UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

May 18, 2005

Mr. Paul D. Hinnenkamp
Vice President - Operations
Entergy Operations, Inc.
River Bend Station
5485 US Highway 61N
St. Francisville, LA 70775

SUBJECT: INSPECTION REPORT 050-00458/05-009; 072-00049/05-001

Dear Mr. Hinnenkamp:

An NRC inspection was conducted on January 31 through February 3, 2005, at your River Bend Station. The enclosed inspection report documents the results of that inspection, which were discussed with you and members of your staff during a telephonic exit meeting on April 21, 2005. This inspection consisted of observing the fluid operations segment of your Independent Spent Fuel Storage Installation (ISFSI) pre-operational testing program. The fluid operations segment included demonstrations of spent fuel canister hydrostatic testing, draining, moisture removal, helium backfilling, gas sampling and fuel assembly cooling.

The inspection determined that you are conducting pre-operational testing activities in compliance with the Commission's rules and regulations and within the conditions of your license as they relate to pre-operational testing activities. No violations were identified.

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 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, you 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/ J. V. Everett

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

Docket Nos.: 50-458
72-049

License No.: NPF-47
Enclosure:
NRC Inspection Report
050-00458/05-009; 072-00049/05-001

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	050-00458; 072-00049
License No.:	NPF-47
Report No:	050-00458/05-009; 072-00049/05-001
Licensee:	Entergy Operations, Inc.
Facility:	Independent Spent Fuel Storage Installation River Bend Station 5485 U.S. Highway 61 St. Francisville, Louisiana
Dates:	January 31 through February 3, 2005
Inspectors:	S.P. Atwater, Health Physicist R.L. Kellar, P.E., Health Physicist
Approved By:	D.B. Spitzberg, Ph.D., Chief Fuel Cycle and Decommissioning Branch
Attachments:	1. Supplemental Information 2. Inspector Notes

EXECUTIVE SUMMARY

River Bend Nuclear Generating Station
NRC Inspection Report 050-00458/05-009; 072-00049/05-001

License Condition 10 of Holtec Certificate of Compliance 72-1014, Amendment 1 required the licensee to conduct pre-operational testing of the loading, closure, handling, unloading, and transfer of the HI-STORM 100 cask system prior to first use of the system to load spent fuel assemblies. License Condition 10 consisted of ten subsections numbered a. through j.

On January 31 through February 3, 2005, River Bend conducted several pre-operational testing activities required by License Conditions 10.f and 10.j. The testing was conducted using a spent fuel canister mock-up, and included canister hydrostatic testing, draining, moisture removal by forced helium dehydration, helium backfilling, gas sampling and cooling of fuel assemblies. Based on NRC inspector observations, the pre-operational testing demonstrated the licensee's ability to safely perform these activities with spent fuel assemblies.

License Condition 10.f also required helium leak testing of the canister welds. Holtec License Amendment Request #2 proposed to remove this requirement. If License Amendment Request #2 is approved by the NRC, the licensee will have met all the requirements of License Condition 10.f. The remaining activities to be demonstrated by the licensee under License Condition 10.j include cask system unloading and flooding of the canister.

Details related to the activities observed are provided in Attachment 2 to this report. The following provides a summary of the findings of this inspection.

Pre-Operational Testing of an ISFSI (60854, 60854.1)

- Moisture was successfully removed from the canister using the Forced Helium Dehydration (FHD) system. The degree of dryness specified by the Holtec technical specifications was achieved. (Attachment 2, Page 1)

- The Holtec Final Safety Analysis Report (FSAR) specified that spent fuel assemblies must never be exposed to air or oxygen. The licensee had sequenced the steps in both the loading and unloading procedures to ensure that spent fuel assemblies were maintained underwater or under a helium blanket at all times. (Attachment 2, Page 2)

- The Holtec FSAR required pressure relief valves to be installed to limit canister pressure. The licensee procedures required these pressure relief valves to be calibrated. The pressure relief valves identified by the FSAR were installed and calibrated, with one exception. The helium supply pressure relief valve was installed but not calibrated. A Condition Report was generated to evaluate and correct this condition. (Attachment 2, Page 2)

- The Holtec FSAR prohibited boiling of the water inside the canister. The time required for boiling to occur (time-to-boil) is calculated as a function of the initial water temperature and the decay heat load of the fuel. The time-to-boil calculations were demonstrated as required by the loading procedure. (Attachment 2, Page 3)

- The Holtec FSAR specified that during an unloading operation, the fuel assemblies must be cooled to prevent boiling when the canister was re-flooded with water. The licensee successfully demonstrated the ability to use the FHD system to cool the canister with helium. (Attachment 2, Page 4)

- The Holtec FSAR required that gas sampling be performed during an unloading operation to determine the integrity of the fuel cladding. A sampling rig was installed on the canister vent port and a gas sample was obtained using a vacuum pump. (Attachment 2, Page 4)

- Once dried, the canister was backfilled with high purity helium to the correct pressure and density specified by the Holtec technical specifications. (Attachment 2, Page 5)

- The American Society of Mechanical Engineers (ASME) code provided specifications for conducting hydrostatic leak testing. The licensee met all of these ASME code requirements during the hydrostatic testing demonstration. (Attachment 2, Pages 6-8)

- The Holtec FSAR identified the pressure, temperature and moisture monitoring instruments requiring calibration. These instruments were installed and calibrated at the time of the inspection. (Attachment 2, Page 9)

- The Holtec FSAR specified that a pre-job ALARA briefing should be conducted with workers and radiological protection personnel. A comprehensive pre-job briefing was conducted at the start of the pre-operational testing. (Attachment 2, Page 10)

- The Holtec FSAR specified that temporary shielding should be used to minimize occupation exposure. Permanent and temporary shielding were both used during the pre-operational testing. (Attachment 2, Page 11)

- The Holtec Certificate of Compliance required dry run training exercises to be conducted by the licensee. The dry run training exercise observed during this inspection included fill and vent of the canister; a hydrostatic test, canister blowdown with helium, moisture removal with the FHD system, helium backfill, gas sampling and fuel assembly cooling. (Attachment 2, Pages 11-12)

Followup (92701)

- Discussions with the licensee were conducted concerning Inspection Follow-up Item (IFI) 72-49/0401-01 related to program requirements for conducting ASME code year reconciliation. The licensee had elevated the issue to the corporate level and issued Program Change Notice CEP-WP-PCN-35. This IFI will remain open. (Attachment 2, Page 8)

ATTACHMENT 1

Supplemental Information

PARTIAL LIST OF PERSONS CONTACTED

R. Biggs, Coordinator, Safety and Regulatory Affairs
M. Bourgeois, Radiation Protection Technician
M. Boyle, Manager, Radiation Protection
G. Bush, Manager, Outage
J. Campbell, Manager, Dry Fuels Storage (DFS) Project
R. Clardy, SWEC Boilermaker
E. Clevenger, Engineering Support
D. Drude, Mechanical Maintenance Lead
P. Ellis, Radiation Protection Technician
M. Feltner, Manager, Fuel Services
D. Heath, Supervisor, Radiation Protection
T. Hoffman, Manager, Strategic Capital Project
H. Hollkamp, Coordinator, Fuel Services
B. Houston, Manager, Maintenance
K. Huffstatler, Technical Specialist
K. Jenks, Supervisor, Engineering
D. Lorfing, Acting Manager, Licensing
C. Mallory, Manager, Dry Fuel Storage (DFS) Training
J. Rhodes, Mechanical Maintenance Lead
B. Smith, Superintendent, Craft
G. Smith, Supervisor, SWEC Boilermaker
K. Suhrke, Dry Fuel Storage (DFS) Technical Support
L. Woods, Supervisor, Quality Assurance

INSPECTION PROCEDURES USED

60854	Preoperational Testing of an Independent Spent Fuel Storage Installation (ISFSI)
60854.1	Preoperational Testing of ISFSIs at Operating Plants
92701	Followup

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

None

Closed

None

Discussed

72-049/0401-01	IFI	Program Requirement for Conducting ASME Code Reconciliation

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
ASME	American Society of Mechanical Engineers
AWS	Automated Welding System
CFR	Code of Federal Regulations
CoC	Certificate of Compliance
CR	Condition Report
EAD	Electronic Alarming Dosimeter
FHD	Forced Helium Dehydrator
FME	Foreign Material Exclusion
FSAR	Final Safety Analysis Report
HEPA	High Efficiency Particulate Airborne
ISFSI	Independent Spent Fuel Storage Facility
kW	Kilowatt
LAR	License Amendment Request
MPC	Multi-Purpose Canister
NDE	Non-Destructive Examination
NRC	U.S. Nuclear Regulatory Commission
RVOA	Removable Valve Operating Assembly
RWP	Radiation Work Permit

ATTACHMENT 2

RIVER BEND INSPECTION

(INSPECTOR NOTES - TABLE OF CONTENTS)

Attachment 2

RIVER BEND INSPECTION 50-458/05-09; 72-049/05-01
(Inspector Notes)

Category: Fluid Operations **Topic:** Canister Dryness

Reference: CoC 1014, Tech Spec A.3.1.1.1

Requirement: While using the recirculating helium method to dehydrate the canister, verify the gas temperature exiting the demoisturizer is less than or equal to 21 degrees F for greater than or equal to 30 minutes.

