required operators to verify that the difference in the ambient temperature and each cask outlet temperature was < 90 degrees F. If the acceptance criteria was not met, the operators were required to check the affected cask vent openings and remove any blockages, if found.

Documentation was reviewed for the months of September 2013, December 2013, February 2014, and July 2014 for compliance with Technical Specification 3.1.6. Of the four months selected for review, temperature monitoring was performed daily as required. The provided documentation showed a daily printout of the difference between the ambient temperature and each cask's temperature. For all the days selected for review, no temperature difference between the ambient and a cask's vents were found to be > 90 degrees.

(6) Corrective Action Program

A list of Condition Reports (CRs) issued since the last NRC inspection in February of 2014 was provided by the licensee for the cask handling cranes from each unit and the ISFSI operations. Issues were processed in accordance with Procedure 90DP-0IP10, "Condition Reporting," Revision 57. When a problem was identified the licensee documented the issue as a PVAR in the licensee's corrective action program. Once a PVAR was initiated, the Action Request Review Committee determined if a Condition Report/Disposition Request (CRDR) per Procedure 90DP-0IP10 "Condition Reporting," Revision 53 was required.

Of the list of PVARs/CRDRs provided relating to the ISFSI and the cask handling cranes, 29 documents were selected by the NRC inspectors for further review. The PVARs/CRDRs related to a variety of issues. The PVARs/CRDRs reviewed were well documented and properly categorized based on the safety significance of the issue. The corrective actions taken were appropriate for the situations. Based on the level of detail of the corrective action reports, the licensee demonstrated a high attention to detail in regard to the maintenance and operation of their ISFSI program and the cask handling cranes. No NRC safety concerns were identified related to the PVARs/CRDRs reviewed.

(7) Preparation of Loading Activities

The inspectors requested documentation related to maintenance of the fuel building cask handling crane for Unit 1, the annual maintenance of the licensee's special lifting devices, and the calibration of various gauges associated with the loading activities.

Documents were reviewed that demonstrated that the Unit 1 cask handling crane was inspected on an annual basis in accordance with American Society of Mechanical Engineers (ASME) B30.2 prior to the 2015 loading campaign. PVNGS utilized Work Order (WO) 4437112 dated October 21, 2014, to perform the annual maintenance in October of 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: the Safelift (Lift Beam) and the canister shield lift rig. Documentation reviewed included WO 4465187 and associated non-destructive examination documentation associated with the testing. All equipment passed the magnetic particle, liquid penetrant, and dimensional testing.

The FSAR Section 9.2.2 required annual visual inspections of the transfer cask lifting trunnions, shield door, and shield door rails for permanent deformation and cracking. In addition, dimensional inspection of load-bearing components and a nondestructive examination of the major load-bearing welds were required annually. The transfer cask annual inspections for 2013 through 2014 were reviewed. The licensee implemented the annual inspections using WO 4165175, dated August 14, 2013 and WO 4414043, dated August 14, 2011. For each year, magnetic particle examination was the method of nondestructive examination utilized. No indications were identified during the visual, dimensional, or magnetic particle examination for the years reviewed.

Calibration documentation of the hydrostatic pressure gages and the vacuum drying gage were reviewed to ensure the equipment had been properly calibrated prior to the loading operations. All calibration certificates reviewed demonstrated that the gages were properly calibrated prior to the loading campaign. After each canister loading the licensee performed a post-calibration on the hydrostatic pressure gages to verify the calibration of the gages in accordance with AMSE Section III NB-6413.

