UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

March 29, 2005

Mr. J. Alan Price
Site Vice President - Millstone
c/o Mr. D. W. Dodson, Supervisor - Station Nuclear Licensing
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

SUBJECT: INSPECTION REPORT 05000336/2005006, DOMINION NUCLEAR CONNECTICUT, MILLSTONE POWER STATION UNIT 2, WATERFORD, CONNECTICUT

Dear Mr. Price:

On February 19, 2005, the NRC completed an inspection of your Millstone Unit 2 nuclear reactor facility at Waterford, Connecticut, which covered activities associated with the Independent Spent Fuel Storage Installation (ISFSI) dry run and initial loading of spent fuel in the ISFSI facility. The inspection period began on December 1, 2004. The findings of the inspection were discussed with you and members of your staff on February 11, 2005. The enclosed report presents the results of that inspection.

Your preparations to demonstrate the capability to safely load spent fuel into the ISFSI facility were inspected during this inspection period. The inspection covered all aspects associated with the preparation, movement and placement of spent fuel into the ISFSI facility. The inspection consisted of field observations, extensive examination of procedures and documents, and interviews with personnel. Dry run preparations were thorough and individuals appropriately trained and qualified in the performance of tasks. Sound, conservative decision making was noted throughout the performance of the dry run and the initial loading of spent fuel into the ISFSI facility. Activities were implemented in a safe manner. No safety concerns were identified.

In accordance with Section 2.390 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations (CFR), a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

We appreciate your cooperation with us during this inspection.

Sincerely,

/RA/

Ronald R. Bellamy, Chief
Decommissioning Branch

Enclosure: Inspection Report No. 05000336/2005006

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U.S. NUCLEAR REGULATORY COMMISSION
REGION I

INSPECTION REPORT

Inspection No.	05000336/2005006
Docket No.	05000336
License No.	DPR-65
Licensee:	Dominion Nuclear Connecticut, Inc. (DNC)
Location:	Rope Ferry Road Waterford, CT 06385
Inspection Dates:	December 1, 2004 through February 19, 2005
Inspectors:	Robert Prince, Health Physicist Decommissioning Branch Division of Nuclear Materials Safety
	E. Harold Gray, Senior Reactor Inspector Materials and Structural Engineering Branch Division of Reactor Safety
	Frank Jacobs, Safety Inspection Engineer Spent Fuel Project Office
	Michael Karmis, Transportation and Storage Safety Inspector Spent Fuel Project Office
	Maurice Heath, Nuclear Safety Professional Development Program Spent Fuel Programs Office
Approved By:	Ronald R. Bellamy, Chief Decommissioning Branch Division of Nuclear Materials Safety

EXECUTIVE SUMMARY

Dominion Nuclear Connecticut, Inc.
NRC Inspection Report No. 5000336/2005006

This integrated inspection included aspects of licensee activities regarding the preoperational testing program (licensee trial dry runs and the final NRC Dry Run) for safely loading spent fuel from the spent fuel pool (SFP) into a dry cask storage system and transferring the spent fuel to the Independent Spent Fuel Storage Installation (ISFSI). The NRC Dry Run included the loading through placement of a dry storage canister (DSC), containing simulated spent fuel assemblies, to the ISFSI. The first loading and transfer of spent reactor fuel was also observed, following successful completion of the NRC Dry Run.

Dominion Nuclear Connecticut (DNC) selected the Transnuclear NUHOMS-32PT Horizontal Modular dry cask storage system as the storage system for the spent fuel. The Transnuclear NUHOMS-32PT dry cask storage system (DCSS) is licensed by the Nuclear Regulatory Commission (NRC) as Certificate of Compliance (CoC) No. 1004. The Millstone ISFSI consists of a series of reinforced concrete horizontal storage modules (HSMs), approximately 8.5 feet wide and 18.5 feet high. This NUHOMS DCSS consists of a DSC which holds 32 fuel assemblies. The DSC is placed into a transfer cask (TC) to provide shielding for protection of workers during transfer operations and during the 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 pit while in the TC and placed onto a transfer trailer (TT) located in the truck bay of the Unit 2 Auxiliary Building. The transfer trailer with the loaded TC is transported from the plant to the ISFSI. The DSC is inserted into a shielded horizontal storage module (HSM) for storage. Each HSM holds a single, loaded DSC.

The licensee demonstrated the ability to safely load the TC onto the TT and subsequently transport the loaded TC to the ISFSI. The placement of a DSC into the TC to verify fit and confirmation that the DSC fuel storage cells were capable of accepting Unit 2 spent fuel assemblies was successfully completed. The licensee successfully aligned the DSC with the HSM and demonstrated the ability to insert and retrieve a DSC. Individuals were qualified to perform their assigned functions and were knowledgeable of their responsibilities. Procedures and work-related documentation were accurate with strict procedural compliance demonstrated by workers in the field.

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 Millstone site.

The licensee had developed a cask loading plan in accordance with approved procedures. Licensee documentation supported the proper characterization of the first 64 fuel assemblies to be loaded into the first two DSCs and were in compliance with design parameters specified in the CoC.

The inspector concluded that the capability to adequately weld and perform nondestructive examination (NDE) of DSCs was demonstrated by the mockup work. