UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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March 31, 2005

Jeffrey S. Forbes
Vice President Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801-0967

SUBJECT: NRC INSPECTION REPORT 050-00313/05-013; 050-00368/05-013; 072-00013/04-002

Dear Mr. Forbes:

A routine inspection of storage and loading operations at the Arkansas Nuclear One (ANO) Independent Spent Fuel Storage Installation (ISFSI) was conducted on November 16-17, 2004. A followup inspection was conducted on January 25-26, 2005, to review ANO's response to the discovery of a potential spent fuel misloading at your ISFSI. The root cause evaluation, including the extent of condition, actions taken, generic implications, and measures taken to prevent recurrence, was reviewed. Evaluation of this event continued through March 17, 2005, at which time a telephonic exit meeting was held with members of your staff. The enclosed inspection report documents the results of these inspections and event evaluation.

Based on the results of this inspection, the NRC has determined that three violations of NRC requirements occurred. The violations involved: 1) loading damaged fuel assemblies into Holtec canisters not authorized to contain damaged fuel; 2) failure to perform a site specific fire and explosion hazards analysis for the ISFSI docking station; and 3) use of an uncalibrated thermometer to comply with the Holtec Technical Specification for canister dryness.

These Severity Level IV violations are being treated as Non-Cited Violations (NCVs) consistent with Section VI.A of the Enforcement Policy. The NCVs and the circumstances surrounding the violations are described in the subject inspection report. These violations are not being cited, in part, because your staff issued deficiency reports and took appropriate corrective actions to prevent recurrence. If you contest the violations or severity level of the 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 a copy to the Regional Administrator, Region IV and the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document 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, proprietary, or safeguards 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) 860-8191 or Mr. Scott Atwater at (817) 860-8286.

Sincerely,

/RA JVEverett for/

D. Blair Spitzberg, Ph.D., Chief
Fuel Cycle and Decommissioning Branch

Docket Nos.: 50-313
50-368
72-013
License Nos.: DPR-51
NPF-6

Enclosure:
NRC Inspection Report
050-00313/05-013; 050-00368/05-013; 072-00013/04-002

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.:	050-00313; 050-00368; 072-00013
License No.:	DPR-51; NPF-6
Report No.:	050-00313/05-013; 050-00368/05-013; 072-00013/04-002
Licensee:	Entergy Operations, Inc.
Location:	Arkansas Nuclear One Independent Spent Fuel Storage Installation 1448 S. R. 333 Russellville, Arkansas 72801
Dates:	November 16-17, 2004 January 25-26, 2005
Inspectors:	Scott P. Atwater, Health Physicist Ray L. Kellar, PE, Health Physicist
Approved:	D. Blair Spitzberg, Ph.D., Chief Fuel Cycle and Decommissioning Branch
Attachments:	1) Supplemental Information 2) Loaded Casks at the ANO ISFSI 3) Inspector Notes

EXECUTIVE SUMMARY

Arkansas Nuclear One
NRC Inspection Report 050-00313/05-013; 050-00368/05-013; 072-00013/04-002

The Independent Spent Fuel Storage Installation (ISFSI) at Arkansas Nuclear One (ANO) was storing 24 Ventilated Storage Casks (VSC)-24 and 10 Holtec HI-STORM Storage Casks at the time of the inspection. The VSC-24 cask loading operations were complete and the licensee was loading Holtec HI-STORM casks under Certificate of Compliance #1014, Amendment 1.

Environmental Monitoring

- The ISFSI had been incorporated into the licensee's Part 50 environmental monitoring program. The Annual Radioactive Effluent Release Report for 2003 was submitted to the NRC within the 60-day window allowed by 10 CFR 72.44(d)(3) and included a summary statement that no effluents were released from the ISFSI in 2003. The report met the requirements of ANO Unit 1 Technical Specification (Tech Spec) 5.6.3 and Unit 2 Tech Spec 6.9.3.

Fuel Inventory

- Holtec Certificate of Compliance (CoC), Appendix B, Section 2.1.1, Table 2.1-1, prohibited the loading of damaged fuel assemblies into the Multi-Purpose Canister (MPC)-32. Contrary to this, the licensee inadvertently loaded five damaged fuel assemblies into four MPC-32 canisters. Upon discovery, the licensee notified the NRC within 24 hours and submitted a special report to the NRC within 30 days, providing a summary of the root cause, immediate actions taken, and corrective actions to be taken to prevent recurrence. The licensee has submitted an exemption request to the NRC to allow the affected canisters to remain in storage. The request is currently under NRC review. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VI.A of the NRC Enforcement policy.

- The Special Nuclear Material (SNM) transfer records reviewed indicated that the receipt, inventory, and transfer of fuel assemblies was being tracked in accordance with 10 CFR 72.72(a).

Operations/Maintenance

- The VSC-24 cask center to center spacing on the ISFSI pad was within the BNFL technical specification tolerances of at least 15 feet, plus or minus 1-foot.

- The licensee was meeting the Final Safety Analysis Report (FSAR) requirements for combustible gas control during welding. The area beneath the canister lid was evacuated with an explosive-proof vacuum system and the vacuum exhaust was monitored for combustible gases.

- The 2003 VSC-24 cask exterior concrete inspections identified shrinkage cracks on all casks. The cracks were subsequently grouted as required by British Nuclear Fuels, Limited (BNFL) Tech Spec 1.3.2. The 2004 inspections identified concrete defects greater than one quarter inch deep and one half inch wide. Repairs were scheduled for early December 2004. No time limit for completing repairs was specified in the VSC-24 technical specification.

- Holtec CoC, Appendix B, Section 3.4.5, required that the potential for fire and explosion be addressed based on site-specific considerations. Contrary to this, the licensee had not evaluated the fire and explosion hazards at the ISFSI docking station and had not established controls to prevent transient flammable material from being stored there. The specific fire and explosion hazards not evaluated were; 1) the diesel fuel in the portable air compressor unit; 2) the modular trailer containing paint and other flammable material, and 3) the engine oil, hydraulic oil and transmission fluid contained in the Linde forklift used to move casks onto the ISFSI pad. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VI.A of the NRC Enforcement policy.

- The helium used for providing an inert atmosphere in the spent fuel canister for dry storage was 99.995 percent pure as specified in the Holtec CoC. The helium bottles on the refueling floor were stored separately from other gases and all helium was introduced into the canister using the Forced Helium Dehydrator (FHD) skid.

- The licensee was meeting the Holtec FSAR and American National Standards Institute (ANSI) N14.6 requirements for inspection of the transfer cask trunnions. The Holtec FSAR specified visual inspection of the trunnions prior to each fuel loading. ANSI N14.6 specified annual dimensional testing, visual inspection, and non-destructive examination (NDE) of the major load-carrying welds and critical areas of the trunnions.

- The licensee had registered all the loaded Holtec casks with the NRC within 30 days of placing them in service, as required by 10 CFR 72.212(b)(1)(ii). Ten Holtec casks were placed in service between December 13, 2003, and November 16, 2004.

- The licensee's procedure for unloading a spent fuel canister contained adequate steps for cooling the canister with the FHD system prior to re-flooding it with water, and for collecting a gas sample prior to cutting the shield lid weld. This procedure met the requirements of the Holtec FSAR and Technical Specifications.

Quality Assurance (QA)

- The licensee was meeting the requirements of their QA program and 10 CFR 72.176 for conducting audits in the ISFSI arena. The dry fuel storage surveillance conducted December 4-12, 2003, encompassed the spent fuel selection process, implementation of dry fuel storage procedures, rigging/lifting/material handling, industrial safety, radiological safety, Foreign Material Exclusion (FME), and management oversight. No adverse trends, recurring problems or corrective actions were identified.

- Conditions adverse to quality were promptly identified and corrected as required by 10 CFR 72.212. From January 1, 2004 to the time of the inspection the licensee had generated 31 condition reports related to the ISFSI operations. All condition reports had been reviewed, resolved and closed. With the exception of the VSC-24 temperature monitoring system, there were no repetitive equipment deficiencies.