(8) VCC and ISFSI Yearly Maintenance

The NAC UMS FSAR, Section 9.2.1 required an annual inspection of the concrete casks that included visual examination of the concrete, vent screens, and other attached hardware for damage. If concrete defects were found that were larger than 1-inch in diameter and deeper than 1-inch, repair by grouting was required. The annual visual inspections for 2013 through 2014 were reviewed. The 2013 annual inspection was documented in Component Observation Report (COR) 13-9-001, Revision 0. The 2014 report was documented in COR 14-9-001, Revision 0. Both reports documented that no new indications of concrete pop-outs or voids > 1/2-inch in depth, no indications of spalling or scaling, and no new indications of concrete reinforcing bar corrosion were observed. The deficiencies noted during

the inspections included minor efflorescence in portions of concrete surfaces typically in the upper half of the cask, random map cracks ranging from hairline to 0.016 inches, and rust on VCC steel lifting lugs which was removed and touched up a corrosion-inhibiting coating. All other deficiencies noted, were minor superficial surface issues that did not affect the function of the casks.

(9) Cask Loading Observations

Various loading activities were observed by the NRC inspectors during the course of the routine ISFSI inspection. PVNGS was in the process of loading canister #125 at the time of the inspection. The NRC inspectors observed the fuel movement activities to place spent fuel assemblies into canister #125. The licensee's staff was experienced in moving the spent fuel assemblies and was proficient in locating the correct assembly, verifying the assembly, moving the assembly from the rack to the canister, and inserting the assembly into the assigned canister slot. The time from grappling the assembly, placing the assembly into the assigned canister slot, and returning to the next assigned spent fuel assembly was approximately six to seven minutes.

Selected welding and non-destructive examination activities were observed during the loading associated with canister #125. An automatic welding process was used to weld the canister lid. The automated welding machine utilized one weld head to weld the lid to shell weld. The welders operated the equipment remotely in a low dose rate area. Hydrogen monitoring was performed during the welding of the root weld. Additionally, the NRC inspectors observed the non-destructive dye penetrant exams conducted on the lid-to-shell weld, the TSC structural lid weld, and the welds on the vent and drain port covers. If any welding defects were found the defects were removed by the welders and subsequent NDE examinations passed with clear results.

Other activities that were observed by NRC inspectors during the loading of canister #125 included the draining of the TSC, drying of the TSC, lifting the transfer cask and fully loaded TSC out of the cask loading pit, and downloading of the TSC into the VCC storage cask. The licensee's cask handling crane was able to handle the heavy load without any observed problems.

(10) Vertical Cask Transporter Lifting Brackets

PVNGS utilized a Vertical Cask Transport (VCT) to move the VCC from outside the fuel building to ISFSI pad. The FSAR section 8.1.3 allows a license to utilize a mobile lifting frame (or transporter) when the lift height is limited to 24 inches and the mobile lifting device follows the requirements of Section A5.6.c of the Technical Specifications. The NAC FSAR does not specifically address the type of the mobile lifting device or the lifting brackets that lift the VCC to transport the cask to the ISFSI at PVNGS. PVNGS utilized a 72.48 safety evaluation to evaluate the use of the VCT to transport the VCC to the ISFSI pad. The 72.48 safety evaluation, procedures, and process performed at PVGNS abided by the Technical Specification requirement of A5.6.a. limiting the lift height of the VCC to 24 inches.

Table 1.5-1, NUREG-1536 Compliance Matrix from the FSAR, Chapter 3 – Structural Evaluation stated that: “the lifting equipment design and devices for lifting the system

components that are important to safety must comply with American National Standards Institute (ANSI) Standard N14.6.” The VCC is listed as a system component that is important to safety. ANSI N14.6, Section 6.3.1 requires that each special lifting device be subjected to either a load test or dimensional checks, non-destructive examination and a visual examination annually, not to exceed 14 months. PVNGS had not been performing an annual inspection of the VCT lifting brackets used to lift the VCC in accordance with ANSI N14.6 Section 6.3.1. Since the lifting brackets of the VCT were not specifically identified in the NAC FSAR, PVNGS has placed this issue into their corrective action program to confer with NAC to understand if the lifting brackets of the VCT shall conform to the requirement listed in FSAR Table 1.5-1 and be in compliance with the ANSI N14.6 Standard. This applicability of the VCT lifting brackets to comply with the ANSI N14.6 Standard is being tracked as an Unresolved Item (URI 72-44/1501-01).

b. Findings

No findings were identified.

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

a. Inspection Scope

Changes to the 10 CFR 72.212 Evaluation Report were reviewed to verify site characteristics were still bounded by the NAC UMS cask system’s design basis. PVNGS had not made any changes to their 72.212 Evaluation Report since the last ISFSI inspection in February 2013. The 72.212 Evaluation Report was at Revision 11, dated January 18, 2013.

b. Findings

No findings were identified.

.3 Review of 10 CFR 72.48 Evaluations (60857)

a. Inspection Scope

The licensee’s 10 CFR 72.48 screenings and evaluations for ISFSI program changes and 50.59 screenings and evaluations for changes made to the cask handling cranes since the last NRC routine ISFSI inspection were reviewed to determine compliance with regulatory requirements. PVNGS had performed six 72.48 screens associated with changes to the ISFSI equipment or operations. No modifications had been performed on any of the cask handling cranes which had required a 50.59 screen. The licensee had not performed any 72.48 full safety evaluations for the ISFSI or any 50.59 full safety evaluations for the cask handling cranes since the last NRC inspection in February of 2013.

Inspectors reviewed the six 72.48 screens provided by the licensee. The licensee utilized Procedure 93DP-0LC07, “10 CFR 50.59 and 72.48 Screenings and Evaluations,” Revision 26 to perform the 10 CFR 72.48 safety screening. None of the screenings reviewed required a full 10 CFR 72.48 safety evaluation. All screenings were determined to be adequately evaluated.

b. Findings

No findings were identified.

40A6 Meetings, Including Exit

Exit Meeting Summary

On February 26, 2015, the inspectors presented the inspection results to Mr. Dwight Mims, Senior Vice President, Regulatory & Oversight, 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.

SUPPLEMENTAL INSPECTION INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

B. Hansen, Department Leader, NFM
D. Heckman, Compliance, Regulator Affairs
M. Kohrt, Operations Manager
M. McGhee, Department Leader, Regulatory Affairs
D. Mims, Senior Vice President, Regulatory and Oversight
H. Nelson, Director of Maintenance Projects
C. Stephenson, Licensing, Regulatory Affairs
S. Toone, Dry Cask Storage Engineering
A. Wrape, Director of Fuel Management

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

72-44/1501-01	URI	VCT Lifting Bracket compliance with ANSI N14.6.
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Discussed

None

Closed

None

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

<u>NUMBER</u>	<u>TITLE</u>	<u>DATE</u>
0-M-20150122-2	VSDS Standard Map Survey Report	01/22/15

Procedures

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
72DP-9NF01	Control of SNM Transfer and Inventory	Rev. 45
78OP-9FX03	Spent Fuel Handling Machine	Rev. 55
78OP-9ZZ02	NAC-UMS Cask Loading Operations	Rev. 32
GQP-9.6	Visual Examinations of Welds	Rev. 14
78ST-9DC01	Helium Testing of TSC Shield Lid Welds	Rev. 7
PI-CNSTR-T-OP-210	Closure Welding of NAC Dry Cask Storage Canisters for APS	Rev. 7
GQP-9.2	High Temperature Liquid Penetrant Examination and Acceptance Standards for Welds, Base Materials and Cladding (50° – 350°F)	Rev. 7
90DP-0IP10	Condition Reporting	Rev. 57
93DP-0LC07	10 CFR 50.59 and 72.48 Screenings and Evaluations	Rev. 26
93DP-0LC07-01	10 CFR 50.59 and 72.48 Administrative Guidelines	Rev. 2
40ST-9ZZM1	Operations Mode 1 Surveillance Logs	Rev. 62, 63

Design Basis Documents

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
	PVNGS ISFSI 72.212 Evaluation Report	Rev. 11
	Certificate of Compliance 72-1015 NAC International Inc., NAC-UMS System	Amendment 5
	NAC International FSAR for the UMS Cask System	Rev. 10

Miscellaneous Documents

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION / DATE</u>
RE-02-C18-2013-003	U2C18 Spent Fuel Selection for Dry Casks 101-104	Rev. 1
RE-03-C17-2013-012	U3C17 Spent Fuel Selection for Dry Casks 105-106	Rev. 0
RE-02-C18-2013-013	U3C17 Spent Fuel Selection for Dry Casks 107-110	Rev. 0
RE-03-C18-2014-003	U3C18 Spent Fuel Selection for Dry Casks 111-113	Rev. 0
RE-03-C18-2014-010	U3C18 Spent Fuel Selection for Dry Casks 114-116	Rev. 0
RE-02-C19-2014-011	U2C19 Spent Fuel Selection for Dry Casks 117-122	Rev.0
RE-01-C19-2015-002	U1C19 Spent Fuel Selection for Dry Casks 123-124	Rev. 0
RE-01-C19-2015-003	U1C19 Spent Fuel Selection for Dry Casks 125-131	Rev. 0
N/A	NAD Audit Plan and Report 2014-010 ISFSI	01/16/15
N/A	NUPIC Audit # 23744 / APS Audit # A-NAC1-14-06	07/09/14
N/A	ISFSI TLD Trending 2003 - Present	N/A
COR-13-9-001	VCC Annual Inspection	Rev. 0
COR-13-9-002	ISFSI berms, culverts, ditches, etc., inspections	Rev. 0
COR 14-9-002	ISFSI berms, culverts, ditches, etc., inspections	Rev. 0
COR-14-9-001	VCC Annual Inspection	Rev. 0
N/A	PVNGS AREOR 2012	04/26/13
N/A	PVNGS AREOR 2013	05/04/14
N/A	PVNGS 2012 Annual Radioactive Effluent Release Report	04/30/13
N/A	PVNGS 2013 Annual Radioactive Effluent Release Report	04/30/14

72.48 Screenings

72.48 Screening S-14-003	72.48 Screening S-14-002	72.48 Screening S-14-001
72.48 Screening S-13-003	72.48 Screening S-13-002	72.48 Screening S-13-001

Work Orders

WO 4437112	WO 4465187	WO 4165175	WO 4414043
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PVARs/CRDRs

CRDR-4444058	CRDR-4459713	CRDR-4354531	CRDR-4605390
CRDR-4606985	CRDR-4601795	CRDR-4563698	CRDR-4558044
CRDR-4555811	CRDR-4548986	CRDR-4518912	CRDR-4459713
CRDR-4444078	CRDR-4424784	CRDR-4421994	CRDR-4386426
CRDR-4396605	CRDR-4356970	CRDR-4354530	CRDR-4353777
CRDR-4335239	CRDR-4562047	CRDR-4534473	CRDR-4558044
PVAR-4628208	PVAR-4627111	PVAR-4627295	CRDR-4627418
PVAR-4455514			

LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
ANSI	American National Standards Institute
APS	Arizona Public Service
AREOR	Annual Radiological Environmental Operating Report
ASME	American Society of Mechanical Engineers
CE	Combustion Engineering
CFR	Code of Federal Regulations
CoC	Certificate of Compliance
COR	Component Observation Report
CRDR	Condition Report/Disposition Report
DNMS	Division of Nuclear Material Safety
F	Fahrenheit
FSAR	Final Safety Analysis Report
IMC	Inspection Manual Chapter
IP	inspection procedure
ISFSI	Independent Spent Fuel Storage Installation
kW	kilowatt
mR	milliRoentgen
micro(μ)R/hr	microRoentgen per hour
micro(μ)rem/hr	microRoentgen equivalent man per hour
MPC	multipurpose canister
mrem	milliRoentgen equivalent man
MWD/MTU	megawatt days/metric ton uranium
NAD	Nuclear Assurance Department
NDE	non-destructive examination
NRC	U.S. Nuclear Regulatory Commission
NUPIC	Nuclear Utility Procurement Issues Committee
PA	Protected Area
PVAR	Palo Verde Action Request
PVNGS	Palo Verde Nuclear Generating Station
PWR	pressurized water reactor
QA	quality assurance
REMP	Radiological Environmental Monitoring Program
RP	radiation protection
SNM	Special Nuclear Material
TLD	thermoluminescent dosimeter
TFR	transfer cask
TSC	transportable storage canister
UMS	Universal Multi-Purpose Canister System
VCC	vertical concrete cask
WO	work order

ATTACHMENT 2:

LOADED CASKS AT THE PALO VERDE NUCLEAR GENERATING STATION ISFSI

LOADING ORDER	VCC ID No.	Canister ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
1	AMZDNE001	AMZDFX001	Unit 2	3/15/03	7.59	42,833	4.0334	0.552
2	AMZDNE002	AMZDFX002	Unit 2	4/15/03	7.76	41,841	4.0368	0.402
3	AMZDNE003	AMZDFX003	Unit 2	5/15/03	10.17	40,737	4.0397	0.507
4	AMZDNE004	AMZDFX004	Unit 2	5/29/03	10.04	40,408	4.0098	0.351
5	AMZDNE005	AMZDFX005	Unit 2	6/12/03	10.96	38,357	4.044	0.260
6	AMZDNE006	AMZDFX008	Unit 1	7/24/03	10.37	42,318	4.050	0.286
7	AMZDNE007	AMZDFX007	Unit 1	8/07/03	10.48	42,214	4.046	0.262
8	AMZDNE008	AMZDFX006	Unit 1	8/21/03	11.03	42,168	4.057	0.325
9	AMZDNE009	AMZDFX009	Unit 1	9/05/03	11.52	42,050	4.057	0.253
10	AMZDNE010	AMZDFX010	Unit 1	9/18/03	7.14	30,134	3.309	0.251
11	AMZDNE011	AMZDFX011	Unit 3	1/23/04	12.16	39,735	3.905	0.259
12	AMZDNE012	AMZDFX012	Unit 3	2/06/04	12.13	39,574	3.917	0.239
13	AMZDNE013	AMZDFX013	Unit 3	2/26/04	12.26	39,821	3.913	0.297
14	AMZDNE014	AMZDFX014	Unit 3	3/11/04	11.52	39,640	3.919	0.207

LOADING ORDER	VCC ID No.	Canister ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
15	AMZDNE015	AMZDFX015	Unit 3	3/25/04	11.73	39,180	3.917	0.218
16	AMZDNE016	AMZDFX016	Unit3	5/27/04	11.74	39,939	3.913	0.202
17	AMZDNE017	AMZDFX017	Unit 2	7/15/04	10.65	44,693	4.041	0.195
18	AMZDNE018	AMZDFX018	Unit 2	7/29/04	10.66	44,637	4.050	0.164
19	AMZDNE019	AMZDFX019	Unit 2	8/12/04	9.71	43,369	4.030	0.137
20	AMZDNE020	AMZDFX020	Unit 2	8/26/04	9.73	43,362	4.043	0.095
21	AMZDNE021	AMZDFX021	Unit 2	9/10/04	9.73	43,350	4.044	0.125
22	AMZDNE022	AMZDFX022	Unit 2	9/23/04	9.73	43,205	4.036	0.115
23	AMZDNE023	AMZDFX023	Unit 1	1/22/05	12.28	44,953	4.032	0.165
24	AMZDNE024	AMZDFX024	Unit 1	3/17/05	12.28	44,973	4.035	0.178
25	AMZDNE025	AMZDFX025	Unit 1	3/24/05	12.05	44,973	4.033	0.193
26	AMZDNE026	AMZDFX026	Unit 1	3/03/05	12.40	44,992	4.033	0.097
27	AMZDNE027	AMZDFX027	Unit 1	3/10/05	12.40	44,608	4.032	0.126
28	AMZDNE028	AMZDFX028	Unit 1	3/30/05	12.06	44,957	4.033	0.115
29	AMZDNE029	AMZDFX029	Unit 3	8/03/05	10.33	41,361	3.528	0.144
30	AMZDNE030	AMZDFX030	Unit 3	8/11/05	10.24	41,603	3.528	0.142

LOADING ORDER	VCC ID No.	Canister ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
31	AMZDNE031	AMZDFX031	Unit 3	8/19/05	11.60	44,247	3.970	0.116
32	AMZDNE032	AMZDFX032	Unit 3	8/31/05	11.56	43,594	4.000	0.105
33	AMZDNE033	AMZDFX033	Unit 3	9/08/05	11.57	44,247	3.992	0.104
34	AMZDNE034	AMZDFX034	Unit 3	9/16/05	11.57	43,594	4.001	0.094
35	AMZDNE035	AMZDFX035	Unit 2	1/20/06	11.98	44,849	4.384	0.100
36	AMZDNE036	AMZDFX036	Unit 2	1/27/06	12.00	44,877	4.386	0.091
37	AMZDNE037	AMZDFX037	Unit 2	2/09/06	11.98	44,877	4.388	0.064
38	AMZDNE038	AMZDFX038	Unit 2	2/17/06	11.98	44,877	4.386	0.066
39	AMZDNE039	AMZDFX039	Unit 2	2/24/06	11.99	44,877	4.390	0.078
40	AMZDNE040	AMZDFX040	Unit 2	3/03/06	12.01	44,390	4.383	0.051
41	AMZDNE041	AMZDFX041	Unit 2	3/10/06	12.02	43,877	4.380	0.064
42	AMZDNE042	AMZDFX042	Unit 1	7/21/06	8.52	44,801	4.162	0.035
43	AMZDNE043	AMZDFX043	Unit 1	7/29/06	8.39	44,801	4.149	0.042
44	AMZDNE044	AMZDFX044	Unit 1	8/04/06	8.41	44,801	4.148	0.035
45	AMZDNE045	AMZDFX045	Unit 1	8/18/06	8.41	44,801	4.144	0.041
46	AMZDNE046	AMZDFX046	Unit1	8/25/06	8.46	44,706	4.146	0.044

LOADING ORDER	VCC ID No.	Canister ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
47	AMZDNE047	AMZDFX047	Unit 1	9/01/06	8.45	44,706	4.146	0.032
48	AMZDNE048	AMZDFX048	Unit 3	4/06/07	9.07	44,841	4.287	0.058
49	AMZDNE049	AMZDFX049	Unit 3	4/13/07	8.81	44,778	4.287	0.058
50	AMZDNE050	AMZDFX050	Unit 3	4/20/07	8.76	44,778	4.266	0.049
51	AMZDNE051	AMZDFX051	Unit 3	4/28/07	8.80	44,778	4.272	0.049
52	AMZDNE052	AMZDFX052	Unit 3	5/04/07	8.67	44,841	4.269	0.046
53	AMZDNE053	AMZDFX053	Unit 3	5/11/07	8.64	44,841	4.298	0.043
54	AMZDNE054	AMZDFX054	Unit 2	9/25/08	9.46	44,822	4.208	0.074
55	AMZDNE055	AMZDFX055	Unit 2	12/06/08	9.54	44,822	4.208	0.107
56	AMZDNE056	AMZDFX056	Unit 2	12/16/08	9.53	44,822	4.206	0.051
57	AMZDNE057	AMZDFX057	Unit 2	12/31/08	9.56	44,822	4.387	0.040
58	AMZDNE058	AMZDFX058	Unit 1	2/28/09	12.70	44,850	4.375	0.096
59	AMZDNE059	AMZDFX059	Unit 1	3/10/09	14.17	53,665	4.378	0.124
60	AMZDNE060	AMZDFX060	Unit 1	3/20/09	14.18	52,637	4.379	0.089
61	AMZDNE061	AMZDFX061	Unit 1	6/09/09	14.21	52,874	4.381	0.121
62	AMZDNE062	AMZDFX062	Unit 1	6/24/09	14.23	52,915	4.379	0.096