Finding: This requirement was demonstrated through use of the Forced Helium Dehydrator (FHD) system and Procedure DFS-0140. Procedure DFS-0140 dried the canister in two phases. During the heating phase (phase 1), water was boiled and carried out of the mockup canister by heated helium. At equilibrium, the helium temperatures observed during the pre-operational testing were 400 degrees F at the outlet of the FHD heater, 378 degrees F entering the canister, and 208 degrees F returning from the canister. System differential pressure was approximately 10 psi and overall system pressure was maintained between 50 and 55 psig by periodically venting helium through a HEPA filter. Phase 1 continued until water no longer collected in the accumulator and the inlet and outlet dew points approached to within 2 degrees F of each other. During the pre-operational testing, the inlet dew point was 68.5 degrees F and the outlet dew point was 69.0 degrees F at the end of phase 1.

During the drying stage (phase 2), the last remaining moisture was driven out of the mock-up canister using a refrigeration cycle. The FHD heater was deenergized and the chiller unit was started. The temperature of the helium exiting the demoisturizer was monitored on temperature gauge TG-2 as it cooled down. Procedure DFS-0140, Step 8.2.3.5 directed a 30 minute clock to start once TG-2 indicated a helium temperature of 19 degrees F or less. Although the technical specification requirement was 21 degrees F, the licensee conservatively set their acceptance criteria to 19 degrees F to allow for possible instrument or calibration error in TG-2. After 30 minutes had elapsed, Procedure DFS-0140, Step 8.2.3.6 directed the TG-2 temperature and dew point sensor readings to be recorded on Attachment 2. During the pre-operational testing, the temperature of the helium exiting the demoisturizer was 19 degrees F at the start of the 30-minute clock and 16 degrees F at the end. The final dew point reading was 14.2 degrees F.

Documents Reviewed: Procedure DFS-0140, "MPC Forced Helium Dehydration Operation", Draft

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Category: <u>Fluid Operations</u> **Topic:** <u>Fuel is Never Subjected to Air</u>

Reference: FSAR 1014, Table 8.0.1

Requirement: Fuel assemblies are never subjected to air or oxygen during loading and unloading operations.

Finding: The cask loading and unloading procedures maintained the fuel assemblies underwater or under a helium blanket at all times. The procedure sequence consisted of loading the spent fuel assemblies into the canister underwater in the spent fuel pool and then moving the canister, fuel assemblies and water to the cask washdown pit for canister lid welding and hydrostatic testing. The spent fuel assemblies remained underwater in the canister until the water was blown out of the canister with helium following hydrostatic testing.

Procedure DFS-0140, Step 7.13 purged the FHD system with ultra high purity helium. Step 8.1 connected the FHD system to the canister and introduced the helium into the canister through the vent port at the top. The helium displaced the water in the canister, which returned to the spent fuel pool through the canister drain line. As the water was displaced it was immediately replaced by the helium. Procedure DFS-0140, Step 8.2 dried the canister using the FHD system and Step 8.3 backfilled the canister with helium for dry storage. The spent fuel assemblies were never exposed to air or oxygen.

During canister unloading, the opposite sequence occurred. Procedure DFS-0004A used the FHD system to maintain a helium cover gas over the fuel assemblies until water displaced the helium during the flooding operation.

Documents Reviewed: Procedure DFS-0004A, "MPC Unloading Procedure", Draft
Procedure DFS-0140, "MPC Forced Helium Dehydration Operation", Draft

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Category: <u>Fluid Operations</u> **Topic:** <u>Pressure Relief Valves</u>

Reference: FSAR 1014, Table 8.0.1

Requirement: Pressure relief valves in the water and gas processing systems limit canister pressure to acceptable levels. Reference Figures 8.1.20, 8.1.21, 8.1.23 and 8.3.4.

Finding: This requirement was demonstrated, however not all pressure relief valves had been calibrated. The licensee generated Condition Report CR-RBS-2005-01516 concerning calibration of the pressure relief valves. The pressure relief valves referenced in the FSAR figures included FSV-1, the 140 psig relief valve installed downstream of canister drain valve DV-1; FSV-2, the 95 psig relief valve installed downstream of canister vent valve VV-1; and VS-2, the 95 psig relief valve installed downstream of helium supply regulator BR-2. These relief valves provided canister over-pressure protection during hydrostatic testing, blowdown, helium backfilling and cooldown. At the time of the pre-operational test, pressure relief valves FSV-1 and FSV-2 had been calibrated but VS-2 had not.

Procedure DFS-0150, Step 8.1.1 and Attachment 2 required pressure relief valve FSV-1 to be calibrated for hydrostatic testing. FSV-1 was calibrated by pneumatic test in accordance with CMP-9166 on January 10, 2005.

Procedure DFS-0140, Step 7.7 and Attachment 2 required pressure relief valve FSV-2 to be calibrated for canister blowdown. FSV-2 was calibrated by pneumatic test in accordance with CMP-9166 on January 10, 2005.

Procedure DFS-0008, Step 7.5 and Attachment 5 required pressure relief valve VS-2 to be calibrated for canister cooldown. No calibration documentation was identified for VS-2. Condition Report CR-RBS-2005-01516 was generated concerning the lack of calibration data for pressure relief valves VS-2.

Documents Reviewed: Procedure DFS-0008, "MPC Sampling and Cooldown", Draft
Procedure DFS-0140, "MPC Forced Helium Dehydration Operation", Draft
Procedure DFS-0150, "MPC Hydrostatic Test Procedure", Draft
Procedure CMP-9166, "Safety Relief Valve Testing", Revision 14

Category: Fluid Operations **Topic:** Time to Boil Limit

Reference: FSAR 1014, Sect 4.5.1.1.5

Requirement: Water inside the canister cavity is not permitted to boil. A limit is imposed on the maximum allowable time duration for fuel to be submerged in water after a loaded transfer cask is removed from the pool and prior to the start of vacuum drying operations. The bounding heat-up rate for the transfer cask is 3.77 degree F per hour. Table 4.5.6 of the FSAR provides the maximum allowable duration for the fuel to be submerged.

Finding: Controls on the length of time the fuel is submerged such that boiling would not occur were incorporated into Procedure DFS-0002. From the time the canister lid is installed underwater in the spent fuel pool until the water is removed from the canister following hydrostatic testing, the water inside the canister will heat up. Given enough time, the water inside the canister could eventually boil. The time needed for boiling to occur is known as the time-to-boil limit. Procedure DFS-0002, Attachment 1 contained the equation for calculating the time-to-boil limit based on initial water temperature and canister heat load. This equation was drawn from Holtec Procedure HPP-1027-100.

The licensee calculated a time-to-boil limit twice during the canister closure sequence. The first calculation was made when the canister lid was installed underwater in the spent fuel pool in Step 8.4.8 of Procedure DFS-0002. Spent fuel pool temperature was used as the initial water temperature in the equation for calculating the time-to-boil limit.

When the transfer cask and canister were raised to an accessible height above the spent fuel pool in Step 8.5.4 of Procedure DFS-0002, 50 gallons of water were removed from the canister. The temperature of the water removed from the canister was measured and used to calculate a new time-to-boil limit. If the time-to-boil limit was approached to within 2 hours, canister recirculation with the spent fuel pool was required to prevent boiling.

During the pre-operational testing, the licensee performed the time-to-boil calculations as required by Procedure DFS-0002 and tracked the times in Attachment 1. The NRC inspectors reviewed the calculations and concurred with the results.

Documents Reviewed: Procedure DFS-0002, "Dry Fuel Cask Loading", Draft
Holtec Procedure HPP-1027-100, Revision 0

Category: Fluid Operations **Topic:** Unloading - Cooldown and Flooding

Reference: FSAR 1014, Sect 4.5.1.1.6.

Requirement: Prior to reflooding the canister cavity 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: Canister cooldown with the FHD system was demonstrated during this inspection. The transfer cask annulus cooling and canister flooding demonstrations were deferred to a future pre-operational test.

Procedure DFS-0008, Step 8.4.5 purged the FHD system with helium and Step 8.6 cooled down the canister using helium recirculation. During the pre-operational test, cooldown started with a canister internal pressure of 52 psig, an inlet temperature of 64 degrees F, and an outlet temperature of 63 degrees F. Step 8.6.20 required canister cooldown to continue for 30 minutes beyond reaching 190 degrees F. Since canister temperatures were less than 190 degrees F at the start of the demonstration, the cooldown was terminated once the canister reached 20 degrees F.

Documents Reviewed: Procedure DFS-0004A, "MPC Unloading Procedure", Draft
Procedure DFS-0008, "MPC Sampling and Cooldown", Draft

Category: Fluid Operations **Topic:** Unloading - Gas Sampling

Reference: FSAR 1014, Sect 8.3.3, Step 7; Table 8.0.1

Requirement: During unloading of a cask, take a canister gas sample. Gas sampling allows the operators to determine the integrity of the fuel cladding prior to opening the canister. This allows preparation and planning for failed fuel.

Finding: Collection of a canister gas sample was demonstrated using a spare canister lid rather than the canister mock-up. A stainless steel sampling rig, equipped with temperature and pressure gauges, was installed on the canister vent port Removable Valve Operating Assembly (RVOA). Procedure DFS-0008, Step 8.3.8 required evacuating the sample chamber to a minimum of 10" Hg vacuum prior to drawing a canister gas sample. A small vacuum pump was used to evacuate the sample chamber and RVOA housing. When 10" Hg vacuum was achieved, canister vent port valve VV-1 was slowly opened and gas was drawn from under the spare lid into the sample chamber. When sample chamber pressure reached 0 psig, canister vent port valve VV-1 was closed and the sampling rig was removed. A HEPA vacuum was continuously operated during sample collection, as required by Procedure DFS-0008, Step 6.10.

Documents Reviewed: Procedure DFS-0008, "MPC Sampling and Cooldown", Draft

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Category: Helium Backfill **Topic:** Helium Pressure and Density

Reference: CoC 1014, Tech Spec A.3.1.1.2

Requirement: Verify MPC helium backfill density or pressure is within the limit specified in Table 3-1. For helium backfill of the MPC-68, CoC, Appendix A, Table 3-1 specifies the canister helium backfill pressure shall be greater than or equal to 29.3 psig and less than or equal to 33.3 psig OR 0.1218 +0/-10% g-moles/l. Footnote 1 to Table 3-1 of the technical specification states the pressure value is for 70 degrees F.

Finding: This requirement was incorporated into Procedures DFS-0140 and DFS-0002. Holtec CoC 1014, Table 3.1 required a helium backfill pressure of 29.3 to 33.3 psig at a reference temperature of 70 degrees F. Since the helium used for backfilling was recirculating in the canister at temperatures much higher than 70 degrees F, a method was needed to determine the equivalent pressure range at these higher gas temperatures. Holtec provided the method through an E-mail to River Bend dated January 28, 2005 which contained a "Helium Backfill Pressure Chart". This chart converted the 29.3 - 33.3 psig at 70 degrees F to equivalent pressure ranges at temperatures up to 350 degrees F. The licensee planned to incorporate this chart into the final version of Procedure DFS-0140 as Attachment 3.

Procedure DFS-0140, Step 8.3.1.4 selected the target backfill pressure from the Holtec chart based on the helium inlet and outlet temperatures. During the pre-operational testing, canister inlet temperature was 264 degrees F and canister outlet temperature was 252 degrees F. Based on these temperatures the backfill pressure chart yielded a target backfill pressure of 45.9 - 49.8 psig. Procedure DFS-0002, Step 8.17.3 documented a final mock-up pressure of 47.0 psig during the pre-operational testing.

Documents Reviewed: Procedure DFS-0002, "Dry Fuel Cask Loading", Draft
Procedure DFS-0140, "MPC Forced Helium Dehydration Operation", Draft
Holtec E-mail to River Bend dated January 28, 2005, Subject: "Helium Backfill Pressures Using the Holtec International Forced Helium Dehydrator System"

Category: Helium Backfill **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 incorporated into Procedure DFS-0140, Step 5.2, which required that the helium used for dry fuel storage operations be of ultra high purity (greater than or equal to 99.995 percent pure).

The licensee had taken measures to minimize the potential for inadvertently introducing gases other than helium into the canister. Two rolling helium bottle racks had been specifically designed and fabricated for storing the ultra high purity helium. The in-service bottle rack was positioned near the FHD skid. No other gas bottles were permitted to be stored in that area. Each bottle rack held 6 helium bottles which were connected to a valve manifold. All the valves on the manifold were color coded green to match the helium bottles. Procedure DFS-0140, Step 7.4.2 required the worker to verify that a sufficient quantity of ultra high purity helium was connected to the FHD prior to each use of the system. The bottles connected to the FHD system during the pre-operational testing were from lot number 43PO59121. The certificate from the helium supplier (Airgas) dated January 12, 2005 certified that lot number 43PO59121 was 99.999 percent pure helium.

Documents Reviewed: Procedure DFS-0140, "MPC Forced Helium Dehydration Operation", Draft
Airgas Certificate for Helium Bottles in Lot #43PO59121

Category: Hydrostatic Testing **Topic:** Holding Time

Reference: ASME Section III, Article NB-6223

Requirement: The hydrostatic test pressure shall be maintained for a minimum of 10 minutes prior to examination for leakage.

Finding: This requirement was incorporated into Procedure DFS-0150, Step 8.2.11, which required the hydrostatic pump operator to monitor canister pressure for a minimum of 10 minutes using pressure gauge P-3. During the pre-operational testing, canister pressure was maintained between 126 and 130 psig for the full 10 minute hold period prior to the final visual inspection for leakage. Stop watch DSW-127A, with a calibration due date of April 25, 2005, was used to ensure that 10 minutes had elapsed after reaching the minimum hydrostatic test pressure. The elapsed time and pressure reading from P-3 were recorded on Attachment 2 of Procedure DFS-0150.

Documents Reviewed: Procedure DFS-0150, "MPC Hydrostatic Test Procedure", Draft

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Category: Hydrostatic Testing **Topic:** Pressure Gauge Calibration

Reference: ASME Section III, Article NB-6413

Requirement: All test gauges shall be calibrated against a standard dead weight tester or a calibrated master gauge. The gauges shall be calibrated before each test or series of tests. A series of tests is that group of tests using the same pressure test gauge or gauges, which is conducted at the same site within a period not exceeding 2 weeks.

Finding: This requirement was implemented through use of a calibrated gauge. Procedure DFS-0150, Step 6.4 required a hydrostatic test pressure gauge with a maximum error of 0.5 percent. The test gauge used during the hydrostatic testing was an Ashcroft 0-200 psig analog gauge designated as P-3. Procedure DFS-0150, Step 8.1.1 and Attachment 2 required P-3 to be calibrated. P-3 had been calibrated on January 19, 2005 in accordance with laboratory standard WLS-604A . The gauge error was 0.25 percent at 120 psig and 0.14 percent at

140 psig, well within the 0.5 percent error tolerance specified in Step 6.4 of Procedure DFS-0150. The River Bend instrument calibration record documented that laboratory standard WLS-604A was in calibration at the time it was used to calibrate P-3.

Documents Reviewed: Procedure DFS-0150, "MPC Hydrostatic Test Procedure", Draft
River Bend Instrument Calibration Record

Category: Hydrostatic Testing **Topic:** Pressure Gauge Installation

Reference: ASME Section III, Article NB-6411

Requirement: Pressure test gauges shall be connected directly to the component, and visible to the operator controlling test pressure.

Finding: This requirement was demonstrated during the pre-operational testing. The pressure gauge used was an Ashcroft 0-200 psig analog gauge designated as P-3. P-3 was installed directly downstream of canister vent valve VV-1 and was visible to the hydrostatic pump operator controlling canister pressure. The licensee also stationed a backup operator at P-3 for local monitoring of canister pressure.

The licensee stated they intended to use a digital gauge instead of the Ashcroft analog gauge for hydrostatic testing during the actual loading campaign. The pressure sensor would be installed at the same location as P-3, but the electronic display would be placed outside the high radiation area. This would make the pressure reading more visible to the hydrostatic pump operator and would reduce his radiation exposure during canister hydrostatic testing.

Documents Reviewed: None.

Category: Hydrostatic Testing **Topic:** Pressure Gauge Ranges

Reference: ASME Section III, Article NB-6412

Requirement: Analog type indicating pressure gauges used in testing shall be graduated over a range not less than 1.5 times nor more than 4 times the test pressure. Digital type pressure gauges may be used without range restriction, provided the combined error due to calibration and readability does not exceed 1 percent of test pressure.

Finding: The test gauge used during the pre-operational testing was an Ashcroft 0-200 psig analog pressure gauge, which met the ASME code requirement. To meet the ASME code requirement, an analog pressure gauge used for hydrostatic testing at a pressure of 125 psig must have a minimum range of 0-187.5 psig and a maximum range of 0-500 psig. Procedure DFS-0150, Step 6.4 specified a test gauge with a pressure range of 0-200 psig.

Documents Reviewed: Procedure DFS-0150, "MPC Hydrostatic Test Procedure", Draft

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Category: <u>Hydrostatic Testing</u> **Topic:** <u>Thermal Expansion</u>

Reference: ASME Section III, Article NB-6126

Requirement: If a pressure test is to be maintained for a period of time and the test medium in the system is subject to thermal expansion, precautions shall be taken to avoid excessive pressure.

Finding: This requirement was incorporated into Procedure DFS-0150, Step 8.2.5, which stationed a backup operator at the canister pressure gauge P-3 to vent the canister if pressure increased above 150 psig. Step 8.2.9 directed the hydrostatic pump operator to maintain canister pressure below 130 psig for the 10 minute hold period of the hydrostatic test. Both operators were properly stationed during the pre-operational testing and understood their responsibilities for preventing over-pressurization of the canister mock-up.

Procedure DFS-0150, Step 8.1.1 and Attachment 2 required the 150 psig pressure relief valve, HTS-1, on the discharge side of the hydrostatic testing pump to be calibrated. HTS-1 was calibrated by pneumatic test in accordance with CMP-9166 on January 10, 2005.

Documents Reviewed: Procedure DFS-0150, "MPC Hydrostatic Test Procedure", Draft
Procedure CMP-9166, "Safety Relief Valve Testing", Revision 14

Category: <u>Hydrostatic Testing</u> **Topic:** <u>Weld Exam Following Hydro Testing</u>

Reference: FSAR 1014, Sect 9.1.2.2.2; Sect 8.1.5.4

Requirement: Following completion of the 10 minute hold period at the hydrostatic test pressure, and while maintaining a minimum test pressure of 125 +5/-0 psig, the surface of the canister lid-to-shell weld shall be visually examined for leakage, and then re-examined by liquid penetrant examination in accordance with ASME Code III, Subsection NB, Article NB-5350 acceptance criteria.

Finding: This requirement was incorporated into Procedure DFS-0150. Step 8.2.7 raised hydrostatic test pressure to 126-130 psig and Step 8.2.8 started the 10 minute clock. Step 8.2.11 required the operator to monitor canister pressure for a minimum of 10 minutes while inspecting the canister lid-to-shell weld for leakage. During the pre-operational testing, canister pressure was maintained between 126 and 130 psig for the full 10 minute hold period. The visual examination and liquid penetrant examination of the lid-to-shell weld had been previously demonstrated during the August 31 through September 2, 2004 inspection, and documented in Inspection Report 072-00049/04-001 (ML042780632).