- The licensee was properly storing ISFSI related material and equipment, as required by 10 CFR 72.166. Two new spent fuel canisters were stored outside the warehouse with shipping covers and tarpaulins installed to protect them from rusting and weathering. Their associated lids, drain pipes, silver dollars, shims and closure rings were stored inside the warehouse out of the weather.

- 10 CFR 72.164 required the licensee to establish measures to ensure that gauges used in activities affecting quality were properly calibrated to maintain accuracy within necessary limits. Contrary to this, the licensee had not calibrated the thermometer used to measure the gas temperature at the exit of the Forced Helium Dehydrator (FHD) de-moisturizer. This thermometer was intended to be used for verifying canister dryness in accordance with Holtec Tech Spec 3.1.1.1. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VI.A of the NRC Enforcement policy.

Radiological Controls

- The ISFSI pad area was properly posted as a Radioactive Materials Area and a Radiation Area. The licensee was performing monthly radiation surveys of the ISFSI pad perimeter. An independent radiation survey performed by the NRC inspectors confirmed the licensee survey results.

- The licensee provided pre-job briefings during dry fuel storage operations prior to any major work activity. The pre-job briefing for moving Holtec cask #10 onto the ISFSI pad was focused on industrial safety and sound radiological practices. The person-rem data for casks loaded to date indicated the briefings have been effective in reducing personnel exposures.

Technical Specification Surveillance

- Holtec Tech Spec 3.3.1 specified minimum boron concentrations, sampling frequency and sampling independence for water in the MPC-32 canister during loading and unloading operations. The licensee's loading procedure contained the necessary steps to meet this technical specification, however the unloading procedure did not. A condition report was generated to update the unloading procedure.

- The licensee was performing daily inspections of the VSC-24 and Holtec cask air inlet and outlet screens, and documenting the inspection results. The surveillance records reviewed for the period August 1 through September 30, 2004 and November 16, 2004 demonstrated compliance with the requirements of Holtec Tech Spec A.3.1.2 and BNFL Tech Spec 1.3.1.

- The licensee was performing radiation surveys of the storage casks following loading. The surveys documented average surface dose rates well below the limits of Holtec Tech Spec A.3.2.3.

- The licensee completed the heat transfer validation test for their first Holtec HI-STORM 100-cask system and submitted the results to the NRC in accordance with the Holtec CoC. The actual heat transfer values were consistent with the values predicted by the Holtec thermal model.

- The licensee was monitoring VSC-24 thermal performance each shift and documenting the temperature data obtained. The surveillance records reviewed for the period August 1 through September 30, 2004 and November 16, 2004 demonstrated compliance with the requirements of BNFL Tech Specs 1.2.3 and 1.3.4.

ATTACHMENT 1

Supplemental Information

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

B. Bradshaw Radiation Protection Technician
D. Eichenberger, Project Manager, Dry Fuel Storage
S. Garve, Reactor Engineer
D. Helm, Reactor Engineer
D. Lomax, Dry Fuel Storage Manager
B. Puckett, Supervisor, Fire Protection
M. Fultz, Radiation Protection Technician
S. Pyle, Licensing Specialist
T. Robinson, Fire Protection Specialist
C. Walker, Dry Fuel Storage Engineer
J. Walker, Dry Fuel Storage Engineer
J. Wellwood, Reactor Operator, Dry Fuel Storage
P. Williams, Acting Manager Nuclear Engineering

Framatome, ANP Personnel

T. Pugh, Level II Ultrasonic Testing (UT) Examiner
S. Morris, Level II Ultrasonic Testing (UT) Examiner

INSPECTION PROCEDURES USED

IP 60855.1 Operation of an ISFSI at Operating Plants

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

NVC 72-13/0402-01	Loading damaged fuel assemblies into Holtec canisters not authorized to contain damaged fuel.
NCV 72-13/0402-02	Failure to perform a site specific fire and explosion hazards analysis for the ISFSI docking station.
NVC 72-13/0402-03	Use of an uncalibrated thermometer to comply with the Holtec Technical Specification for canister dryness.

Closed

LER 41276	Loading damaged fuel assemblies into Holtec canisters not authorized to contain damaged fuel.
NVC 72-13/0402-01	Loading damaged fuel assemblies into Holtec canisters not authorized to contain damaged fuel.
NCV 72-13/0402-02	Failure to perform a site specific fire and explosion hazards analysis for the ISFSI docking station.
NVC 72-13/0402-03	Use of an uncalibrated thermometer to comply with the Holtec Technical Specification for canister dryness.

Discussed

None.

LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
ANO	Arkansas Nuclear One
ANSI	American National Standards Institute
BNFL	British Nuclear Fuels Limited
CoC	Certificate of Compliance
CFR	Code of Federal Regulations
CR	Condition Report
DFS	Dry Fuel Storage
ER	Engineering Report
FHD	Forced Helium Dehydrator
FME	Foreign Material Exclusion
FSAR	Final Safety Analysis Report
ISFSI	Independent Spent Fuel Storage Installation
LER	Licensee Event Report
MPC	Multi-Purpose Canister
NCV	Non-Cited Violation
NDE	Non Destructive Examination
NRC	Nuclear Regulatory Commission
SNM	Special Nuclear Material
Tech Spec	Technical Specification
UT	Ultrasonic Test
VCC	Ventilated Concrete Cask
VSC	Ventilated Storage Cask
WO	Work Order

ATTACHMENT 2
Loaded Casks at the ANO ISFSI

VSC-24

Loading Order	Cask #	Unit	Date Placed On Pad	Heat Load (Kw)	Burnup Mwd/mtu	Fuel Enrichment	Person Hours To Load	Person Rem Dose
1	#1	Unit 1	12/96	5.2	19,905	2.067	not tracked	0.185
2	#3	Unit 1	1/97	10.7	32,599	3.190	1750	0.384
3	#5	Unit 2	4/97	4.18	20,318	1.930	1852	0.291
4	#6	Unit 2	4/97	6.2	30,149	2.939	1463	0.469
5	#12	Unit 2	9/98	10.8	34,938	3.384	2479	0.900
6	#11	Unit 2	10/98	8.0	33,075	2.938	1416	0.553
7	#7	Unit 2	10/98	8.0	34,891	3.328	1844	0.567
8	#2	Unit 2	11/98	8.1	34,773	3.337	1542	0.483
9	#4	Unit 1	4/99	9.1	33,051	3.059	2036	0.236
10	#8	Unit 1	4/99	9.2	33,255	3.059	1186	0.231
11	#9	Unit 1	5/99	9.1	33,194	3.205	1324	0.189
12	#13	Unit 1	6/99	7.3	33,066	3.048	1380	0.112
13	#14	Unit 1	7/99	10.7	34,646	3.213	1130	0.383
14	#10	Unit 2	4/00	12.16	40,211	3.374	1700	0.602

Loading Order	Cask #	Unit	Date Placed On Pad	Heat Load (Kw)	Burnup Mwd/mtu	Fuel Enrichment	Person Hours To Load	Person Rem Dose
15	#15	Unit 2	6/00	9.86	40,220	3.372	1233	0.603
16	#16	Unit 1	7/00	13.37	40,180	3.206	1233	0.528
17	#18	Unit 1	1/01	14.67	38,794	3.454	1348	0.628
18	#17	Unit 2	6/01	14.23	41,188	4.010	1225	0.695
19	#19	Unit 2	6/01	14.17	41,193	4.010	1000	0.659
20	#20	Unit 2	7/01	14.24	41,204	4.010	940	0.554
21	#21	Unit 2	8/01	14.26	40,931	4.010	936	0.666
22	#22	Unit 1	8/02	14.69	38,909	3.460	1420	0.407
23	#23	Unit 1	9/02	14.66	38,981	3.460	929	0.567
24	#24	Unit 2	6/03	9.355	36,021	3.488	1570	0.296

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.