LOADING ORDER	VCC ID No.	Canister ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
63	AMZDNE063	AMZDFX063	Unit 3	8/08/09	13.61	51,122	4.288	0.108
64	AMZDNE064	AMZDFX064	Unit 3	8/21/09	13.61	51,122	4.289	0.094
65	AMZDNE065	AMZDFX065	Unit 3	8/28/09	13.84	49,692	4.381	0.096
66	AMZDNE066	AMZDFX066	Unit 3	9/04/09	13.86	49,692	4.384	0.106
67	AMZDNE067	AMZDFX067	Unit 3	9/11/09	13.88	49,692	4.387	0.104
68	AMZDNE068	AMZDFX068	Unit 2	1/29/10	12.73	49,797	4.387	0.099
69	AMZDNE069	AMZDFX069	Unit 2	2/05/10	12.73	49,797	4.384	0.097
70	AMZDNE070	AMZDFX070	Unit 2	2/12/10	12.73	49,797	4.390	0.096
71	AMZDNE071	AMZDFX071	Unit 2	2/26/10	14.02	49,487	4.384	0.091
72	AMZDNE072	AMZDFX072	Unit 2	3/05/10	14.02	49,487	4.386	0.102
73	AMZDNE073	AMZDFX073	Unit 2	3/12/10	13.97	49,487	4.390	0.089
74	AMZDNE074	AMZDFX074	Unit 1	8/07/10	12.80	51,421	4.401	0.084
75	AMZDNE075	AMZDFX075	Unit 1	8/13/10	12.80	51,528	4.402	0.060
76	AMZDNE076	AMZDFX076	Unit 1	8/20/10	12.80	51,529	4.400	0.062
77	AMZDNE077	AMZDFX077	Unit 1	9/03/10	12.81	52,548	4.407	0.060
78	AMZDNE078	AMZDFX078	Unit 1	9/10/10	12.41	53,779	4.388	0.059

LOADING ORDER	VCC ID No.	Canister ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
79	AMZDNE079	AMZDFX079	Unit 3	1/28/11	13.01	52,283	4.406	0.169
80	AMZDNE080	AMZDFX080	Unit 3	2/04/11	12.73	50,399	4.401	0.117
81	AMZDNE081	AMZDFX081	Unit 3	2/11/11	12.59	50,399	4.404	0.086
82	AMZDNE082	AMZDFX082	Unit 3	2/25/11	12.58	50,457	4.401	0.074
83	AMZDNE083	AMZDFX083	Unit 3	3/04/11	12.62	51,402	4.403	0.061
84	AMZDNE084	AMZDFX084	Unit 3	3/11/11	12.66	51,402	4.404	0.076
85	AMZDNE085	AMZDFX085	Unit 2	7/29/11	14.03	51,119	4.396	0.109
86	AMZDNE086	AMZDFX086	Unit 2	8/06/11	14.04	51,119	4.400	0.140
87	AMZDNE087	AMZDFX087	Unit 2	8/12/11	14.06	51,116	4.391	0.108
88	AMZDNE088	AMZDFX088	Unit 2	8/26/11	14.06	51,116	4.407	0.106
89	AMZDNE089	AMZDFX089	Unit 2	9/02/11	14.05	51,046	4.400	0.101
90	AMZDNE090	AMZDFX090	Unit 1	1/20/12	13.89	48,347	4.394	0.138
91	AMZDNE091	AMZDFX091	Unit 1	1/27/12	13.90	47,489	4.392	0.119
92	AMZDNE092	AMZDFX092	Unit 1	2/10/12	13.91	49,253	4.390	0.118
93	AMZDNE093	AMZDFX094	Unit 1	2/17/12	13.90	48,750	4.392	0.100
94	AMZDNE094	AMZDFX096	Unit 1	2/24/12	13.92	48,388	4.394	0.089