Documents Reviewed: Procedure DFS-0150, "MPC Hydrostatic Test Procedure", Draft

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Category: <u>Inspection Follow-up Item</u> **Topic:** <u>Program Requirement for ASME Code Year</u>

Reference: Inspection Report 72-49/0401

Requirement: An inspection follow-up item (IFI) was opened in Inspection Report 72-49/0401 (ML 042780632) concerning the ASME code edition required for the weld wire. The weld wire used for the pre-operational demonstration met the 1974-1980 version of the ASME code. However, the Holtec FSAR required the weld wire for use on the canister lid to meet the 1995 version of the ASME code.

Finding: During the welding and non-destructive examination (NDE) pre-operational testing conducted on August 31 through September 2, 2004, a programmatic deficiency was identified concerning ASME code year reconciliation for weld wire. The weld wire used for the pre-operational testing was purchased in 1984 under the 1974-1980 editions of the ASME code. The Holtec FSAR required weld wire meeting the requirements of the 1995 edition of the ASME code with addenda through 1997. At the time of the inspection, a code reconciliation had not been performed between the code years and a programmatic requirement to do so could not be identified. During the inspection, the weld wire in use was verified to meet the requirements of ASME code 1995 with addenda through 1997. However, the programmatic deficiency remained. Condition Report CR-RBS-2004-02551 was generated to evaluate the condition. Since that inspection, a Program Change Notice CEP-WP-PCN-35 was generated by the licensee to request an Entergy corporate resolution that would apply to all Entergy sites. This Inspection Follow-up Item will remain open pending resolution of this issue.

Documents Reviewed: None

Category: Instrumentation **Topic:** Instrumentation Requiring Calibration

Reference: FSAR 1014, Table 8.1.7

Requirement: Instruments requiring calibration are listed in Table 8.1.7. These include pressure gages, temperature gages, surface pyrometers, vacuum gages and moisture monitoring instruments.

Finding: At the time of the pre-operational testing, all required instruments were installed and calibrated. The instruments referenced in the FSAR included: pressure gauge P-3 which displayed canister pressure downstream of the canister vent valve VV-1; pressure gauge P-4 which displayed canister pressure downstream of the canister drain valve DV-1; temperature gauge TG-2 which displayed helium temperature downstream of the demoisturizer; temperature gauge TG-3 which displayed helium temperature downstream of the canister vent valve VV-1; and temperature gauge TG-4 which displayed helium temperature downstream of the canister drain valve DV-1. Although not required by the FSAR, the licensee incorporated dew point sensor DPS-1 into their calibration program. DPS-1 displayed the dew point of the helium entering and exiting the canister during forced helium dehydration.

Procedure DFS-0150, Step 8.1.1 and Attachment 2 required P-3 to be calibrated for hydrostatic pressure testing of the canister. Procedure DFS-0140, Step 7.7 and Attachment 2 required P-3, P-4, TG-2, TG-3, TG-4, and DPS-1 to be calibrated for canister blowdown. Procedure DFS-0008, Step 7.5 and Attachments 4 and 5 required P-3 and TG-3 to be calibrated for canister cooldown.

P-3 and P-4 were calibrated on January 19, 2005 in accordance with lab standard WLS-0604A. TG-2 was calibrated on January 19, 2005 in accordance with lab standard TDS-009A. TG-3 and TG-4 were calibrated on January 19, 2005 in accordance with lab standard WLS-540A. DPS-1 was calibrated on January 4, 2005 by Exelon Power labs and the results were documented on Certificate of Calibration #0010337861.

Documents Reviewed: Procedure DFS-0008, "MPC Sampling and Cooldown", Draft
Procedure DFS-0140, "MPC Forced Helium Dehydration Operation", Draft
Procedure DFS-0150, "MPC Hydrostatic Test Procedure", Draft
River Bend Station Instrument Calibration Record
Exelon Power Labs Certificate of Calibration #0010337861.

Category: Radiological **Topic:** ALARA Pre-Job Briefings

Reference: FSAR 1014, Sect 10.1.1

Requirement: Pre-job ALARA briefings should be held with workers and radiological protection personnel prior to work on or around the system.

Finding: This requirement was implemented through a comprehensive pre-job briefing conducted at the start of the pre-operational testing. The briefing covered job scope, industrial safety and radiological safety.

The job scope was to demonstrate canister hydrostatic testing, blowdown, moisture removal with forced helium dehydration, helium backfilling, gas sampling and cooldown in accordance with Work Order 56979, Radiation Work Permit (RWP) 2005-2025 Task 02, and the draft loading and unloading procedures. The licensee planned to improve the draft procedures based on the lessons learned during the pre-operational testing. Procedure adherence was emphasized and feedback from all participants was solicited. Operating experience was presented and the role of management to maintain station priorities of safety, quality, and schedule was emphasized.

