UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

September 16, 2005

Carolina Power and Light Company
ATTN: Mr. John Moyer
Vice President - Robinson Plant
H. B. Robinson Steam Electric Plant
Unit 2
3851 West Entrance Road
Hartsville, SC 29550

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT - INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) DRY RUN NRC INSPECTION REPORT 07200060/2005001

Dear Mr. Moyer:

On August 18, 2005, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Robinson Steam Electric Plant following the successful loading, transport, and spent fuel storage of the first Independent Spent Fuel Storage Installation (ISFSI) cask under the general license. Robinson also has an ISFSI under a plant specific license. The enclosed inspection report documents the inspection findings, which were discussed on July 29 and on August 18, 2005, with you and other members of your staff.

The inspection examined activities conducted under your ISFSI license as they relate to safety and compliance with the Commission's rules and regulations. The team reviewed selected procedures and records, observed activities, and interviewed personnel. These inspections included observation of activities associated with your pre-operational testing program and the loading, transport, and storage of your first ISFSI cask. The pre-operational testing and training exercises are performed to satisfy the requirements of the NUHOMS 24-PTH Certificate of Compliance (CoC) 1004, Amendment 8. The inspections were conducted to confirm compliance of your program and activities with the requirements specified in the CoC, Technical Specifications, Final Safety Analysis Report and the NRC's Safety Evaluation Report for the NUHOMS dry cask storage system.

The enclosed report presents the results of this inspection. Overall, the inspection found that activities were being performed in accordance with procedural and regulatory requirements. Based on direct observation of activities and review of the various procedures, the team determined that the licensee was capable of safely loading spent fuel from the Spent Fuel Pool (SFP) into the Dry Shielded Cannister (DSC), and performing the steps necessary to close the DSC, including draining, vacuum drying, helium backfill, and leakage rate testing. Furthermore, the licensee was capable of transporting the DSC using the Transfer Cask (TC) to the NUHOMS horizontal storage modules (HSM) located within the site protected area. Procedures and administrative controls have been established to ensure compliance with CoC requirements. The team also determined that the licensee was capable of re-transferring spent fuel from the HSM to the SFP.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document
system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).
If you have any questions concerning this inspection, please contact Mr. Binoy Desai, Senior Project Engineer, at (404) 562-4519 or me at (404) 562-4510.

Sincerely,

/RA by Larry W. Garner Acting For/

Kerry D. Landis, Chief
Reactor Projects Branch 5
Division of Reactor Projects

Docket No. 72-60
License No. CoC 1004, Amendment 8 (NUHOMS)

Enclosure: NRC Inspection Report 07200060/2005-001 cc w/encl:

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DATE	8/19/2005	9/6/2005	9/6/2005	9/6/2005	8/23/2005		
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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.:	72-60
License No.:	CoC 1004, Amendment 8
Report No.:	07200060/2005001
Licensee:	Carolina Power and Light (CP&L)
Facility:	H.B. Robinson Steam Electric Plant, Unit 2
Location:	3581 West Entrance Road Hartsville, SC 29550
Dates:	June 13 - August 18, 2005
Inspectors:	Binoy Desai, Senior Project Engineer, Region II (Team Leader) Rich Chou, Reactor Inspector, Region II James Pearson, Safety Inspection Engineer, NMSS/SFPO G. Michael Karmis, Safety Inspector, NMSS/SFPO Scott Atwater, DNMS, Region IV
Approved by:	Kerry D. Landis, Chief Reactor Projects Branch 5 Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

H. B. ROBINSON STEAM ELECTRIC PLANT - INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)

NRC Inspection Report 07200060/2005001

The Robinson Plant developed and implemented a dry cask storage program to remove spent fuel from the reactor spent fuel pool (SFP) for storage at the Robinson Independent Spent Fuel Storage Installation (ISFSI). The ISFSI is located within the current reactor protected area.

The licensee utilized the NUHOMS-24 PTH cask system (NUHOMS design is owned by Transnuclear Corporation) for spent fuel storage needs. The NUHOMS-24 PTH system consists of a series of reinforced concrete horizontal storage modules (HSMs), approximately 8.5 ft wide and 18.5 ft high. The Dry Shielded Cannister (DSC) is constructed from stainless steel and is designed to hold 24 fuel assemblies. The DSC is placed in a reusable Transfer Cask (TC) to provide shielding for the protection of workers during transfer operations and during drying, helium backfilling, and welding of the DSC. The DSC is loaded with spent fuel, drained of water, vacuum dried, filled with helium gas, and sealed by welding. The DSC is then moved from the cask washdown area while in the TC and placed onto a Transfer Trailer (TT). The transfer trailer with the loaded TC is transported from the plant to the ISFSI. The DSC is inserted into a shielded HSM for storage. Each HSM holds a single, loaded DSC.

The licensee demonstrated the capability to perform drain-down, vacuum drying, welding and helium backfilling of a DSC. Procedures and processes were sufficient in achieving the required limits specified in the technical specifications, ensuring minimal water content of loaded DSCs and that an inert atmosphere is present to support the safe storage of spent fuel assemblies.

The NRC conducted onsite inspections of the activities associated with the licensee's NUHOMS cask storage program. The team was also present for the heavy lift of the loaded DSC/TC and insertion of the DSC into the HSM. The NRC inspections focused on the licensee's efforts to demonstrate that adequate equipment, procedures, and personnel were in-place to safely move spent fuel from the SFP to the HSM. Throughout the demonstrations observed by the NRC, the Robinson staff functioned professionally and performed their assigned duties safely.

Based on direct observation of activities and review of the various procedures, the team determined that the licensee was capable of safely loading spent fuel from the SFP into the DSC, and performing the steps necessary to close the DSC, including draining, vacuum drying, helium backfill, and helium leakage rate testing. Furthermore, the licensee was capable of transporting the DSC to the HSM and appropriately inserting the DSC into the HSM. Procedures and administrative controls were established to ensure compliance with CoC requirements. The team also determined that the licensee was capable of re-transferring spent fuel from the ISFSI to the SFP.

NRC made several observations during the licensee's dry run demonstrations. These observations were captured by the licensee in the corrective action program documents, such as Action Report (ARs) and the Nuclear Task Management (NTM) documents.

Report Details

1. Dry Run Observations

a. Inspection Scope (60854.1)

The team observed licensee dry run demonstrations for the NUHOMS , Horizontal Storage Module (HSM), Independent Spent Fuel Storage Installation (ISFSI) system at the Robinson plant from June 13, 2005, through August 18, 2005. The dry run activities were intended to demonstrate licensee (Robinson) readiness and their capability to safely load, seal, transport, and store spent fuel in the ISFSI system. During the course of the inspection, the team verified and/or observed the following attributes to assess licensee performance relating to dry cask storage activities:

- Licensee's pre-operational test program to determine if the licensee is capable of safely using the NUHOMS system. The pre-operational test program is intended to ensure that the conditions and requirements of the Certificate of Compliance (CoC) are being met and that the licensee is capable of safely loading spent fuel into the ISFSI and transferring spent fuel back to the spent fuel pool (SFP) from the ISFSI pad.

- The licensee had completed an evaluation to verify compliance with the conditions of the NUHOMS system design, Final Safety Analysis Report (FSAR), and requirements in 10 CFR Part 72.

- The licensee had established a safe loads path for cask related heavy load movement activities.

- The licensee had incorporated into procedures the correct requirements for helium backfill of the Dry Shielded Canister (DSC) after drying. The acceptable leak rates for passing the test were consistent with the requirements in the Technical Specifications (TS). Personnel assigned to perform the leak tests were qualified to the appropriate leak test certification requirements.

- Vacuum drying time limits and acceptance criteria had been incorporated into procedures.

- Strong radiological controls had been established to support cask activities.

- Functional testing of the Transfer Cask (TC) to ensure that the TC can be safely transported over the entire route for fuel loading.

- Procedures related to characterization of spent fuel at the Robinson Plant, selection of fuel to be stored in the NUHOMS cask system, and the movement of fuel from the SFP to the DSC. Further, the team observed licensee demonstration of fuel assembly loading into the DSC using a simulated fuel assembly.

- DSC loading into the TC to verify fit and TC/DSC annulus seal.

- Testing of TC on transport trailer and its transportation to the ISFSI along a predetermined route and alignment to an HSM.

- Testing of transfer trailer alignment and docking equipment. Testing of the hydraulic ram to insert a DSC loaded with test weights into an HSM and then to retrieve it.

- Loading a simulated fuel assembly into the DSC.

- DSC sealing, vacuum drying, and cover gas backfilling operations (using a mock-up DSC).

- Opening a DSC (using a mock-up DSC).

- Returning the DSC and TC to the spent fuel pool.