LOADING ORDER	VCC ID No.	Canister ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
95	AMZDNE095	AMZDFX095	Unit 1	8/18/12	13.79	51,957	4.406	0.104
96	AMZDNE096	AMZDFX093	Unit 1	8/24/12	13.77	49,876	4.407	0.085
97	AMZDNE097	AMZDFX097	Unit 1	8/31/12	13.77	49,876	4.412	0.095
98	AMZDNE098	AMZDFX098	Unit 1	9/07/12	13.74	49,876	4.404	0.084
99	AMZDNE099	AMZDFX099	Unit 2	2/09/13	13.08	49,876	4.391	0.135
100	AMZDNE100	AMZDFX100	Unit 2	2/15/13	13.08	49,886	4.655	0.109
101	AMZDNE101	AMZDFX101	Unit 2	2/25/13	13.08	49,895	4.655	0.113
102	AMZDNE102	AMZDFX103	Unit 2	05/10/13	13.17	54,062	4.646	0.155
103	AMZDNE103	AMZDFX106	Unit 2	05/17/13	13.26	50,058	4.656	0.086
104	AMZDNE104	AMZDFX104	Unit 2	05/24/13	14.86	48,548	4.206	0.113
105	AMZDNE105	AMZDFX105	Unit 3	08/13/13	13.62	54,507	4.410	0.136
106	AMZDNE106	AMZDFX102	Unit 3	08/24/13	13.62	54,507	4.406	0.191
107	AMZDNE107	AMZDFX107	Unit 3	08/30/13	13.43	54,507	4.403	0.075
108	AMZDNE108	AMZDFX108	Unit 3	09/30/13	13.45	54,507	4.401	0.136
109	AMZDNE109	AMZDFX109	Unit 3	12/13/13	13.44	54,507	4.407	0.156
110	AMZDNE110	AMZDFX110	Unit 3	02/14/14	13.42	52,971	4.402	0.102

LOADING ORDER	VCC ID No.	Canister ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
111	AMZDNE111	AMZDFX111	Unit 3	02/21/14	13.54	48,507	4.404	0.107
112	AMZDNE112	AMZDFX112	Unit 3	02/28/14	13.55	48,704	4.409	0.085
113	AMZDNE113	AMZDFX113	Unit 3	03/07/14	13.56	48,501	4.404	0.070
114	AMZDNE114	AMZDFX114	Unit 3	05/16/14	13.4	49,388	4.411	0.100
115	AMZDNE115	AMZDFX115	Unit 3	05/27/14	13.39	49,388	4.412	0.073
116	AMZDNE116	AMZDFX116	Unit 3	05/30/14	13.33	45,139	4.409	0.084
117	AMZDNE117	AMZDFX117	Unit 2	07/18/14	12.96	54,554	4.381	0.089
118	AMZDNE118	AMZDFX118	Unit 2	07/25/14	12.96	54,554	4.391	0.078
119	AMZDNE119	AMZDFX119	Unit 2	08/01/14	12.95	54,554	4.385	0.094
120	AMZDNE120	AMZDFX120	Unit 2	08/08/14	13.17	54,554	4.390	0.075
121	AMZDNE121	AMZDFX121	Unit 2	08/29/14	13.22	54,542	4.386	0.091
122	AMZDNE122	AMZDFX122	Unit 2	09/05/14	13.31	54,542	4.654	0.070
123	AMZDNE123	AMZDFX123	Unit 1	02/13/15	12.70	48,792	4.407	0.089
124	AMZDNE124	AMZDFX124	Unit 1	02/20/15	12.75	51,006	4.404	0.102
125	AMZDNE125	AMZDFX125	Unit 1	02/27/15	13.09	49,387	4.515	0.124

- 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 individual “initial” enrichment per cent of U-235

Casks #1 through 16 were loaded to CoC No. 1015, Amendment 2

Casks #17 through 34 were loaded to CoC No. 1015, Amendment 3

Casks #35 through 58 were loaded to CoC No. 1015, Amendment 4

Casks #59 through 125 were loaded to CoC No. 1015, Amendment 5

All casks are currently maintained under CoC No. 1015, Amendment 5, and FSAR Revision 10