Note:
Heat Load (kW) is the sum of the heat load values for all 24 spent fuel assemblies.
Burnup is the value for the spent fuel assembly with the highest individual discharge burnup.
Fuel Enrichment is the spent fuel assembly with the highest individual enrichment per cent of U-235.

Holtec HI-STORM 100

Loading Order	Cask Model Number	MPC (canister) Serial #	Unit	Date On Pad	Heat Load (kW)	Burnup MWd/MTU	Maximum Fuel Enrichment	Person Hours to Load	Person Rem Dose
1	1	24-3	1	12/03	16.4	44,329	3.502	1157	0.525
2	2	24-4	1	01/04	16.7	44,421	3.504	1194	0.755
3	3	24-2	1	01/04	17.5	44,328	3.498	830	0.707
4	4	24-1	1	02/04	15.5	42,991	3.504	1722	0.667
5	5	24-5	1	02/04	12.1	41,792	3.500	970	0.267
6	6	24-6	1	03/04	10.5	40,771	3.501	1120	0.277
7	7	24-10	2	09/04	14.4	44,986	4.020	1563	0.498
8	8	24-14	2	09/04	17.7	49,003	4.020	970	0.745
9	9	24-43	2	09/04	18.6	50,414	4.020	771	0.492
10	10	32-1	2	11/16	18.3	47,037	4.020	830	0.430

Use of the Forced Helium Dehydrator (FHD) commenced with MPC 24-10, Cask #7.

Note:
Heat Load (kW) is the sum of the heat load values for all spent fuel assemblies.
Burnup is the value for the spent fuel assembly with the highest individual discharge burnup.
Fuel Enrichment is the spent fuel assembly with the highest individual enrichment per cent of U-235.

ATTACHMENT 3

ARKANSAS NUCLEAR ONE

(INSPECTOR NOTES - TABLE OF CONTENTS)

ANO INSPECTION 72-013/04-02

INSPECTOR NOTES

Category: Environment Monitoring **Topic:** Radioactive Effluent Control Program

Reference: CoC 1014, Tech Spec A.5.4.b, A.5.4.c

Requirement: The radioactive effluent control program must include an environmental monitoring program. Each general license user may incorporate ISFSI operations into their environmental monitoring programs for 10 CFR Part 50 operations. An annual report shall be submitted pursuant to 10 CFR 72.44(d)(3).

Finding: This requirement was implemented by incorporating the ISFSI into the licensee's Part 50 environmental monitoring program. The Annual Radioactive Effluent Release Report for 2003 was submitted to the NRC on February 27, 2004, within the 60-day window allowed by 10 CFR 72.44(d)(3). The report included a summary statement that no effluents were released from the ISFSI in 2003. The report also met the requirements of ANO Unit 1 Tech Spec 5.6.3 and Unit 2 Tech Spec 6.9.3.

Documents Reviewed: Entergy letter OCAN020405 to the NRC dated February 27, 2004 containing the ANO 2003 Annual Radioactive Effluent Release Report

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Category: Fuel Inventory **Topic:** Acceptable Fuel for Storage

Reference: CoC 1014, Tech Spec B.2.1.1, Table 2.1-1

Requirement: Fuel allowed for storage in the canisters is identified in CoC 1014, Appendix B, Tech Spec 2.1 and Tables 2.1-1 through 2.1-8. Table 2.1-1, Section V.C states that damaged fuel assemblies and fuel debris are not authorized for loading into the MPC-32.

Finding: This requirement was not fully implemented and a Non-Cited Violation (NCV) has been issued due to loading damaged fuel into MPC-32 canisters not authorized to contain damaged fuel. At the time of the initial inspection in November 2004, the licensee was loading Combustion Engineering (CE) 16 X 16 fuel assemblies into Holtec MPC-32 canisters using the regionalized loading pattern. For this fuel and canister combination, Table 2.1-1, Section V.C of the technical specification required each fuel assembly to be intact. Damaged fuel and fuel debris were not allowed in the MPC-32 canisters. Damaged fuel was defined in the definitions section (Section 1.0) of Appendix B of the technical specifications for CoC 1014 as fuel cladding with defects greater than pinhole leaks or hairline cracks.

Appendix E to Procedure 1302.028 provided the worksheets for determining fuel assembly acceptability. In addition to the "intact" criteria, each fuel assembly was required to have: 1) zircaloy cladding; 2) a maximum initial enrichment of less than 5.0 wt% U235; 3) a combination of burnup and cooling time within the design envelope; and 4) a combination of decay heat load and cooling time within the design envelope. Non-fuel hardware was allowed in the MPC-32, however the ANO canisters were too short to accommodate it. Worksheets for

MPC-32-002 (Cask #11) were reviewed in detail. The worksheets adequately documented that the spent fuel loaded in MPC-32-002 was in compliance with the requirements of Tech Spec 2.1. At the time of the inspection, MPC-32-002 had been loaded with spent fuel and the lid was being welded.

On December 21, 2004, the NRC was notified by the licensee that five Unit 2 fuel assemblies previously identified as intact had been reclassified by AREVA (the fuel inspection vendor) as being suspect of containing a failed fuel rod. The suspect fuel assemblies, identified as AKC401, AKC504, AKD001, AKF103 and AKF110, had been loaded into four separate MPC-32 canisters during November and December of 2004. The licensee notified the NRC of the potential misloading on December 21, 2004 via Licensee Event Report (LER) #41276 in compliance with Holtec Tech Spec 2.2.2.

The licensee submitted Special Report 0CAN010503 to the NRC on January 19, 2005 in compliance with Holtec Tech Spec 2.2.3. The report provided a summary of the root cause as determined by the licensee, corrective actions that had been taken and additional corrective actions that would be taken to avoid further violations. The licensee also stated their plan to submit an exemption request to leave the affected fuel assemblies in storage at the ISFSI. The exemption request was submitted to the NRC on March 21, 2005 and is currently under review. LER #41276 has been closed based on the special report and the exemption request.

On January 25 and 26, 2005, the NRC inspectors conducted a site visit to review the Root Cause Evaluation Report completed by ANO and to interview personnel that had been involved with the fuel misloading event. The NRC inspectors independently reviewed the information and concluded that the licensee's Root Cause Evaluation Report was thorough and comprehensive.

The Root Cause Evaluation Report discussed the sequence of events leading to the determination that the fuel rods were damaged. ANO had established a contract with AREVA to provide ultrasonic testing inspections of approximately 900 fuel assemblies in the Unit 1 and Unit 2 spent fuel pools. The ultrasonic testing method was used to determine those fuel assemblies that could be classified as "intact". A fuel assembly would be classified as "intact" if no water was found in any of the fuel rods contained within the assembly. The absence of water in the fuel rod provided the basis to conclude that the fuel rod was intact and did not contain any defects.

On September 26, 2004, AREVA started ultrasonic testing of the fuel assemblies located in the Unit 2 spent fuel pool. AREVA completed ultrasonic testing of 506 Unit 2 fuel assemblies on November 2, 2004 and delivered a preliminary report to ANO on November 8, 2004. In the preliminary report, AREVA identified several fuel rods in which water had been detected. The AREVA technician verbally informed the ANO Reactor Engineer that all damaged fuel assemblies had been identified in the preliminary report and that the final report would mirror the preliminary report. Preliminary reports had been provided to ANO in the past and the final reports had always matched the preliminary reports. ANO used the

November 8, 2004, preliminary report to identify the intact fuel assemblies for the loading campaign which commenced on November 9, 2005.

ANO personnel failed to recognize that during previous ultrasonic testing activities, AREVA had provided both the initial UT technician and the secondary UT reviewer at the site to support the testing. AREVA Quality Assurance (QA) personnel had also been on site to provide an initial QA review of the information incorporated into the preliminary reports. During the ultrasonic testing campaign conducted during October and November, 2004, AREVA only had a single UT qualified technician on site. The final report required documented reviews from both an initial and secondary Level II qualified UT examiner. AREVA did not have a second Level II qualified examiner available until December 2004 to perform his review. During this second review is when additional failed fuel rods were identified.