- Licensee demonstration involving: lifting the empty TC, setting the lid on top of the loaded DSC; verification of positive engagement of lifting devices to the trunnions; fuel loading (using simulated assemblies), moving the loaded cask to the cask setting area by following the heavy load lifting path.

- Auxiliary building crane operation to ensure that heavy loads could be lifted by the auxiliary building crane without compromising the licensing basis margins of safety. The team reviewed qualification, maintenance, and surveillance records for the auxiliary building crane. In addition, the team reviewed the operating limitations for the auxiliary building crane, and compared the auxiliary building crane rated load to the anticipated operating load. The team reviewed completed procedures for the annual, monthly, and daily mechanical inspections of the auxiliary building crane.

- The licensee's records program had incorporated the various requirements for creating and maintaining ISFSI records.

- The training program for personnel assigned to the ISFSI provided a good basis for understanding the requirements and safe practices associated with dry cask loading operations.

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

The team reviewed licensee procedures and observed the implementation of the procedures which tested the site’s capability to safely load spent fuel from the SFP into the DSC and transfer it to the HSM. The procedures were well developed and complete. The licensee held pre-job briefings prior to each segment of the procedure. These pre-job meetings were conducted such that necessary items to ensure safety (such as the need for three way communication, pre-staging of equipment, specific assignment of job functions by name and reinforcement of teamwork among work parties) were discussed. The briefs included reviews, select portions of procedures and discussion for particular contingencies during loading activities.

The team observed crane operation to ensure that heavy loads could be safely lifted and transferred. Lifts of the DSC and the TC combined were witnessed. The team observed good communication and teamwork between departments.

The licensee was prompt in initiating corrective action documents for areas requiring improvement during the dry run activities.

The team made the following observations during the dry run. Though none of the observations constituted an immediate safety or regulatory compliance issue, the licensee initiated corrective actions to address the observations.

- Engineering Change 61411R2, Spent Fuel Pool Cask Crane Upgrade; Restricted Path Set Point Changes specifies the crane upgrade required to support cask loading and transfer operations. Section B.4, Design Inputs Paragraph 6 - Environmental Conditions of the Engineering Change, states, in part, CMAA sets the normal operating temperature for the design of an outdoor crane at 0 degrees F to 100 degrees F. Licensee procedures reviewed by the team did not specify an upper temperature limit. AR Number 00164963, Evaluate Need For Procedure High Temp Limit on SF Cask Crane, was initiated to document the need to examine the upper temperature limit of 100 degrees F as specified by the Crane Manufacturers Association of America, Inc., - CMAA Specification #70, 1971, Specification for Electric Overhead Traveling cranes.

- AR 00165053 was initiated to add the time to boil in the limits and precautions in procedure ISFS-012, 24P ISFSI Transfer Cask Handling.

In conclusion, based on direct observation of activities and review of the various procedures, the team determined that the licensee was capable of safely loading spent fuel from the SFP into the DSC, and performing the steps necessary to close the DSC, including draining, vacuum drying, helium backfill, and helium leakage rate testing. Furthermore, the licensee was capable of transporting the storage cask to the HSM. Procedures and administrative controls have been established to ensure compliance with CoC requirements. The team also determined that the licensee was capable of re-transferring spent fuel from the ISFSI to the SFP.

2 Part 72.212(b) Requirements

a. Inspection Scope (60856)

The inspection scope was to determine if the H. B. Robinson Steam Electric Plant had performed an acceptable 72.212 evaluation to determine compliance with 10 CFR Part 72.212(b) requirements in regard to the NUHOMS 24-PTH cask system.

b. Observations and Findings

The team reviewed select portions of the Draft 10 CFR Part 72.212 evaluation which was dated July 7, 2005. The sampled portions of the Part 72.212 evaluation were reviewed to determine if the conditions set forth in the Part 72-0060 CoC for the NUHOMS 24-PTH cask system had been met. The 72.212 report is supplemented by Attachment 1, titled: RNP24P-ISFSI, CoC evaluation 10CFR 72.212(b)(2)(i)(A); "RNP24-ISFSI Hazards Evaluation (fuel building/haul path/site)" dated June 23, 2005; "10 CFR72 compliance matrix, Robinson ISFSI: 24PTH-ISFSI". A listing of the Reg-NGGC0010 screenings and evaluations which were performed during design of the facility were also included in the 72.212 documents. In addition, the contents of these documents includes references to procedures, Appendix "P" of the NUHOMS system FSAR, the NRC SER for the NUHOMS system, as well as annual reports for effluents and various calculations and analysis.

The team reviewed a sample of documents, some of which were draft, which governed the ISFSI Dry Run activities and also verified the existence and control of a selection of the documents in the Robinson records management and document control systems. The documents and licensee procedures reviewed during the Robinson 72.212 evaluation are referenced at the end of the report.

The team reviewed the "Final Report of Geotechnical Exploration, 24-P Independent Spent Fuel Storage Installation, Unit 2, HB Robinson Plant," MACTEC Project No. 6468-03-0263, dated March 3, 2004, and associated with EC54720 to help determine that the cask storage pads and areas have been designed to support the stored static load of the storage casks.

The team determined that the licensee had performed written evaluations which established that the requirements of 10 CFR 72.104 regarding effluents and direct radiation from an ISFSI have been met through the review of RC-05-002, titled "Evaluation of Dose Impacts from Dry Spent Fuel Storage Activities and New Site Facilities," dated June 21, 2005. This procedure provides guidance on how to comply with radiation dose limit regulations provided in 10 CFR 72.104. This procedure directs operational restrictions to be established to meet As Low As Reasonably Achievable (ALARA) objectives for radioactive materials in effluents and direct radiation levels associated with ISFSI operations. The restrictions established must meet the 10 CFR 72.104 requirements. Since the NUHOMS 24-PTH model cask has not been used previously at Robinson, two calculations (RNP-M/Mech-1774 & RNP-M/Mech-1780) titled "Site dose calculations for the NUHOMS 24-PTH system at the Robinson Plant (1780 same title) both calculations are performed by Transnuclear (TN) were reviewed and accepted by the licensee. The 1774 calculation provided acceptable results by showing all 66 HSMs loaded and placed on the ISFSI Pad. The second (1780) calculation showed lower results for only 4 HSMs loaded. This second calculation allows Robinson to develop compensatory measures (if determined to be needed) for personnel who may work in the immediate area, such as coal handlers for Robinson Unit 1. The results of the 1780 calculation reduces projected dose by approximately one half. The 1774 calculation was reviewed by the team and found acceptable. The team determined that provisions are in place for retaining the evaluations (records) referenced above until spent fuel is no longer stored under the general license. The team noted that records included both Robinson documents such as RC-05-002, titled "Evaluation of Dose Impacts from Dry Spent Fuel Storage Activities and New Site Facilities," dated 6/21/05 and engineering changes such as, EC 58024 associated with effluents and direct radiation level for the 24-PTH ISFSI operations. The team determined that the licensee has the capability for maintaining the records provided by the cask supplier for each cask design used, and provisions are in place for transferring these records if a cask is sold, leased, loaned, or otherwise transferred to another user. However, the team noted that the cask fabrication records were not yet input into the licensee's record management system.

The fabrication packages were being reviewed by some of the licensee's personnel at the time of the ISFSI dry run inspection. The fabrication packages were able to be located and controls were identified as acceptable. The team reviewed select portions of RDC-NGGC-0001, Revision 10, NGG Standard Records Management Program, and MCP-NGGC-0401, Revision 18, Material Acquisition, to understand the licensee's process for record collection storage and maintenance. In addition, the team witnessed the performance of the "Passport" record management system (RMS) as demonstrated by licensee's staff and understood that the Passport system would be the system relied upon by the licensee for the storage of fabrication records once the records review was completed.

The team determined that the licensee performed the necessary revisions to the written evaluations required by 10 CFR 72.212 in accordance with 10 CFR 72.48(c). The team reviewed procedure REG-NGGC-0010, Revision 8, titled "10C FR 50.59 and selected regulatory reviews. The procedure provides instructions and personnel training and qualification requirements for performing reviews of proposed changes to the independent spent fuel storage installation including the associated safety analysis report and the Robinson 10 CFR 72.212 report. The team also reviewed that the evaluators for a sample of four 10 CFR 72.48s were trained and qualified to perform the evaluator function. The team reviewed numerous 10 CFR 72.48s and 10 CFR 50.59s associated with the ISFSI activities. The team determined these reviews and activities to be acceptable.

The team verified that the licensee reviewed the Safety Analysis Report (SAR) referenced in the cask CoC and associated NRC Safety Evaluation Report (SER) and determined that the cask design bases used in these reports are enveloped by the reactor site parameters. This verification is based on the licensee's review of draft engineering change (EC) 58024. Although multiple ECs have been previously submitted to assist in the evaluation process, EC 58024 is intended to represent a central compilation of all relevant documentation. The resulting determination of EC 58024 is that the ISFSI is a stand alone passive system that does not interact with, or change, any FSAR systems structure or component design function.

The team determined that the licensee reviewed the following programs to determine if their effectiveness is decreased by the implementation of the ISFSI:

Emergency Plan

The team reviewed procedure PLP-007 titled “Robinson Emergency Plan EC 54719 ISFSI PAD." This was referenced in the Robinson 72212 for review required under (b)(6). In addition, the team reviewed abnormal operating procedure, AOP-028-BD, Basis Document, ISFSI Abnormal Events. Multiple steps of this document were recognized as containing recent information in regard to the use of the 24-PTH HSMs. The team noted two recent changes from the licensee’s review. The team’s review found this area acceptable.

Quality Assurance Program

The team reviewed the Quality Assurance Project Plan, dated 7/12/04, which is the first QA Plan for the ISFSI Project. This plan was developed to supplement the Progress Energy “Quality Assurance Program Manual (NGGM-PM-0007)." The team also reviewed a letter and associated attachments from Enercon who was contracted by Progress Energy Carolinas, Inc. to evaluate eight (8) program areas identified under EC 58024 (draft) for any QA commitment reductions in regard to ISFSI implementation. Reviews, proposed changes, and justification all were found acceptable.

Radiation Protection Program

The team reviewed technical information document RC-05-002, Evaluation of Dose Impacts from Dry Spent Fuel Storage Activities and New Site Facilities, dated 6/21/05. The document describes how dose limit requirements will continue to be met with the addition of the ISFSI. The team also reviewed the section of EC 58024 noted above for the section associated with effluents and direct radiation level associated with the ISFSI operations.

Training Program

The team reviewed the letter and associated attachments noted above. The team also reviewed plant operating manual "PLP-009, rev. 20, titled Robinson Training Program." The team noted three specific changes were made in regard to ISFSI activities. The team found the reviews and evaluations, as well as, procedural changes acceptable.

The team determined that activities related to storage of spent fuel under the general license will be performed only in accordance with licensee written procedures by reviewing section 6 of the NGG Program Manual titled: “Quality Assurance Program Manual," revision 9, NGGM-PM-6007, which establishes requirements for preparation, review and approval and control of procedures and drawings for activities affecting quality. The team also reviewed the quality assurance project plan for the ISFSI at the Robinson Plant. This plan specifies procedures as well as some of the recently developed procedures. At the time of review (7/27/05), it should be noted five (5) of the eleven (11) ISFSI procedures were in draft form because the lesson learned from recent dry run practicing had been added but not yet approved. The review of this area was found acceptable by the team.

In conclusion, based on the review performed by the team of the sampled documents, the licensee had performed adequate written evaluations to establish that the conditions of the CoC had been met. The licensee will need to evaluate the impact of the completion of Draft documents on the Draft Robinson Steam Electric Plant, ISFSI 10 CFR 72.212 Report. No findings of significance were identified from the review.

3. 10 CFR 72.48 Requirements (IP 60857)

a. Inspection Scope

The team reviewed several 10 CFR 72.48 screening evaluations to determine if Robinson Nuclear Steam Station had performed acceptable 10 CFR 72.48 screening evaluations related to the design, construction, and operation of the NUHOMS cask, HSM, and related ancillary equipment.

b. Observations and Findings

The team held discussions with Robinson personnel and reviewed a sample of licensee identified changes which were considered under the screening criteria related to 10 CFR 72.48, Changes, tests, and experiments.

The bulk of the 10 CFR 72.48 screening evaluations were performed as a result of having to develop new procedures covering the entire fuel loading and unloading operations; i.e., a new procedure is a change by definition, since there was no procedure in use prior to issuing the new procedure.

A written evaluation is required per 10 CFR 72.212(b)(2)(I), prior to use, to establish that the conditions of the CoC have been met. The licensee documented its written evaluation to confirm the ISFSI is within the licensed scope in “H. B. Robinson, Unit 2 - 10 CFR 72.212 Evaluation Report," dated August 04, 2005. The licensee had performed written evaluations which confirmed that the conditions set forth in the CoC had been met, the HSM pads had been designed to support the stored load of the casks, and the requirements of 10 CFR 72.104 had been met. Applicable reactor site parameters, such as fire and explosions, tornados, wind-generated missile impacts, seismic qualification, lightning, flooding, and temperature, had been evaluated for acceptability with the bounding values specified in the NUHOMS Safety Analysis Report (SAR) and the NRC Safety Evaluation Report (SER).

A 10 CFR 50.59 evaluation of the construction and operation of the ISFSI and plant interfaces had been performed to demonstrate that changes to plant technical specifications or a license amendment were not required. Physical security had been evaluated and determined to satisfy the requirements of 10 CFR 73.55 and

72.212(b)(5). The ISFSI has been incorporated into the Protected Area of the H. B. Robinson station. The NUHOMS system design parameters were enveloped by the reactor site parameters described in the H. B. Robinson FSAR, including analysis of earthquake intensity and tornado-generated missiles.

The team reviewed selected referenced records and procedure changes related to the security, emergency preparedness, training, health physics and quality assurance programs. The team interviewed cognizant personnel to confirm that they were knowledgeable of the impact of ISFSI-related activities. The emergency plan, quality assurance program, radiological safety program, and training program had been evaluated and their effectiveness were determined not to be decreased by ISFSI activities.

The team interviewed Robinson engineering and other personnel in order to ensure the requirements of 10 CFR 72.212 and 10 CFR 72.48 were being met. An “Owners Review” of design documents from Transnuclear occurs using personnel from Progress Energy corporate or from Robinson personnel. All personnel interviewed were able to provide detailed descriptions of the control and review processes for design control activities being performed. Included in the description was the role that Robinson has in the owners review of changes generated from Transnuclear - the provider of the cask (as documented in Transnuclear Implementing Procedure (TIP) 3.1, "Design Control," TIP 3.2, "Calculations." Tip 3.5, “Licensing Reviews” which control design documents used to specify requirements for transportation packages).

Engineering personnel and the Licensing Lead Engineer described the development, issuance, and control of the drawings and the process where FSAR Change Notices (FCNs) are reviewed and approved, or forwarded for 10 CFR Part 72.48 evaluation under the requirements of TIP 3.5. Robinson and corporate Progress Energy staff activities include the Owners Review of FCNs and associated review and change of ISFS procedures and drawings. From the interviews, document reviews, and shop observations, the team determined design control was acceptable with the exception that an interim method of reviewed FCN changes for impact to drawings and procedures needs to be accomplished prior to the finalization of Progress Energy’s NGG Program Manual - NGGM-PM-0028 , Transnuclear NUHOMS Dry Fuel Storage Program Manual, (which is in draft and will be in place to control changes from FCNs). A review of FCNs and their associated impact on ISFSI procedures was accomplished and no issues were identified. A Nuclear Task Management (NTM), 166656, was written to track the development of this procedural control. The procedure will ensure the Attachment for processing FCNs clearly specifies the need to identify impacted procedures and follow to completion.

The team reviewed ISFSI Procedures, FCNs from Transnuclear and associated drawings, calculations and 10 CFR Part 72.48, Evaluations for adherence to Robinson implementing procedures. The documents reviewed by the team are listed at the end of the report.

In conclusion, the licensee performed an extensive review of the dry cask storage program to ensure compliance with the requirements of 10 CFR 72 Subpart K. The licensee had documented the required evaluations and developed an extensive set of procedures to control ISFSI related work activities. Evaluations had been completed to demonstrate that the design features for the NUHOMS cask system were enveloped by the site specific characteristics of the Robinson site.

The documents reviewed were found to be complete and in order. Revisions to procedures and, drawings occurring due to an approved FCN had been accomplished. However, many of the ISFSI procedures documenting operations were still in draft at the time of this inspection. A final check of FCNs to the finalized ISFS procedures needs to be accomplished to assure all changes are incorporated as required by the approved design documents. A Nuclear Task Management item number 166656 was written to track this procedural control and is discussed in this report under design review. Other than the above mentioned issue, no concerns were identified and the results were found to be acceptable.

4. Welding Activities

a. Inspection Scope (IP 60853)

The Robinson Nuclear Station conducted welding related pre-operational testing of the NUHOMS 24-PTH dry fuel storage system on June 13-17, 2005. The testing was required by NUHOMS Certificate of Compliance (CoC) #1004, Amendment 8, Technical Specifications A.1.1.6.6 and A.1.1.6.7. This testing consisted of spent fuel canister welding and weld testing, vacuum drying, helium backfilling and lid removal. The NRC observed the testing to confirm that the licensee’s procedures, personnel, equipment and materials were adequate to; 1) perform the welds specified for the NUHOMS 24PTH canister; 2) dry and inert the canister for dry storage; and 3) remove the canister lid in preparation for an unloading operation.

NUHOMS FSAR #1004, Section P.9.1.2 specified that the 24PTH canister confinement welds are designed, fabricated, tested, and inspected in accordance with the American Society of Mechanical Engineers (ASME) Code Section III, Subsection NB - 1998 edition including 2000 addenda, with exceptions provided under alternate ASME Code Case N–595-2. ASME Section III, Article NB-4311 specified that only those processes capable of producing welds in accordance with the welding procedure qualification requirements of Section IX may be used for welding pressure-retaining material or attachments thereto.

b. Observations and Findings

The pre-operational testing was performed under Work Order #00692517-01 and the licensee’s “Internal ISFSI Ancillary Dry Run Plan-NRC," Revision 0. It was conducted in the maintenance shop using a mockup of the spent fuel canister and transfer cask. A Berkeley Process Control Automatic Welding System (AWS) was used. The AWS was a

new, single head, computer driven, touch screen operated system. The welding process used was machine and manual Gas Tungsten Arc Welding (GTAW).

Canister welding, weld testing, vacuum drying and helium backfilling were performed in accordance with Procedure ISFS-014, “24P ISFSI DSC Sealing Operations," Revision 2. Canister lid removal was performed in accordance with Procedure ISFS-017, “24P ISFSI DSC Lid Removal," Revision 2.

The pre-operational test began with the inner top cover plate installed in the canister and the canister installed in the transfer cask. The AWS and baseplate were mounted on the inner top cover plate. The welders used the AWS for all welding on the inner top cover plate. Tack welds held the top cover plate in place while the root pass between the shell and cover plate was completed. One final pass was required in order to complete the weld. Non-destructive examinations (NDE) were completed after each weld using the visual testing and liquid penetrant testing methods. No relevant indications were identified. The AWS and baseplate were then removed from the inner top cover plate and stored.

Residual water was then blown out of the canister through the Vacuum Drying System. Helium entered the vent port and displaced the residual water out through the siphon port. Following canister blowdown, initial vacuum drying was performed. Once initial vacuum drying was complete, the canister was backfilled with helium and pressurized to 12 psig. Following a 30 minute hold at 12 psig, the inner top cover plate weld was helium leak tested. The canister was then depressurized and final vacuum drying was performed. The last step of canister vacuum drying and inerting was to backfill the canister with helium to a pressure of 2.5 psig.

The welders then welded the siphon port cover plate to the outer top cover plate manually. Two tack welds held the cover plate in position while a root pass was made around 3/4 of the circumference of the cover plate. The 1/4 of the circumference not welded contained the helium fill needle valve. The volume under the cover plate was then purged with helium, the needle valve was removed and the last quarter of the root pass was completed. Two more passes were made on the siphon port cover plate to bring the weld material up to the level of the top cover plate. Visual testing and liquid penetrant testing were completed after each weld. No relevant indications were identified. Welding and weld testing of the vent port cover plate was performed in the same manner. Both vent and siphon port cover plates were then helium leak tested.

The outer top cover plate was then installed into the canister shell and the AWS and baseplate were installed on top of the outer top cover plate. The outer top cover plate was welded to the canister shell using the same method and sequence as used for the inner top cover plate. The pre-operational testing was terminated when the root pass had been completed through 45 degrees of the outer top cover plate circumference. This was adequate to incorporate one of the tack welds into the final weld. Visual testing indicated there were no relevant indications.

At this point, the pre-operational testing of spent fuel canister welding, vacuum drying and helium backfilling was complete. The requirements of NUHOMS CoC #1004, Technical Specification A.1.1.6.6 had been satisfactorily met. Completion of the outer top cover plate welding and the final helium leak rate testing were simulated, since they were repetitive to operations just completed.

Pre-operational testing of canister lid removal was performed using Procedure ISFS-017. A Hoegen Rotabroach milling machine was used to bore through the outer top cover plate and through the vent and siphon port cover plates. The licensee did not remove the inner and outer top cover plates during this pre-operational testing. Instead, the licensee intended to take credit for the cover plate removal demonstration conducted by PCI Energy Services, LLC at the Point Beach station in August 2004. The NRC observed that demonstration and documented the results in Inspection Report 07200005/2004-001. The NRC team viewed the video of the Point Beach demonstration and compared it to Procedure ISFS-017. Both the Point Beach demonstration and the licensee's procedure met the requirements for lid removal testing, as required by NUHOMS CoC #1004, Technical Specification A.1.1.6.7.

Hydrogen Monitoring

NUHOMS Final Safety Analysis Report (FSAR) #1004, Section P.3.4.1 stated that the space between the water and shield plug is monitored for hydrogen concentration before and during welding. If the hydrogen concentration exceeds 2.4%, welding operations are suspended and the canister is purged with an inert gas.

The hydrogen monitor was placed in service in Step 8.5.6 of Procedure ISFS-014. The gas space below the inner top cover plate was monitored for explosive hydrogen concentrations during welding. During the testing, the licensee simulated a high hydrogen concentration (greater than 2.4%) under the inner top cover plate. The ISFSI team responded by purging the gas space with helium for approximately 5 minutes. Helium entered the canister through the siphon port and exited through the vent port. The purge outlet was directed through a High Efficiency Particulate Air (HEPA) filter and a Continuous Air Monitor (CAM).

Welding Procedure Qualification

ASME Section IX, Part QW-201 required a Welding Procedure Specification (WPS) for making production welds on Class I components. The WPS is a written welding procedure that provides directions for making the production welds. The completed WPS shall describe all the essential, non-essential and, when required, supplementary variables for each process used in the WPS. During the pre-operational testing, the licensee used WPS 08-4-01, Revision 4, for performing both manual and machine Gas Tungsten Arc Welding (GTAW). WPS 08-4-01 contained all the essential and non-essential variables required by ASME Section IX, Part QW-256 for GTAW. It specified maximum weld thickness qualified, base metal thickness range qualified, base metal P-number, Spent Fuel Assembly (SFA) number of the filler metal, filler metal form, maximum bead thickness, preheat and interpass temperature, post weld heat treatment conditions, shielding gas and flow rate, backing gas and flow rate, and trailing gas and flow rate.

ASME, Section IX, Part QW-200.2 required a Procedure Qualification Record (PQR) for each procedure. The PQR is a record of the welding data used during welding of the test coupons. The licensee's PQR-6 documented the welding data used during manual GTAW welding and PQR-68 documented the welding data used during machine GTAW welding. Both PQR-6 and PQR-68 contained all the GTAW variables listed in the WPS.

Welding Personnel Qualification

ASME Section IX, Part QW-301.2 required the Welder Performance Qualification (WPQ) test to be performed in accordance with a qualified WPS. The WPQ Test Records for the welding personnel indicated they had satisfactorily performed WPS 08-4-01 for machine and manual GTAW.

ASME Section IX, Part QW-301.4 required the record of WPQ tests to include the essential variables, the type of test, test results and the ranges qualified for each welder. Welder qualifications were documented in the Welder Qualification Status Report dated June 7, 2005. This report contained each welder's name, welding process qualified, welding procedure specification used, maximum thickness qualified to deposit, welding position, root type and qualification expiration date. For machine welding qualification, the report included automatic joint tracking, automatic voltage control and number of passes per side. At the time of the inspection, all welders were qualified to perform both manual and machine GTAW.

ASME Section IX, Part QW-322.1 required that the performance qualification for a process shall expire when the welder has not welded with that process for six months or more. The licensee used the "Welders Daily Filler Material Usage" log to track welder activity and to update each welder's qualification record. If a welder did not draw material (indicating no welding activity) for six months or greater, his qualification expired. At the time of the inspection, all welders were current in their qualifications.

Welding Materials

NUHOMS FSAR #1004, Section P.3.1.2 stated that the 24PTH canister is designed and fabricated as a Class I component in accordance with ASME Section III, Subsection NB, 1998 Edition with Addenda through 2000. The weld wire spool and welding rods used during the demonstration were provided to the licensee by the Weldstar Company. The Weldstar material certification sheet for the weld wire spool stated that the spool met the requirements of ASME Section III, NB 2400, 1998 Edition with Addenda through 2000. However, the material certification sheet for the welding rods stated that the welding rods met the requirements of ASME Section III, NB 2400, 1986 Edition with no addenda. The licensee generated Action Request #161410 to reconcile the 1986 code edition to the 1998 code edition for the welding rods.

ASME, Section III, Article NB-2420 limited weld wire splicing to one splice per spool. When the producing mill allows splicing, a chemical analysis shall be performed on each end of the spool. If the producing mill prohibits splicing, the chemical analysis is only required on one end of the spool. The weld wire spool used during the pre-operational testing was manufactured by Arcos Industries. The Arcos certified material test report for the weld wire spool contained a single lot number and only one set of chemical analysis results. Additionally, the licensee verified by telephone that Arcos Industries prohibited weld wire splicing.

Tack Welds and Weld Repairs

ASME Section III, Article NB-4231.1 required all tack welds to be removed completely when they have served their purpose, or their stopping and starting ends prepared so that they can be satisfactorily incorporated into the final weld. Eight tack welds were made on the inner and outer top cover plates using the AWS. Two tack welds were made to each vent and siphon port cover plate manually. The starts and stops on the machine tack welds did not need preparation prior to the final weld. The starts and stops on the manual tack welds needed only minor surface preparation with a wire brush.

ASME Section III, Article NB-4132 required that weld repairs exceeding in depth the lesser of 3/8" (10 mm) or 10% of the section thickness, shall be documented on a report which shall include a chart which shows the location and size of the prepared cavity, the welding material identification, the welding procedure, the heat treatment, and the examination results of the repair welds. While making the inner top cover plate root pass, a blowout occurred in the vent and siphon block. The base metal in the mock-up contained an air pocket approximately ½" from the weld area and the heat from welding blew out the metal. The welding engineer generated a Repair Weld Data Report containing the elements required by Article NB-4132. The welder made the weld repair using manual GTAW.

In conclusion the pre-operational testing of the NUHOMS 24PTH dry fuel storage system met the requirements of NUHOMS Certificate of Compliance (CoC) #1004, Amendment 8, Technical Specifications A.1.1.6.6 and A.1.1.6.7. The pre-operational testing confirmed that the licensee’s procedures, personnel, equipment and materials were adequate to; 1) perform the welds specified for the NUHOMS 24PTH canister; 2) dry and inert the canister for dry storage; and 3) remove the canister lid in preparation for an unloading operation.

Hydrogen concentrations below the inner top cover plate were monitored during welding, as required by the NUHOMS FSAR #1004.

All boundary welds (including tack welds and weld repairs) were made in accordance with ASME Code Sections III and IX.

Welding procedures were qualified in accordance with ASME Code Section IX.

Welding personnel were qualified in accordance with ASME Code Section IX.

5. Weld Testing

a. Inspection Scope

NUHOMS CoC #1004, Technical Specification 1.2.5 required that all canister closure welds, except for those subject to full volumetric inspection, be dye penetrant tested in accordance with the requirements of ASME Code, Section III, Article NB-5000. Article NB-5112 referenced ASME Section V, Article 6 for liquid (dye) penetrant examinations.

b. Observations and Findings

Liquid Penetrant Testing

ASME Section V, Article 6, T-621 required each liquid penetrant procedure to include the:

- materials, shapes or sizes to be examined
- type of each penetrant, remover, emulsifier, and developer
- pre-examination cleaning and drying, including the cleaning materials used and minimum time allowed for drying
- applying the penetrant, the length of time the penetrant will remain on the surface (dwell time), and the temperature of the surface during examination. When testing outside the 50-125 ^{o}F (10-52 ^{o}C) range, modifications to the standard procedure must be provided.
- removing excess penetrant and drying the surface before applying the developer
- length of developing time before interpretation
- post-examination cleaning.

Licensee Procedure NDEP-0201, “Liquid Penetrans Examination," Revision 27 was used during the pre-operational testing. The procedure and its attachments contained all the elements required by Article 6 for liquid penetrant testing procedures.

ASME Section V, Article 6, T-642 (b) required that the surface to be examined, and all adjacent areas within an inch, be dry and clean prior to each liquid penetrant examination. Procedure NDEP-0201, Step 9.2 contained this provision and the examiners complied with it during the pre-operational testing.

ASME Section V, Article 6, T-673.3 prohibited flushing the surface with solvent between application of the penetrant and development of indications. Procedure NDEP-0201, Step 4.2 contained this prohibition and the examiners complied with it during the pre-operational testing.

ASME Section V, Article 6, T-676.1 required final interpretation to be made within 7-60 minutes after the minimum developing time. Procedure NDEP-0201, Step 11.3 and Attachments 1-4 contained this provision and the examiners complied with it during the pre-operational testing.

ASME Section V, Article 6, T-676.3 specified that for color contrast penetrants, a minimum light intensity of 50 footcandles (500 lux) was required to ensure adequate sensitivity during examination and evaluation of indications. Procedure NDEP-0201, Step 5.2 contained this provision and the examiners complied with it during the pre-operational testing.

ASME Section V, Article 6, T-676 required the inspection process, including findings (indications), to be made a permanent part of the user's records by video, photographic, or other means which provide an equivalent retrievable record of weld integrity. Procedure NDEP-0201, Section 17.0 classified NDE records as Quality Assurance documents, to become a permanent part of the user's records.

NUHOMS CoC #1004, Technical Specification 1.2.5 required that all canister closure welds, except for those subject to full volumetric inspection, be dye penetrant tested in accordance with the requirements of ASME Code, Section III, Article NB-5000. The acceptance standards specified in Article NB-5350 were:

- only indications with major dimensions greater than 1/16" should be considered relevant.
- no cracks or linear indications
- no rounded indications with dimensions greater than 3/16" (4.8 mm)
- no more than four rounded indications in a line, separated by 1/16" (1.6 mm) or less edge to edge
- no more than ten rounded indications in any 6 square inch area in the most unfavorable location relative to the indications being evaluated.

Procedure NDEP-0201, Section 12, referred to Appendix B of Nuclear NDE Manual, NGGM-PM-0011 for liquid penetrant acceptance criteria. NGGM-PM-0011, Appendix B, “NDE Surface Examination Criteria” Revision 5 was in use at the time of the inspection and it contained acceptance criteria consistent with Article NB-5350.

ASME Section V, Article 6, Subarticle T-641 required the user to obtain certification of contaminant content for all liquid penetrant materials used on austenitic stainless steels. The certifications shall include the manufacturers batch number and sample results. Sub-article T-641(b) limited the total halogen (chlorine plus fluorine) content of each agent (penetrant, cleaner and developer) to 1.0 weight percent (wt.%) when used on austenitic stainless steels. During the pre-operational testing, liquid penetrant testing of all welds was performed by Level II NDE examiners using Procedure NDEP-0201 and its Attachment 1. The liquid penetrant examinations were made with standard temperature Magnaflux Stopcheck products. The Met-L-Chek high temperature products, methods and times were simulated, due to lack of heat in the mock-up. Twelve testing kits were maintained in a locked flammable storage cabinet located behind the Quality Control office. The two NDE examiners maintained the kits and controlled access to the storage cabinet.

The Magnaflux Spotcheck standard temperature products ordered for the dry fuel storage project included Spotcheck SKC-S cleaner, Spotcheck SKL-SP penetrant and Spotcheck SKD-S2 developer. The certification sheets for each batch of Magnaflux Spotcheck products contained the sample results for halogen (chlorine plus flourine) and sulfur content, as required by the ASME code. All halogen and sulfur contents were less than 1.0 wt.%.

The Met-L-Chek high temperature products ordered for the dry fuel storage project included Met-L-Chek R-502 cleaner, Met-L-Chek VP-302 penetrant and Met-L-Chek D-702 developer. During the inspection, the licensee reviewed the material certification sheets for these Met-L-Chek products. Although the certification sheets indicated each product met the requirements of ASME Section V, Article 6, Subarticle T-641, the licensee suspected that individual batch sampling and analysis had not been performed as required by the ASME code. Licensee telephone contact with the vendor confirmed that individual batch sampling had not been performed. Upon discovery, the licensee immediately removed the Met-L-Chek products from service and generated Nuclear Condition Report #00161436 to evaluate and resolve the deficiency. The Met-L-Chek products had not been used on any Holtec supplied dry fuel storage system components.

Visual Testing

ASME Section V, Article 9, T-921.1 required Visual Testing procedures to include the; technique used, surface conditions, surface preparation and cleaning, method or tool(s) required for surface preparation, direct or indirect viewing method, special illumination, equipment to be used, sequence of performing examination, data to be documented, report forms to be completed, personnel qualifications and procedure qualification reference. Procedure NDEP-0601, “VT Visual Examination of Piping System and Component Welds at Nuclear Power Plants," Revision 15 was in use during the pre-operational testing. The procedure and its attachments contained all the elements required by the Article 9 for visual testing procedures.

ASME Section V, Article 9, T-952 required visual examinations to be conducted with the eye within 24" of the surface, at an angle not less than 30 degrees. Further, the light intensity must be at least 100 footcandles. During the pre-operational testing, the licensee visually examined all completed welds (machine and manual) in accordance with Procedure NDEP-0601. Procedure NDEP-0601 contained the Article 9 requirements for eye position and lighting.