The industrial safety topics included slip hazards due to the recent rains, trip hazards from hoses on the floor, noise hazards from the FHD system, burn hazards from hot lines on the FHD system during the heating phase, and frostbite hazards from the ice wagon hoses during the final drying phase.

The radiological safety topics included; continuous radiation protection coverage, access control measures, high potential dose rates from the transfer cask annulus, low dose waiting areas, airborne monitoring, contamination control measures, radiation protection hold points, Electrical Alarming Dosimeter (EAD) setpoints, and neutron dosimetry for use when the canister mock-up was blown down. RWP 2005-2025 Task 02 was developed using acutal dose rates from a similar loading campaing at another plant.

Documents Reviewed: Work Order 56979 and Radiation Work Permit 2005-2025 Task 02

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Category: Radiological **Topic:** Temporary Shielding

Reference: FSAR 1014, Sect 10.1.4

Requirement: To minimize occupational dose during loading and unloading operations, a specially designed set of auxiliary shielding is available. Table 10.1.1 of FSAR 1014 describes this shielding. Table 10.1.2 provides the minimum requirements for the use of the shielding.

Finding: This requirement was demonstrated during the pre-operational testing using polyborated blocks, lead blankets and lead snakes. Procedure DFS-0002, Step 8.7 filled the transfer cask water jacket prior to work around the transfer cask in the cask washdown pit. Step 8.9 installed temporary polyborate blocks and lead blankets near the top of the transfer cask prior to annulus seal removal. Step 8.11.1 installed the annulus shield (lead snake) following the smear survey of the shield lid top and accessible portions of the sides.

Procedure DFS-0002, Step 8.12.3 installed the Automated Welding System (AWS) baseplate following installation of the annulus shield. The metal AWS baseplate provided additional shielding on top of the canister. The AWS baseplate was installed during the canister welding and non-destructive examination demonstration conducted on August 31 through September 2, 2004.

Documents Reviewed: Procedure DFS-0002, "Dry Fuel Cask Loading", Draft

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Category: Training **Topic:** Dry Run Exercise; Loading

Reference: CoC Condition 10 / FSAR 1014, Sect 12.2.2

Requirement: A dry run training exercise of the loading, closure, handling, and transfer of the HI-STORM 100 System shall be conducted by the licensee. The dry run shall include the demonstrations described in CoC Condition 10.

Finding: The pre-operational testing conducted during this inspection partially satisfied the loading requirements of License Condition 10.f. The testing included canister hydrostatic testing, draining, moisture removal by forced helium dehydration and helium backfilling.

The pre-operational testing was conducted under Work Order 56979 and RWP 2005-2025 Task 02, using draft procedures and mock-ups of the canister and transfer cask. The testing commenced with the canister lid-to-shell weld complete, Removable Valve Operating Assemblies (RVOAs) installed, canister filled (less 50 gallons), and the FHD Unit purged with helium. The sequence included fill and vent of the canister; a hydrostatic test at 126-130 psig for 10 minutes, simulated NDE of the lid-to-shell weld; canister blowdown with helium; moisture removal by forced helium dehydration; and helium backfill.

The remaining activity for demonstration to satisfy License Condition 10.f is helium leak testing of the canister weld. However, License Amendment Request #2 proposed by Holtec for CoC 1014 removes this requirement. If License Amendment Request #2 is approved and the helium leak test requirement removed, all required demonstrations for License Condition 10.f will be met.

Documents Reviewed: Work Order 56979
Radiation Work Permit 2005-2025 Task 02
Procedure DFS-0002, "Dry Fuel Cask Loading", Draft
Procedure DFS-0140, "MPC Forced Helium Dehydration Operation", Draft
Procedure DFS-0150, "MPC Hydrostatic Test Procedure", Draft

Category: Training **Topic:** Dry Run Exercise; Unloading

Reference: CoC 1014 Condition 10.j / FSAR Section 12.2.2

Requirement: A dry run exercise of the unloading, including cooling fuel assemblies, flooding the MPC cavity, and removing MPC welds shall be conducted by the licensee.

Finding: The pre-operational testing conducted during this inspection partially satisfied the unloading requirements of License Condition 10.j. The testing included canister gas sampling and cooling fuel assemblies. The canister gas is sampled and analyzed for determining the degree of fuel integrity, and the fuel assemblies are cooled to less than 190 degrees F to prevent boiling when the canister is re-flooded with water. The pre-operational testing was conducted under Work Order 56979 and RWP 2005-2025 Task 02, using draft procedures and mock-ups of the canister and transfer cask.

Remaining activities to demonstrate to met the requirements of License Condition 10.j are cask unloading and flooding of the canister.

Documents Reviewed: Work Order 56979
Radiation Work Permit 2005-2025 Task 02
Procedure DFS-0004A, "MPC Unloading Procedure", Draft
Procedure DFS-0008, "MPC Sampling and Cooldown", Draft
Procedure DFS-0140, "MPC Forced Helium Dehydration Operation", Draft