AREVA used the ECHO-330 ultrasonic testing system for the ANO fuel examinations. This system was designed to detect water inside a fuel rod through an ultrasonic scan. If the initial scan indicated water in the fuel rod, a re-scan was performed to confirm the finding. Over 20 years of experience in performing ultrasonic testing of fuel rods provided the basis for analyzing the test data. Calibration of the system using both intact and damaged fuel rods was performed by AREVA prior to conducting the test scans. The process however, cannot determine the size of the breach and therefore cannot differentiate pin hole leaks and hairline cracks from gross breaches. Therefore a fuel rod containing any water was classified as damaged without any further evaluation to determine if the breach was greater than a pin hole leak or hairline crack. All the damaged rods in the fuel assemblies identified by the ultrasonic testing process and subsequently loaded into the MPC-32 canisters were interior rods. The interior rods could not be easily examined visually to determine the extent of the fuel rod damage.

On December 20, 2004, AREVA verbally notified ANO that their final review of the ultrasonic testing data had identified an additional 13 fuel assemblies as damaged. Of the 13 fuel assemblies identified as damaged, ANO determined that five had been loaded into canisters and moved to the ISFSI pad for dry storage. The five damaged fuel assemblies had been loaded into four canisters (MPC 32-001, MPC 32-002, MPC 32-003 and MPC 32-009) between November 9, 2004 and December 6, 2004. By loading the damaged fuel assemblies into the MPC-32 canisters, the licensee violated Tech Spec 2.1 of CoC 1014. This violation was identified by the licensee and entered into their corrective action program as Condition Report CR-ANO-C-2004-02188. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VI.A of the NRC Enforcement Policy (NCV 72-13/0402-01).

In addition to the failed fuel assemblies loaded into the MPC-32 canisters, the licensee also discovered during their evaluation of the misloading, that between 1997 and 1999, four spent fuel assemblies that could be classified as damaged under the Holtec criteria, had been loaded into three VSC-24 canisters. After review with NRC Spent Fuel Project Office, consensus was reached that these

four spent fuel assemblies had met the Sierra Nuclear VSC-24 CoC definition for fuel cladding "with no known or suspected gross cladding failures" that existed at the time of loading. Since the VSC-24 canisters are not licensed for shipment and the licensee was tracking the affected canisters, no further actions are required.

Documents Reviewed: (a) Procedure 1302.028, "Fuel Selection Criteria for Dry Storage", Rev. 9; (b) CR-ANO-2-2004-2188, Root Cause Evaluation Report, "Loading Failed Fuel Assemblies into DFS Casks", dated 01/24/05

Category: Fuel Inventory **Topic:** Acceptable Loading Patterns

Reference: CoC 1014, Tech Spec B.2.1.2, B.2.1.3

Requirement: The acceptable loading patterns for all Holtec canisters are: 1) Fuel assemblies with cooling times within one year of each other may be loaded into the same canister in any location (uniform loading). 2) Fuel assemblies with significantly different cooling times (1 year or greater) may be loaded into the same canister, provided the assemblies with the shorter cooling times are placed near the center of the canister and the assemblies with the longest cooling times are placed at the periphery (preferential uniform loading). 3) Regionalized fuel loading may be used to allow higher heat emitting assemblies to be stored than would otherwise be permitted under uniform loading. 4) When fuel assemblies are loaded in the same canister with post irradiation cooling times greater than or equal to one year, preferential or regionalized fuel loading shall be used.

Finding: This requirement was implemented in Appendix E "Fuel Selection Screening Criteria" to Procedure 1302.028 which provided the worksheets for determining fuel assembly acceptability. The worksheets contained a section for determining the appropriate loading method, regionalized or uniform, consistent with the requirements specified in Tech Specs B.2.1.2 and B.2.1.3.

Documents Reviewed: Procedure 1302.028, "Fuel Selection Criteria for Dry Storage", Rev 9

Category: Fuel Inventory **Topic:** Material Balance, Inventory, and Records

Reference: 10 CFR 72.72(a)

Requirement: Each licensee shall keep records showing the receipt, inventory (including location), disposal, acquisition, and transfer of all special nuclear material (SNM) with quantities specified in 10 CFR 74.13(a)(1).

Finding: This requirement was implemented through the completion of a Nuclear Fuel Locator Record required by Procedure 1022.12E. This record tracked all fuel assemblies from initial receipt, core position, spent fuel pool location and finally to a cask on the ISFSI pad. Procedure 1302.028E included each fuel assembly SNM amount in grams of Uranium. The Nuclear Fuel Location Record for spent fuel assembly serial number AKBT02 was randomly selected for a detailed review. The record indicated the licensee had received the assembly on October 28, 1977 and had placed it in the Unit 2 spent fuel pool. It was placed in the Unit 2 reactor on July 26, 1978 and removed on September 8, 1982. It remained in the Unit 2 spent fuel pool until August 26, 2004, when it was loaded into MPC-24-010.

Documents Reviewed:	(a) Procedure 1022.12E, "Nuclear Fuel Location Record", Rev. 5; (b) Procedure 1302.028E, "CE 16X16 MPC-32 Selection Screening Criteria," Rev 9

Category:	Operations/Maintenance **Topic:** Cask Spacing
Reference:	CoC 1007, Tech Spec 1.2.11
Requirement:	Each VSC-24 cask shall be placed in a storage array with at least 15 feet, plus or minus 1 foot, center to center spacing.
Finding:	This requirement had been met for all 24 casks located on the VSC-24 pad. Twenty-three casks were measured with center to center distances of approximately 15 feet. The twenty-fourth cask, located on the southwestern corner of the pad, had a center to center distance of approximately 18 feet from the nearest cask.
Documents Reviewed:	None.

Category:	Operations/Maintenance **Topic:** Combustible Gas Monitoring
Reference:	FSAR 1014, Section 8.1.5.3.e; Table 8.0.1
Requirement:	Monitor the area around the canister lid for combustible gases prior to and during welding or cutting activities. For defense in depth, the space below the canister lid should be evacuated or purged prior to and during these activities.
Finding:	Implementation of this requirement was observed during this inspection. The licensee had evacuated the area beneath the canister lid for MPC-32-002 with a vacuum system and was monitoring the vacuum exhaust for combustible gases during the welding process. Procedure 3403.005, Steps 9.3.14 through 9.3.19 specified the use of an explosive-proof vacuum system to evacuate the area beneath the canister lid. Measurements of the vacuum exhaust for combustible gases was required until the canister lid root pass weld and non-destructive examination (NDE) were completed. The procedure directed that if the root pass of the canister lid weld was interrupted for any reason, the combustible gas concentrations were to be verified to be < 10% of the lower explosive limit prior to continuing welding operations. The requirement to monitor combustible gases during lid cutting (removal) was verified to be incorporated into the licensee's unloading procedure. Procedure 3403.006, Steps 9.5.10 through 9.5.28 required that the licensee use an explosive proof vacuum to evacuate the area beneath the canister lid during the unloading operation phase. During the unloading phase the exhaust from the vacuum would be monitored to ensure that the combustible gas concentration remained less than 10% of the lower explosive limit.
Documents Reviewed:	(a) Procedure 3403.005, "HI-STORM 100 System Loading Operations," Change 003-00-0; (b) Procedure 3403.006, "HI-STORM 100 System Unloading Operations" Change 000-03-0

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Category:	Operations/Maintenance **Topic:** Exterior Inspections of Casks
Reference:	CoC 1007, Tech Spec 1.3.2
Requirement:	The VSC-24 concrete cask exterior surface shall be inspected annually for any damage (chipping, spalling, etc.). Defects larger than ½" in diameter or width and deeper than 1/4" shall be repaired.
Finding:	This annual requirement was being implemented by the licensee. The results of the VSC-24 concrete cask annual inspections conducted during the past 2 years were reviewed. The exterior concrete inspections conducted during 2003 identified shrinkage cracks on casks 1 through 23. Concrete defects identified during this inspection were documented as repaired under Work Order Package 50277187. The deficiencies discovered during the annual inspection conducted during 2004 were documented in Condition Report CR-ANO-2-2004-00951. The condition report noted that quality control inspectors had identified concrete defects that were greater than 1/4" deep and 1/2" wide. A review of Work Order Package 50574423 identified that the repairs to the concrete casks had not been completed at the time of this inspection. The grout planned for the concrete defect repairs had expired and new grout had been ordered. The licensee planned to perform the concrete repairs in early December 2004. No time limit for completing repairs was specified in the VSC-24 technical specification.
Documents Reviewed:	(a) Work Order Package 50277187; (b) Condition Report CR-ANO-2-2004-00951; (c) Work Order Package 50574423

Category:	Operations/Maintenance **Topic:** Fire Combustibles at the ISFSI
Reference:	CoC 1014, Tech Spec B.3.4.5
Requirement:	The potential for fire and explosion shall be addressed, based on site-specific considerations. This includes the condition that the on-site transporter fuel tank will contain no more than 50 gallons of diesel fuel while handling a loaded concrete cask or transfer cask.
Finding:	This requirement was not fully implemented and a Non-Cited Violation (NCV) has been issued due to failure to perform a site specific fire and explosion hazards analyses for the ISFSI docking station. The licensee is required by Tech Spec B.3.4.5 to evaluate any potential fires or explosions that could effect a loaded cask. During this inspection, a number of engineering reports and condition reports were reviewed and a walkdown of the ISFSI area and the travel path for the casks was conducted. The licensee's 72.212 Evaluation Report, Section B.4.3.1.5 "Fire Protection" provided a detailed discussion of the fire and explosion hazards associated with the dry cask operations and referenced several engineering reports that evaluated specific fire protection issues. Engineering Report 95-R-0025-01 provided documentation of the maximum

theoretical diameter of a pool of fuel resulting from the failure of the fuel tanks associated with the equipment used to transport and manipulate the casks. This engineering report analyzed 600 gallons of diesel fuel in the railroad train engine and 24 gallons of diesel fuel in the forklift used to transport the loaded VSC-24 casks.

Engineering Report 96-R-0008-01 evaluated the potential effects of a fire involving in-situ combustibles on the VSC-24 storage containers while inside the power block. The engineering report did not consider transient materials and stated, "The effects of transient combustibles and flammable/combustible liquids are not included in this evaluation as Procedure 1000.047, Control of Combustibles, mandates appropriate levels of compensatory actions to minimize hazards." The conclusions reached by this engineering report were reasonable but were dependent upon the licensee complying with the provisions of Procedure 1000.047 to restrict transient combustibles from being stored near loaded casks.

Engineering Report ER-ANO-2000-3333-006 analyzed the differences between the VSC-24 cask storage system design and the Holtec HI-STORM 100 cask storage system design. The engineering report concluded that the differences between the two cask system designs were negligible from a fire protection standpoint. This engineering report acknowledged that a hydraulic system containing approximately 26 gallons of hydraulic fluid was used during railcar transport operations. The potential impact of this volume of hydraulic fluid to contribute to a fire, was described as "bounded by the assessment of the 50 gallons of fuel in the transporter" and therefore was not analysed in conjunction with the diesel fuel during the fire hazards analysis.

Condition Report CR-ANO-C-2004-00019 was initiated on January 8, 2004. This condition report reviewed the potential impact of a fire located in the paint storage building on a single loaded Holtec cask located at the ISFSI, approximately 125 feet away. The condition report concluded the paint storage building fire analysis was bounded by engineering report ER 96-R-0008-01 which evaluated the responsiveness of the VSC-24 cask system to a fire, and by engineering report ER ANO-2000-333-006 which compared the fire resistive nature of the VSC-24 cask to the Holtec cask and found them to be equivalent.

During this inspection several issues were identified that collectively resulted in the issuance of a non-cited violation. These issues are discussed below:

1. During a walk down of the ISFSI, a portable diesel-driven air compressor was observed approximately 30 feet from the ISFSI docking station where a loaded Holtec cask had been left. The ISFSI docking station is the location where the cask is uncoupled from the railcar before it is moved to it's permanent location on the ISFSI pad. The loaded cask was left unattended at the docking station and did not have fire detection or compensatory measures in place at the time of the discovery. The portable air compressor unit contained approximately 100 gallons of diesel fuel. The presence of this transient flammable material had not been evaluated by the licensee for use or storage near a loaded cask.

Engineering Report ER-ANO-2000-3333-075 was initiated to perform a fire hazards analysis for the loaded cask while it was located at the docking station. The licensee used the fire modeling tools contained in NUREG 1805 to perform the analysis. Although the methodology used in NUREG 1805 differed from the analysis methodology specified in NUREG 1536 for analysis of the Holtec bounding hypothetical fire, the NRC Spent Fuel Project Office staff agreed that the licensee results would be satisfactory in demonstrating that the cask was not compromised by the postulated fire. Four separate fire scenarios were evaluated by the licensee in the engineering report which concluded that none of the evaluated scenarios would result in damage to the spent fuel stored in the cask.

2. No controls had been established to prevent transient flammable material from being stored near the cask while the loaded cask was at the ISFSI docking station. Without controls, the licensee had no way of ensuring that flammable materials in excess of those analyzed in the fire hazards analysis would be restricted from storage near the loaded cask. The licensee committed to establish measures to control storage of flammable and combustible materials at the docking station.

3. The licensee's fire hazards analysis for the ISFSI pad had included an analysis for the nearby paint storage building. However, the fire hazards analysis did not include an evaluation of a cask located at the ISFSI docking station. The licensee included this evaluation in the scenarios analyzed in Engineering Report ER-ANO-2000-3333-075 and concluded that no damage would occur to the stored spent fuel from a fire at the paint storage building.

4. The licensee's fire hazards analysis did not evaluate the potential effects of all the flammable/combustible materials that were near the loaded cask. The casks were moved from the rail car and onto the ISFSI pad using a Linde fork lift. Analysis of the 27.5 gallons of diesel fuel in the fork lift had been evaluated by Engineering Report ER-ANO-2000-3333-033. However, the fork lift also had 3 gallons of engine oil, 27.5 gallons of hydraulic oil and 10.12 gallons of transmission fluid which were not evaluated by the engineering report.

The issues identified above were determined by the NRC to be violations of Tech Spec B.3.4.5 related to the requirement to perform a fire and explosion analysis for the ISFSI. The licensee entered these issues into their corrective action program as Condition Report CR-ANO-C-2004-02081. This Severity level IV violation is being treated as a Non-Cited Violation, consistent with Section VI.A of the NRC Enforcement Policy (NCV 72-13/0402-02).

Documents Reviewed: (a) Condition Report CR-ANO-C-2004-02081; (b) Condition Report CR-ANO-C-2004-00019; (c) Engineering Report 95-R-0025-01, Rev. 0; (d) Engineering Report 96-R-0008-01, Rev. 0; (e) Engineering Report ER-ANO-2000-3333-006, Rev. 0; (f) Engineering Report ER-ANO-2000-3333-033, Rev. 0; (g) Engineering Report ER-ANO-2000-333-075, Rev.0; (h) 72.212 Evaluation Report, Rev. 1

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Category:	Operations/Maintenance **Topic:** Helium Purity
Reference:	CoC 1014, App A, Table 3-1, Footnote 1
Requirement:	Helium used for backfilling the canister shall have a purity of greater than or equal to 99.995 percent.
Finding:	This requirement was being implemented by the licensee. The helium bottles on the refueling floor were labeled 99.995 percent pure and were stored separately from other gases. All helium was introduced into the canister using the Forced Helium Dehydrator (FHD) skid. The helium bottles were moved onto the skid just prior to use and were removed from the skid after each use. The bottles were verified to be 99.995 percent pure helium by the licensee prior to movement to the FHD skid.
Documents Reviewed:	None.