Helium Leak Testing

NUHOMS CoC #1004, Technical Specification 1.2.4.a limited helium leakage through the inner top cover seal weld to 1.0 X 10(-7) reference cubic centimeters per second (cc/s).

NUHOMS FSAR #1004, P.3.1.2 and P.9.1.3 required the inner top cover plate welds and the vent and siphon port cover plate welds to meet the leak tight criteria of American National Standards Institute (ANSI) standard N14.5 - 1997.

ANSI N14.5 Section 8 required the licensee to use a mass spectrometer leak detector (MSLD) with a minimum sensitivity of 5.0 X 10(-8) reference cc/s with the appropriate set of calibrated leak standards. ANSI N14.5 Annex A provided the helium leak testing methods and procedures.

The licensee contracted with Helium Leak Testing Specialists, Inc. (LTS) of Orlando, FL for helium leak testing of their dry fuel storage canisters. LTS used a Varian 959 MacroTorr Mass Spectrometer Leak Detector (MSLD) during the pre-operational testing. This MSLD had a minimum sensitivity of 1.0 X 10(-9) reference cc/s when used in the hood mode. The leak standards were provided by Vacuum Technologies, Inc. (VTI). The fixed leak rate calibration standard was due for calibration on September 9, 2006, and the variable leak rate calibration standard was due for calibration on April 26, 2006.

LTS conducted helium leak testing under their Procedure MSLT-DSC-2, "Helium Mass Spectrometer Leak Test Procedure," Revision Robinson-0. This procedure incorporated the American Society of Testing and Materials (ASTM) standards ASTM-E-499-95 "Leakage Measurement Using the MSLD in the Detector Probe Mode" and ASTM E-1603-99, "Leakage Measurement Using the MSLD in the Hood Mode."

Helium leak testing of the inner top cover plate (including the vent and siphon block) was performed after initial vacuum drying and helium backfilling to 12 psig. LTS performed this leak test using the MSLD in the detector probe mode. Procedure ISFS-014, Step 8.9.9 limited the leak rate through the inner top cover plate to 1.0 X 10(-5) reference cc/s. The minimum detectable leak rate for the MSLD in the detector probe mode was 1.0 X 10(-8) reference cc/s. The actual leak rate measured during the pre-operational testing was less than minimum detectable.

Helium leak testing of the vent and siphon port cover plate welds was performed after liquid penetrant testing of the final weld pass. LTS performed this leak test using the MSLD in the hood mode. Procedure ISFS-014, Step 8.12.29 limited the leak rate through the vent and siphon port cover plates to 1.0 X 10(-7) reference cc/s. The minimum detectable leak rate for the MSLD in the hood mode was 1.0 X 10(-9) reference cc/s. The actual leak rate measured during the pre-operational testing was less than minimum detectable.

Combined helium leak testing of both the inner top cover plate and the vent and siphon port cover plates was not performed, since it was repetitive to the helium leak testing of the vent and siphon port cover plates. The combined leak test would be used to verify compliance with Technical Specification 1.2.4a.

ASME Section V, Article 10, Appendix IV required MSLD system sensitivity to be determined before and after testing, and at intervals not more than 4 hours during the testing. LTS Procedure MSLT-DSC-2 required MSLD system calibration before, during and after testing. The MSLD test duration did not exceed 4 hours.

In conclusion the liquid penetrant testing procedure met the requirements of ASME Code V, Article 6. The procedure included requirements for surface preparation, application of chemicals, illumination, final interpretation and acceptance criteria. The NDE examiners performed the procedure as written.

The standard temperature liquid penetrant products were certified to be free of contaminants as required by ASME Code V, Article 6. The licensee was pursuing certification for the high temperature liquid penetrant products.

The visual testing procedure met the requirements of ASME Code V, Article 9. The procedure included requirements for surface preparation, eye position, illumination and indirect viewing tools. The NDE examiners performed the procedure as written.

Helium leak testing was performed in accordance with ANSI N14.5 and ASTM standards E-499.95 and E-1603-99.

6. NDE Examiner Certifications

a. Inspection Scope

NUHOMS CoC #1004, Technical Specification 1.2.5 required that all canister closure welds, except for those subject to full volumetric inspection, be dye penetrant tested in accordance with the requirements of ASME Code, Section III, Article NB-5000. Article NB-5521 required personnel performing non-destructive testing to be qualified in accordance with the American Society for Non-Destructive Testing (SNT) standard, SNT-TC-1A.

b. Observations and Findings

Licensee Written Practice

SNT-TC-1A, Section 5 required the employer to establish a written practice for control and administration of NDE personnel training, examination and certification. The written practice should describe the responsibility of each level of certification for determining the acceptability of material or components and shall describe the training, experience and examination requirements for each level of certification.

Procedure NDEP-A, “Nuclear NDE Program and Personnel Process," Revision 10 was the licensee’s written practice for control and administration of NDE personnel training, examination and certification.

- Section 10.1.2 stated that a Level I examiner shall be qualified to perform specific calibrations and specific tests. With prior written approval of a Level III examiner, a Level I examiner may perform specific interpretations and evaluations for acceptance or rejection.

- Section 10.1.3 stated that a Level II examiner shall be qualified to setup and calibrate equipment and to interpret and evaluate results with respect to applicable codes, specifications, standards and procedures.

- Section 10.1.4 stated that a Level III examiner shall be capable of interpreting codes, standards and specifications; and designating the particular test methods, techniques and procedures to be used.

- Section 10.3 and Table 1 specified the minimum training and experience requirements for certifying NDE examiners to Levels 1 and 2 for VT and PT. The minimum training and experience requirements were consistent with SNT-TC-1A, Section 6.

- Section 8 specified the minimum number of questions and topics to be covered on each examination used to certify Level 1, 2 and 3 NDE examiners in PT and VT. The number of questions and topics specified were consistent with SNT-TC-1A, Section 8.

- Section 10.4.3 specified that a composite grade should be determined by simple averaging of the results of the 3 examinations for each level of certification. A passing composite grade should be 80% with no one examination below 70%. This examination grading criteria was consistent with SNT-TC-1A Section 8.

Contractor Written Practice

NUHOMS FSAR #1004, P.9.1.3 required the NUHOMS 24PTH canister to be leak tested by personnel qualified in accordance with SNT-TC-1A. Procedure MSLT-DSC-2 required helium leak testing to be performed by personnel qualified and certified to the Leak Testing Specialists, Inc. (LTS) written practice. LTS certification records indicated that the LTS person performing helium leak testing during the pre-operational testing was properly certified and his certification was current.

Visual Acuity Requirements

ASME Section V, Article 9, T-952 and SNT-TC-1A, Section 8.2 required the NDE examiner to:

- have natural or corrected near-distance acuity in at least one eye capable of reading Jaeger Number 1 at a distance of not less than 12 inches on a standard Jaeger test chart, or capable of perceiving a minimum of 8 on an Ortho-Rater test pattern. This should be verified annually.

- demonstrate the capability of distinguishing and differentiating contrast among colors used in the applicable method. This should be verified every 3 years.

NDEP-A, Section 10.4.1 implemented these requirements. The visual examination results (near distance acuity and color contrast) were documented on Form QA PQ-10, “Vision Testing Report," Revision 6. All licensee NDE examiner vision tests were current within one year. LTS certification records indicated that the LTS examiner’s vision testing was also current within one year.

Records and Recertification

SNT-TC-1A, Section 9 required certification records to contain the; name of certified individual, certification level and method, educational background and NDE experience, statement of satisfactory completion of training, visual examination results, evidence of successful completion of examinations including grades, date of certification and signature of employer. NDEP-A, Section 11.1.2 required examiner certification to be documented on Form PQ-6 or PQ-6A," Certificate of NDE Personnel Qualification." The PQ-6 forms for all three NDE examiners participating in the pre-operational testing were complete and contained the information recommended by SNT-TC-1A. The NRC team reviewed the Leak Testing Specialists, Inc. written practice and found it to be consistent with SNT-TC-1A. The certification records for the Level 3 LTS examiner were complete and met the requirements of SNT-TC-1A.

SNT-TC-1A, Section 9 specified the maximum re-certification interval for NDE examiners to be 3 years for Levels 1 and 2, and 5 years for Level 3. Recertification may be granted without testing provided there is documented continuing satisfactory performance. "Continuing" must be defined in the written practice. Without documented continuing satisfactory performance, reexamination is required for those sections deemed necessary by the Level 3 examiner.

NDEP-A, Section 11.3.3 did not establish a maximum recertification interval for NDE examiners. Instead, recertification was granted without examination based on continuing satisfactory performance. Continuing satisfactory performance was defined as:

- VT — 100 visual examinations since the last certification, with at least 25 visual examinations during the last year.
- PT — 120 hours of PT examinations since the last certification, with at least 40 hours during the last year.