Category:	Operations/Maintenance **Topic:** Lifting Trunnion Exam Prior to Use
Reference:	FSAR 1014, Table 9.2.1
Requirement:	Prior to each fuel loading, a visual examination in accordance with a written procedure shall be required of the transfer cask lifting trunnions and pocket trunnion recesses. The examination shall inspect for indications of overstress such as cracking, deformation, or wear marks.
Finding:	This requirement was implemented in Procedure 3403.004 which documented the readiness of the HI-STORM 100 system equipment prior to each loading. Supplement 1 of this procedure required that the lifting trunnions be inspected prior to each loading to ensure that no damage existed. The licensee stated that the trunnion inspection checked for evidence of cracking, deformation and other potential indications of damage to the lifting trunnions. ANO's transfer cask does not contain pocket trunnions, therefore the pocket trunnion inspection requirements were not applicable.
Documents Reviewed:	(a) Procedure 3403.004, "HI-STORM 100 System Equipment Preparation," Change 002-01-0; (b) Procedure 3403.005, "HI-STORM 100 System Loading Operations," Change 003-00-0

Category:	Operations/Maintenance **Topic:** Load Test on Lifting Trunnions
Reference:	FSAR 1014, Table 9.1.3.
Requirement:	Load testing of the transfer cask lifting trunnions shall be performed per ANSI N14.6 annually or prior to use if the period the transfer cask is out of use exceeds one year.
Finding:	This requirement was met through inspections and nondestructive weld testing on the lifting trunnions. Table 9.1.3 of the Holtec FSAR required an annual test of the lifting trunnions on the transfer cask in accordance with ANSI N14.6. Section 6.3.1 of ANSI N14.6 allowed dimensional testing, visual inspection, and nondestructive testing of the major load-carrying welds and critical areas, in lieu of load testing. The licensee was performing dimensional testing, visual inspection, and nondestructive examination to meet the annual trunnion testing

requirement.

Procedure 3406.003 required annual dimensional checks and a nondestructive (liquid penetrant or magnetic particle) examination of the non-threaded load bearing parts of the transfer cask trunnion. The procedure also required a visual inspection of the lifting trunnions (including threads) prior to the start of each loading campaign.

The results of the liquid penetrant examinations performed on November 25, 2003 (Report Number 203PT087) and on August 25, 2004 (Report Number BOP-PT-04-088) were reviewed. No indications had been found by the NDE examiners on the non-threaded areas of the trunnions.

Documents Reviewed: (a) Procedure 3406.003, "Inspection and Test of Special Lifting Devices Utilized for Dry Fuel Storage Activities," Change 000-00-0; (b) ANSI N14.6-1993, "American National Standard for Radioactive Materials - Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More"

Category: Operations/Maintenance **Topic:** Registration of Casks with NRC

Reference: 10 CFR 72.212(b)(1)(ii)

Requirement: The general licensee shall register the use of each cask with the NRC no later than 30 days after using the cask to store spent fuel.

Finding: The licensee had registered all the Holtec casks within the 30 day limit. Ten Holtec casks had been placed on the ISFSI pad between December 2003 and November 2004. A summary of the dates the casks were placed on the ISFSI pad and when the registration letters were submitted is provided below:

Holtec Cask #1 in service December 13, 2003; registered January 12, 2004
Holtec Cask #2 in service January 13, 2004; registered February 12, 2004
Holtec Cask #3 in service January 21, 2004; registered February 12, 2004
Holtec Cask #4 in service February 15, 2004; registered March 15, 2004
Holtec Cask #5 in service February 23, 2004; registered March 15, 2004
Holtec Cask #6 in service March 05, 2004; registered March 15, 2004
Holtec Cask #7 in service September 10, 2004; registered October 07, 2004
Holtec Cask #8 in service September 19, 2004; registered October 07, 2004
Holtec Cask #9 in service September 25, 2004; registered October 07, 2004
Holtec Cask #10 in service November 16, 2004; registered December 15, 2004

Documents Reviewed: (a) Registration letter to the NRC dated January 12, 2004 for Holtec Cask 1; (b) Registration letter to the NRC dated February 12, 2004 for Holtec Casks 2, 3; (c) Registration letter to the NRC dated March 15, 2004 for Holtec Casks 4, 5, 6; (d) Registration letter to the NRC dated October 17, 2004 for Holtec Casks 7, 8, 9; (e) Registration letter to the NRC dated December 15, 2004 for Holtec Cask 10

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Category:	Operations/Maintenance **Topic:** Unloading; Cooldown and Flooding
Reference:	FSAR 1014, Sect 4.5.1.1.6; Tech Spec 3.1.3
Requirement:	Prior to reflooding the canister with water, a forced helium recirculation system with adequate flow capacity shall be operated to remove decay heat and initiate a slow cask cooldown to below 200 degrees F. Before operating the helium recirculation system the transfer cask annulus area is flooded with water to lower the canister shell temperature. For low decay heat loads (approximately 10 kW or less) the annulus cooling is adequate, without forced helium recirculation, to lower the canister cavity temperature below the boiling point of water prior to lid removal.
Finding:	This requirement was implemented in Procedure 3403.006 which provided directions for cooling and flooding the canister. Steps 9.2.109 through 9.3.2 provided directions for the initial cooling of the canister to a temperature below the point where steam would be produced from the introduction of water into the transfer cask annulus area. Section 9.4 of the procedure provided instructions for using the enhanced helium cooldown system to further cool the canister internal gas temperature. Step 9.4.102 provided verification that the system temperature of the gas circulating through the canister had stabilized after 2 hours of system operation at less than or equal to 200 degrees F.
Documents Reviewed:	Procedure 3403.006, "HI-STORM 100 System Unloading Operations", Change 000-03-0

Category:	Operations/Maintenance **Topic:** Unloading; Gas Sampling
Reference:	FSAR 1014, Sect 8.3.3, Step 7; Table 8.0.1
Requirement:	During unloading of a canister, take a gas sample. Canister gas sampling allows operators to determine the integrity of the fuel cladding prior to opening the canister. This allows preparation and planning for failed fuel.
Finding:	This requirement was implemented in Procedure 3403.006 which contained adequate steps for collecting the gas sample into the gas sample bottle, along with precautions for following proper radiological controls during the collection and assessment of the gas sample.
Documents Reviewed:	Procedure 3403.006, "HI-STORM 100 System Unloading Operations," Change 000-03-0

Category:	Quality Assurance **Topic:** Audits
Reference:	10 CFR 72.176
Requirement:	The licensee shall carry out a comprehensive system of planned and periodic audits to verify compliance with all aspects of the QA program and to determine the effectiveness of the program.
Finding:	The licensee had implemented this requirement by conducting audits and surveillances of the ISFSI activities as part of the reactor quality assurance program. Surveillance Report QS-2003-ANO-069, conducted December 4-12, 2003, was reviewed to evaluate the level of detail being included in the

surveillances of the ISFSI. This surveillance encompassed the spent fuel selection process, implementation of dry fuel storage procedures, rigging/lifting/material handling, industrial safety, radiological safety, foreign material exclusion and management oversight. The surveillance concluded that: 1) reactor engineering personnel were knowledgeable of the spent fuel selection process and forms; 2) safe work practices, including the use of personnel protective equipment (PPE) and proper rigging techniques, were demonstrated; 3) foreign material exclusion (FME) and housekeeping controls were in compliance with station requirements; 4) radiation protection personnel provided appropriate support; and 5) team meetings were well conducted, informative, used lessons learned, and stressed industrial safety. The scope of the surveillance was well developed and targeted error likely situations including attention to detail, procedure changes and first time evolutions. No corrective actions were identified.

Documents Reviewed: Surveillance Report QS-2003-ANO-069, "Dry Fuel Storage Surveillance", dated December 17, 2003

Category: Quality Assurance **Topic:** Corrective Actions

Reference: 10 CFR 72.172

Requirement: The licensee shall establish measures to ensure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures must ensure that the cause of the condition is determined and corrective action taken to preclude repetition. This must be documented and reported to appropriate levels of management.

Finding: The licensee had incorporated ISFSI related issues into the reactor facility corrective action program. This program provided for identifying, documenting, tracking, evaluating and closing issues that were identified as adverse to quality. Thirty-one ISFSI related condition reports had been generated since January 1, 2004. Eleven related to breakdowns in the VSC-24 temperature monitoring system, five related to deficiencies and modifications of ISFSI loading equipment, and five related to foreign material exclusion (FME) controls. The remaining 10 condition reports related to records, fuel misloading, L-3 crane, procedure upgrades, welding, and control of combustibles at the ISFSI. The 31 condition reports were reviewed and found to adequately address the problems identified and were closed in a timely manner.

Documents Reviewed: VSC-24 Temperature Monitoring System condition reports: (a) CR-ANO-2-2004-00961; (b) CR-ANO-2-2004-01273; (c) CR-ANO-2-2004-01373; (d) CR-ANO-2-2004-01425; (e) CR-ANO-2-2004-01459; (f) CR-ANO-2-2004-01471; (g) CR-ANO-2-2004-01492; (h) CR-ANO-2-2004-01869; (i) CR-ANO-C-2004-01970; (i) CR-ANO-2-2004-01976; (k) CR-ANO-2-2004-01987; ISFSI Loading Equipment condition reports: (a) CR-ANO-2-2004-00951; (b) CR-ANO-1-2004-01831; (c) CR-ANO-2-2004-01330; (d) CR-ANO-C-2004-01650; (e) CR-ANO-C-2004-01736; FME Controls condition reports: (a) CR-ANO-C-2004-00197; (b) CR-ANO-C-2004-01246; (c) CR-ANO-C-2004-01466; (d) CR-

ANO-2-2004-01885; (e) CR-ANO-2-2004-01955; L-3 Crane condition reports: (a) CR-ANO-1-2004-00065; (b) CR-ANO-1-2004-00294; Records condition reports: (a) CR-ANO-1-2004-00445; (b) CR-ANO-C-2004-01747; Fuel Misloading condition reports: (a) CR-ANO-C-2004-00170; (b) CR-ANO-C-2004-00389; Procedure Upgrades condition reports: (a) CR-ANO-C-2004-00217; (b) CR-ANO-2-2004-01451; Welding condition reports: (a) CR-ANO-1-2004-00366; Control of Combustibles at the ISFSI condition reports: (a) CR-ANO-C-2004-02081

Category: Quality Assurance **Topic:** Handling, Storage and Shipping Control

Reference: 10 CFR 72.166

Requirement: The licensee shall establish measures to control, in accordance with work and inspection instructions, the handling, storage, shipping, cleaning and preservation of material and equipment to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere and specific moisture content and temperature levels must be specified and provided.

Finding: A tour of the storage area outside the warehouse was completed and all ISFSI components were observed to be stored properly. Two canisters were stored outside the warehouse with shipping covers and tarpaulins installed to protect them from rusting and weathering. Their associated lids, drain pipes, silver dollars, shims and closure rings were stored inside the warehouse out of the weather.

Holtec Standard Procedure HSP-314 was selected for review to verify the licensee was properly implementing cleaning requirements for ISFSI equipment. The procedure stated that water was a permissible cleaning agent for stainless steel, provided it contained less than 250 ppm chlorides, 5 ppm fluorides, and 1 ppm sulfides. The licensee used water from the local municipal water supply for receipt flushing of the Holtec canisters. This water was tested annually and met the water standards for chlorides, fluorides and sulfides.

Documents Reviewed: (a) Holtec Standard Procedure HSP-314, "Cleaning Procedure For Fabricated Components and Finished Products", dated June 5, 2000; (b) ANSI/ASME N45.2-1 - 1980, section 3.4 and Table 3.2

Category: Quality Assurance **Topic:** Instrument Calibration

Reference: 10 CFR 72.164

Requirement: The licensee shall establish measures to ensure that tools, gauges, instruments and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specific periods to maintain accuracy within necessary limits.

Finding: This requirement was not fully implemented and a Non-Cited Violation (NCV) has been issued due to the licensee's use of an uncalibrated thermometer to verify compliance with Tech Spec 3.1.1.1. Tech Spec 3.1.1.1 required the gas temperature exiting the demoisturizer to be less than or equal to 21 degrees F

for greater than or equal to 30 minutes. The licensee's Procedure 3406.006 specified monitoring the temperature of the helium exiting the freezer-dryer (or demoisturizer) for 30 minutes to confirm that the helium temperature remained below 19 degrees Fahrenheit. The licensee acceptance limit specified in the procedure was conservative relative to the acceptance limit specified in the technical specifications.

The NRC inspectors found that the thermometer used by the licensee to perform the temperature measurements required by Tech Spec 3.1.1.1 was not calibrated. After identifying this issue, the licensee performed an "as found" calibration of the thermometer and found that it was reading in a conservative manner. The "as found" calibration results provided reasonable assurance that the five canisters that had already been loaded and placed on the ISFSI pad met the Tech Spec 3.1.1.1 dryness requirements. The licensee also placed the thermometer on a schedule to be recalibrated on an annual basis.

10 CFR 72.164 required that measures be established to ensure that instruments and other measuring and testing devices used in activities affecting quality are properly calibrated. Failure to calibrate the thermometer used to demonstrate compliance with Tech Spec 3.1.1.1 was a violation of 10 CFR 72.164. This violation was identified by the NRC during the course of the inspection. The licensee entered the condition into their corrective action program as Condition Report CR-ANO-C-2004-02119. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VI.A of the NRC Enforcement Policy (NCV 72-13/0402-03).

Documents Reviewed: Procedure 3406.006, "Forced Helium Dehydration System Operations," Change 000-01-0

Category: Radiological Controls **Topic:** ALARA Program

Reference: FSAR 1014, Sect 10.1.1

Requirement: Licensees using the Hi-Storm 100 System will utilize and apply their existing site ALARA policies, procedures and practices for ISFSI activities to ensure that personnel exposure requirements of 10 CFR Part 20 are met. Pre-job ALARA briefings should be held with workers and radiological protection personnel prior to work on or around the system.

Finding: ANO was implementing their reactor radiological protection program for ISFSI related activities. The ISFSI pad area was properly posted as a radioactive materials area and a radiation area. The radiological postings were located at the access points to the ISFSI pad. The radiation doses at the access points were less than 1 mrem/hr. The Radiation Technicians performed monthly surveys of the ISFSI pad perimeter. The monthly ISFSI pad radiation survey performed on September 4, 2004 was compared to the radiation survey readings obtained by the NRC inspectors during this inspection, and found to be consistent.

An ALARA pre-job briefing on November 17, 2004, was conducted in preparation for moving cask #10 onto the ISFSI pad. The briefing, attended by the NRC

inspectors, was focused on industrial safety and sound radiological practices and provided a good briefing for the workers on the radiological aspects of the upcoming work.

The first Holtec loading campaign started in December 2003 and continued until March 2004. Six MPC-24 canisters were loaded. Over the four month period of loading canisters, the person-rem dose per canister decreased from 0.755 to 0.277. The second Holtec loading campaign started in September 2004 and was scheduled to be completed in January 2005. At the time of this inspection, three MPC-24 canisters and one MPC-32 canister had been loaded. The person-rem dose per canister had decreased from 0.745 to 0.430. This loading campaign included the licensee's first use of the Forced Helium Dehydrator (FHD) System for canister drying. During each loading campaign, pre-job briefings and lessons learned were stressed. As indicated from the person-rem dose data, as the work continues during a loading campaign, the workers become more efficient in performing their tasks and reducing their overall exposure.