Form QA PQ-8, “Recertification of NDE Examination Personnel," Revision 8 was used to document recertification.

In conclusion, the licensee’s written practice for control and administration of NDE personnel training, examination and certification met the requirements of ASME Code

Section V, Article 9. The written practice defined the responsibilities for determining the acceptability of material or components at each level of certification. It also contained the requirements for training, experience, examination, re-certification, and documentation for each level of certification. The contractor's written practice was equivalent to the licensee's.

7. Vacuum Drying and Helium Backfill

a. Inspection Scope

NUHOMS CoC #1004, Technical Specification 1.2.2 required the canister to be vacuum dried to 3 mm Hg vacuum or less and held for 30 minutes or more. Technical Specification 1.2.3.a required the canister to be backfilled with helium to a pressure of 1.5 to 3.5 psig with pressure remaining stable for 30 minutes after filling.

b. Observations and Findings

During initial vacuum drying, the canister was evacuated in stages to 100, 25, 10, 5 and 3 millimeters Mercury (mm Hg). The canister was held just below each stage for 5 minutes to measure the vacuum decay. If the decay was unacceptable, evacuation to that stage would be repeated. During pre-operational testing, the licensee achieved 92.3 mm Hg at the 100 mm Hg stage. While evacuating the canister to 25 mm Hg, the siphon tube froze at 36 mm Hg. The licensee purged the canister with helium for 5 minutes to break the ice and was then able to achieve approximately 24 mm Hg by the time testing was stopped for the day. The canister remained under vacuum through the night and by morning the vacuum had decayed to approximately 29 mm Hg. Initial vacuum drying was restarted and when canister vacuum reached 16.4 mm Hg, the NRC team determined that the initial vacuum drying process had been adequately demonstrated. The canister was then backfilled with helium to 12 psig and helium leak testing of the inner top cover plate weld was performed.

During final vacuum drying, the canister was evacuated in stages to 30, 5 and 2 mm Hg. When canister vacuum reached 14.9 mm Hg, the NRC team determined that the final vacuum drying process had been adequately demonstrated. Documentation review indicated that the licensee had successfully evacuated the canister to 2 mm Hg and held the canister below 3 mm Hg for greater than 30 minutes on June 7, 2005. This satisfied the pre-operational testing requirement for vacuum drying. After vacuum drying, the canister was backfilled with helium to 2.5 psig for dry storage. The pressure stabilized at 2.4 psig and was held for 30 minutes. This satisfied the pre-operational testing requirement for helium backfilling.

The vacuum and pressure instruments used during the pre-operational testing were controlled and calibrated under the licensee's Measuring and Test Equipment (M&TE) program. The vacuum gauge VP-1 had a range of 0-30 psia and was due for calibration on January 12, 2006. The pressure gauge HP-1 had a range of 0-100 psig and was due for calibration on April 4, 2006. The licensee did not perform a post testing calibration check on their instruments. Instead, the pressure and vacuum readings were confirmed using a calibrated backup transducer. The transducers used for the initial readings were then sent back to the calibration lab to make them ready for the next use.

In conclusion, the licensee met the requirement of NUHOMS CoC #1004, Technical Specification A.1.1.6.6 for pre-operational testing of canister vacuum drying and helium backfilling. The level of canister dryness required by Technical Specification 1.2.2 was achieved, as was the helium backfill pressure required by Technical Specification 1.2.3.a.

8. Radiological Controls

a. Inspection Scope

10 CFR 72.104(b) requires that operational restrictions must be established to meet As Low As Is Reasonably Achievable (ALARA) objectives for direct radiation levels associated with ISFSI operations.

b. Observations and Findings

A pre-job safety briefing was held with workers and radiological protection personnel prior to the pre-operational testing. The briefing included the job scope, industrial safety and radiological safety topics. The job scope briefing included; roles and responsibilities, sequence of events, human performance tools (self checking, peer checking, etc.), 3-way communications, and procedure use. The industrial safety topics included; Personnel Protective Equipment (P.E.), hot work (gloves, heat stress), tools and materials, Foreign Material Exclusion (FME), and operating experience. The radiological safety topics included; adherence to Radiation Work Permit 00003365, expected dose rates, contamination control measures, Electronic Alarming Dosimeters (ED), use of High Efficiency Particulate Airborne (HEPA) fans, and Radiation Protection personnel job coverage.

The area around the transfer cask and canister was posted as a High Radiation Area, in accordance with 10 CFR 20.1902.

Access to the transfer cask and canister was controlled. A swing gate with an audible alarm was provided at the access point, in accordance with 10 CFR 20.1601(a)(2).

Time studies were in progress for all tasks. The data will be used for predicting exposure levels and for developing methods for reducing the exposures during dry fuel storage operations.

In conclusion, the pre-job safety briefing was complete and comprehensive. Workers and radiological protection personnel were provided the information they needed to work safety and to minimize their radiation exposures.

The radiological postings and access control measures established, met the requirements of 10 CFR 20.

Time studies were in progress for all tasks as part of an effort to reduce radiation exposures to ISFSI personnel during dry fuel storage operations. This met the intent of 10 CFR 72.104(b) for keeping radiation exposures ALARA.

9. Initial Cask Loading and Storage Observation

a. Inspection Scope

The team observed portions of initial cask loading, drying, sealing, and moving in accordance with applicable procedures.

b. Observations and Findings

Overall, the licensee established and maintained adequate oversight for the dry cask storage evolution. Technical Specifications requirements and acceptance criteria as outlined in the FSAR for the Holtec casks were followed appropriately. Radiation protection controls were adequately established and implemented to reduce area and personnel doses and contamination. Dose rates to licensee personnel received during the initial NUHOMS 24-PTH cask loading were significantly below dose projected. One ACR (00166125) regarding a heise pressure gauge that was damaged during decontamination activities was initiated by the licensee. The loading campaign for the first 24-PTH cask was safely completed by the licensee.

Meetings, Including Exit

An inspection exit was held with the licensee on June 29 and an exit by telephone was conducted with the licensee on August 18 to discuss team observations. No proprietary information was received.

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

J. Adams, Assessor - Nuclear Assessment Section
J. Andrescavage, ISFSI Project (Contractor)
D. Atkinson, Senior Mechanic - Nuclear
N. Bach, Superintendent - Environment and Chemistry
C. Baucom, Supervisor - Licensing/Regulatory Programs
L. Baxley, Supervisor - Radiation Control
E. Caba, Superintendent - Design Engineer
J. Carnes, QA/QC/NDE Technician I - Nuclear
A. Cheatham, Superintendent - Radiation Protection
B. Clark, Manager - Nuclear Assessment Section
R. Crandall, Lead Engineer
B. Davis, Senior Mechanic - Nuclear
J. Douglas, Superintendent - Mechanical Maintenance
S. Farmer, Superintendent - Systems Engineer
M. Hale, Lead Engineer
J. Huegel, Manager - Maintenance - Nuclear
E. Kapopoulos, Manager - Outage and Scheduling
K. Kline, Senior Nuclear Technical Project Management Specialist
J. Lucas, Manager - Support Services - Nuclear
G. Ludlam, Manager - Training - RNP
H. Malphus, Mechanic 1/C - Nuclear
D. Martrano, Superintendent - Plant Support Assessment
S. Michaud, Manager - Nuclear Information Technology
J. Moyer, VP - Robinson Nuclear Plant
W. Noll, Director - Site Operations - RNP
R. Perkins, Supervisor - Mechanical Maintenance
G. Sanders, Senior Engineer
J. Sanders, Lead Engineer
W. Shively, Radiation Control Technician 1 - Nuclear
J. Stanley, Superintendent - Technical Services
D. Stoddard, Plant General Manager - RNP
G. Webb, Senior Mechanic - Nuclear
S. Wheeler, Supervisor - Emergency Preparedness
C. Wilkey, QA/QC/NDE Technician I - Nuclear

Contractor Personnel (Leak Testing Specialists, Inc.)