Documents Reviewed: Survey ANO-0409-0032, "Dry Fuel Storage Pad", completed September 9, 2004

Category: Tech Spec Surveillance **Topic:** Boron Concentrations

Reference: CoC 1014, Tech Spec A.3.3.1.c, A.3.3.1.d

Requirement: Whenever water and fuel are in an MPC-32 canister during loading, unloading, recirculation or makeup, the water shall be borated to 1900 ppm boron or greater when all fuel assemblies have an initial enrichment of 4.1 wt% U-235 or less, and 2600 ppm boron or greater when one or more fuel assemblies have an initial enrichment between 4.1 and 5.0 wt% U-235. Boron concentration must be verified, using two independent measurements, within 4 hours of reaching fuel and water conditions in the canister and every 48 hours thereafter.

Finding: The boron requirement had been incorporated into loading Procedure 3403.005, Step 9.2.1 which required two separate boron samples analyzed by two separate individuals within 4 hours prior to fuel movement and every 48 hours thereafter while the canister was submerged. The minimum required boron concentration for the MPC-32 was 2650 ppm.

Unloading Procedure 3403.006, Step 6.1.12 contained the 1900 ppm and 2600 ppm specifications for the MPC-32. However, step 9.4.116 specified a minimum boron concentration of 2050 ppm just prior to reflooding the canister. The 2050 ppm concentration was for the MPC-24 canisters. Step 9.4.116 had not been updated to include the MPC-32 requirements for 1900 ppm and 2600 ppm boron concentrations and the sampling frequency was not specified. This procedure, to be used for unloading a canister, had never been implemented at ANO. The licensee generated Condition Report CR-ANO-2-2005-00600 to update the unloading procedure to incorporate the MPC-32 boron requirements.

Documents Reviewed: (a) Procedure 3403.005, "HI-STORM 100 System Loading Operations", Change 003-00-0; (b) Procedure 3403.006, "HI-STORM 100 System Unloading Operations", Change 000-03-0

Category:	Tech Spec Surveillance **Topic:** Cask Air Ducts Free of Blockage
Reference:	CoC 1014, Tech Spec 3.1.2.1; CoC 1007, Tech Spec 1.3.1, Rev. 4
Requirement:	Verify all cask inlet and outlet air ducts are free from blockage daily and the wire mesh screens are intact.
Finding:	This requirement was implemented by the licensee using Procedure 1015.003B, Attachment B which required the VSC-24 and Holtec cask air inlet and outlet screens to be checked for blockage daily. The screen checks were performed each shift and documented on Form OPS B31, "Outside AO Log." The completed Form OPS B31 logs for August 1 through September 30, 2004, and on November 16, 2004 were reviewed and found to adequately document the required inlet and outlet air duct and screen inspections.
Documents Reviewed:	(a) Operations Procedure OP 1015.003B, "Unit Two Operations Logs", Attachment B, Change 048-07-0; (b) Operations Log OPS B31, "Outside AO Log", Change 048-07-0

Category:	Tech Spec Surveillance **Topic:** Cask Surface Dose Rates
Reference:	CoC 1014, Tech Spec A.3.2.3
Requirement:	The average dose rates for each concrete cask shall not exceed 50 mrem/hr (neutron + gamma) on the side, 10 mrem/hr on the top, and 45 mrem/hr at the inlet and outlet vent ducts.
Finding:	This requirement was implemented in Attachment 1 of Procedure 1601.305 which required radiation surveys of the storage casks following loading. The procedure required 12 dose rate measurements on the side, 5 measurements on the top, and one dose rate measurement at each inlet and outlet air vent. The average combined (gamma plus neutron) dose for each set of readings was determined and compared to the acceptance criteria of 50 mrem/hr on the side, 10 mrem/hr on the top, and 45 mrem/hr at the inlet and outlet vent ducts. The acceptance criteria was consistent with Tech Spec A.3.2.3. The radiological survey data for Holtec Cask #10 was reviewed. This was the first MPC-32 cask loaded and was placed in service on November 16, 2004. The survey was performed with the gamma shields installed in the inlet and outlet air vents. The survey found that the average of 12 dose rates measured on the sides was 0.9 mrem/hr, the average of 5 dose rates on the lid was 0.72 mrem/hr, and the average of 8 dose rates measured on the inlet and outlet vents was 3.1 mrem/hr. These readings were within the technical specification requirements.
Documents Reviewed:	Procedure 1601.305, "Radiation Monitoring Requirements for Loading and Storage of the HI-STORM", Change 002-00-0

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Category:	Tech Spec Surveillance **Topic:** Heat Transfer Validation Test
Reference:	CoC 1014, License Condition 9
Requirement:	The heat transfer characteristics of the Hi-Storm 100 cask system will be recorded by temperature measurements for the first cask placed in service, by any user, with a heat load equal to or greater than 10 kW. An analysis shall be performed that demonstrates validation of the thermal behavior described in Chapter 4 of the FSAR. Validation tests are required for subsequent casks exceeding the previous cask by 2 kW up to 16 kW. A letter summarizing each validation test shall be submitted to the NRC in accordance with 10 CFR 72.4.
Finding:	This requirement was implemented. The first Holtec HI-STORM 100 cask system to be used by the licensee had a measured heat load of 16.414 kW. A thermal validation test, as required by License Condition 9 of the certificate of compliance, was satisfactorily performed. Actual temperature measurements on the Holtec cask were performed by ANO and provided to Holtec for analysis to validate the modeling techniques used in Section 4.0 of the Hi-Storm 100 FSAR. Holtec used thermal model, HI-2033126 to calculate predicted temperature values for the cask. The thermal analysis predicted an air temperature difference of 82 degrees F between the inlet the outlet temperature. Actual measurements taken on January 8, 2004 on the cask's inlet and outlet vents were 43.8 degrees F and 112.8 degrees F, respectively. This was a 69 degree F temperature difference between inlet and outlet and was within the predicted values of the thermal model. Entergy provided the results of the thermal test to the NRC by letter dated July 13, 2004 (ML041970388).
Documents Reviewed:	Entergy correspondence #OCANO070401, containing the Validation of HI-STORM 100 System Heat Transfer Characteristics, submitted to the NRC on July 13, 2004.

Category:	Tech Spec Surveillance **Topic:** Thermal Performance
Reference:	CoC 1007, Tech Spec 1.2.3/1.3.4
Requirement:	Verify a temperature measurement of the thermal performance for each VSC-24 cask on a daily basis. The equilibrium air temperature at the outlet of a fully loaded cask (24 kW) shall not exceed ambient by more than 110 degrees F. For casks with heat loads less than 24 kW, the limiting temperature differential must be calculated by the user.
Finding:	This requirement was being implemented in Procedure OP 1015.003B, Attachment B which required the average outlet air temperature for each of the VSC-24 casks to be checked daily. A formula for determining the outlet air temperature limit for each cask had been included in the procedure. Thermocouples on each cask air outlet vent sent cask temperature data to a computer, which printed each shift as Operations Report OPS B42. This report included cask outlet temperature, average outlet temperature and an alarm set point for each of the VSC-24 casks. All VSC-24 casks had heat loads less than 24 kW with Cask #22 having the highest heat load of 14.7 kW. Determination of the maximum outlet air temperature limit was a function of ambient temperature and the kW heat load of the cask. For example, a 4 kW cask with an ambient

temperature of 32 degrees F was limited to an outlet temperature of 61 degrees F, whereas a 14 kW cask with an ambient temperature of 100 degrees F would be limited to an outlet temperature of 179 degrees F. The data was checked each shift by the operators.

The temperature data in the computer reports (OPS B42) for August 1 through September 30, 2004, and on November 16, 2004 was reviewed. No outlet alarm values had been exceeded. For November 16, 2005, the maximum outlet air temperature was calculated by the NRC inspectors for Cask #22. Calculations based on the 14 kW heat load and an ambient temperature of 67 degrees F yielded an outlet temperature limit of 162 degree F. The measured average outlet temperature for Cask #22 was 115 degrees F, well within the limit.

Documents Reviewed: (a) Operations Procedure OP 1015.003B, "Unit Two Operations Logs", Attachment B, Change 048-07-0; (b) Operations Report OPS B42, "Ventilated Storage Cask Report", Change 048-07-0