A. Heinz, Level 3 NDE Examiner
B. Facade, Trainee

NRC

R. Hagar, Senior Resident Inspector
D. Jones, Resident Inspector

INSPECTION PROCEDURES USED

60854	Preoperational Testing of an ISFSI
60855	Operations of an ISFSI
60856	Review of 10 CFR 72.212(b) Evaluations
60857	Review of 10 CFR 72.48 Evaluations
81001	ISFSI Security

ITEMS OPENED, CLOSED, AND DISCUSSED

None

List of Documents Reviewed

Procedures as well as other references used by the team:

Document Reviewed:

Procedures

- Procedure ISFS-012, Rev. 2, 24P-ISFSI Transfer Cask Handling Operations for Fuel Loading
- Procedure ISFS-013, Rev. 2, 24P-ISFSI Dry Shielded Canister Fuel Loading
- Procedure ISFS-015, Rev. 3, 24P-ISFSI Transfer Cask and Dry Shielded Canister Transfer to HSM
- Procedure MST-018, Rev. 14, Spent Fuel Cask Handling Crane Surveillance Testing
- Progress Energy, NGG Program Manual, NGGM-PM-0007, "Quality Assurance Program Manual," Revision 9, July 19, 2005
- H. B. Robinson Steam Electric Plant, Unit No. 2, Plant Operating Manual, Volume 6, Part 5, - FMP-016, "Fuel Assembly Visual Inspection," Revision 7; FMP-022, "Fuel Integrity Monitoring," Revision 6.
- H. B. Robinson Steam Electric Plant, Unit No. 2, "ISFSI Cask Handling NRC Dry Run Plan," Revision 0.
- H. B. Robinson Steam Electric Plant, Unit No. 2, Plant Operating Manual, Volume 4, Part 10, "ISFSI 11, "24P Dry Shielded Cannister/Transfer Cask Preparations For Loading"; ISFS-012, "24P-ISFSI Transfer Cask Handling Operations For Fuel Loading," ISFS-013, "24P-ISFSI Dry Shielded Canister Fuel Loading," Revision 2"; and ISFS-014, "24PTH Dry Shielded Canister Sealing Operations," Revision 2
- Progress Energy, Nuclear Generation Group, Standard Procedure, Volume 99, Book/Part 99, "Reg-NGGC-0010, 10 CFR 50.59 and Selected Regulatory Reviews", Revision 8

- Progress Energy, Nuclear generation group, Standard Procedure, Volume 99, Book/Part 99, “EGR-NGGC-017, “Preparation and Control of Design Analysis and Calculations"
- Progress Energy, Nuclear Generation Group, RNP Standard Procedure, Volume 99, Book/Part 99, NFP-NGGC-0023, “Selection of Fuel For Storage In Irradiated Spent Fuel Storage Installations," Revision 0, Draft 3; EGR-NGGC-0003, “Design Review Requirements."
- AOP-028-BD titled “Basis Document, ISFSI Abnormal Event"
- MCP-NGGC-0401, Revision 18, Material Acquisition
- NGGM-PM-0007, Progress Energy Quality Assurance Program Manual
- PLP-007 titled “Robinson Emergency Plan EC54719 ISFSI PAD”
- Quality Assurance Project Plan, revision 0, dated 7/12/04, and revision 1, dated 7/12/05 for the ISFSI
- RC-05-002, titled “Evaluation of Dose Impacts from Dry Spent Fuel Storage Activities and New Site Facilities”, dated 6/21/05.
- RDC-NGGC-0001, Revision 10, NGG Standard Records Management Program
- REG-NGGC-0010, rev. 8, titled “10CFR50.59 and selected regulatory reviews
- RNP-M/Mech-1774 & RNP-M/Mech-1780 titled “Site dose calculations for the Nuhoms 24-PTH system at the Robinson Plant (1780 same title)
- NGG Program Manual: “Quality Assurance Program Manual”, Revision 9, NGGM-PM-6007

Other Documents

- CP&L Letter to NRC Serial NG-76-691, Robinson Response to Questions on Spent fuel Shipping Cask, dated May 14, 1976
- CP&L letter to NRC Serial NO-81-1336, Robinson Controls of Heavy Loads, Dated August 12, 1981
- CP&L Letter to NRC, titled “Control of Heavy Loads - NUREG-0612," Dated December 15, 1982
- CP&L Letter to NRC Serial RNP-RA/96-0098, Robinson Response to NRC Bulletin 96-02, Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment, Dated May 13, 1996
- NRC Letter to CP&L , Subject: Control of Heavy Loads (Phase 1), Dated May 29, 1984
- NRC Letter to CP&L for Amendment No. 27 to Facility Operating License No. DPR-23 for Robinson, Dated March 22, 1977
- 125/5 Ton Replacement Cask Handling Crane, Serial No. 10698 Operational check and Load Test, Dated February 24, 1976 and June 6, 1975
- Inspection of Fuel Cask Handling Crane Rails and Structures, Dated April 22, 1975
- Work Order No. 00661710-07 Upgrade Spent Fuel Cask Crane EC5884 (Including a 100% operational load test), Dated June 9, 2005
- Adverse Condition Investigation Form for Action Request Nos. 130440-02, 147589-02, and 161411-02 for Spent Fuel Cask Crane Overstresses or Possible Weld Indications
- NRC Even Notification Reports for Cranes from Whiting Corporation for Even Nos. 39545 Dated January 29, 2003; 40843 Dated June 26, 2004; and 41317 Dated January 7, 2005
- Whiting Services, Inc. Inspection Report for Whiting Crane S/N 10698on June 16, 2005
- Ranor, Inc. Procedure and Report for Load Testing NUHOMS OS197 Transfer Cask Mark III Swing Arm Lifting Yoke, Dated April 27, 2005

- Engineering Change 58840, Rev. 7, Spent Fuel Cask Crane Upgrade
- Engineering Change 58673, Rev. 17, FHB Superstructure Modifications
- Engineering Change 61411, Rev. 2, Spent Fuel Cask Crane Upgrade; Restricted Path Set-Point Change
- Calculation No. RNP-C/STRU-1206, Rev. 3, Fuel Handling Superstructure/Crane Support Structure Modification
- Calculation No. RNP-C/STRU-1208, Rev. 0, Fuel Handling Building Superstructure Analysis
- Calculation No. RNP-C/STRU-1224, Rev. 1, Crane Design Report for 110 Ton MCL Under Seismic Conditions
- Calculation No. RNP-C/STRU-1225, Rev. 2, Crane Design Report for 110 Ton MCL During Normal Operating Conditions
- H. B. Robinson Steam Electric Plant, Unit No. 2, “ISFSI Cask Handling NRC Dry Run Plan," Revision 0.
- H. B. Robinson Steam Electric Plant, Unit No. 2, Plant Operating Manual, Volume 4, Part 10, “ISFSI 11, “24P Dry Shielded Canister/Transfer Cask Preparations For Loading”
- ISFS-012, “24P-ISFSI Transfer Cask Handling Operations For Fuel Loading”
- ISFS-013, “24P-ISFSI Dry Shielded Canister Fuel Loading," Revision 2”
- ISFS-014, “24PTH Dry Shielded Canister Sealing Operations," Revision 2

FSAR Change Notices (FCNs):

- (FCNs FSAR Revision 8)
  721004-045
  721004-074
  721004-172
  721004-206
  721004-276
  721004-294

Engineering Changes:

- PCHG-DESG Engineering Change 54930R2, “24P-ISFSI Security Electronics," Re Ken Goddard (Enercon Services, Inc.) James Paul
- PCHG-DESG Engineering Change 61411R2, “Spent Fuel Pool Cask Crane Upgrade; Restricted Path Set Point Changes

Calculations:

- RNP-F/NFSA-0123, “NUHOMS 24PTH Dry Fuel Storage - Initial RNP Fuel Selection

Non Conformance Reports (NCRs):

- NCR Number 00165071, “Need to Evaluate Chemicals Used for Dry Storage," initiated July 29, 2005
- NCR Number 00164963, “Evaluate Need For Procedure High Temp Limit on SF Cask Crane," initiated July 28, 2005

LIST OF ACRONYMS USED

ALARA	As Low As Is Reasonably Achievable
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWS	Automated Welding System
CAM	Continuous Air Monitor
CFR	Code of Federal Regulations
CoC	Certificate of Compliance
CR	Condition Report
CRED	Condition Report Engineering Deposition
DCR	Design Change Request
DCSS	Dry Cask Storage System
DSC	Dry Storage Canister
EAD	Electronic Alarming Dosimeter
EAL	Emergency Action Level
FME	Foreign Material Exclusion
FSAR	Final Safety Analysis Report
GTAW	Gas Tungsten Arc Welding
HEPA	High Efficiency Particulate Airborne
HSM	Horizontal Storage Module
IP	Inspection Procedure
ISFSI	Independent Spent Fuel Storage Installation
M&TE	Measuring and Test Equipment
MSLD	Mass Spectrometer Leak Detector
NDE	Nondestructive Examination
NRC	Nuclear Regulatory Commission
PPE	Personnel Protective Equipment
PQR	Procedure Qualification Record
PT	Liquid Penetrant Testing
QA	Quality Assurance
QC	Quality Control
RWP	Radiation Work Permit
SAR	Safety Analysis Report
SER	Safety Evaluation Report
SFP	Spent Fuel Pool
SNT	American Society for Non-Destructive Testing
TC	Transfer Cask
TT	Tansfer Trailer
VDS	Vacuum Drying System
VT	Visual Testing
WPQ	Welder Performance Qualification
WPS	Welding Procedure Specification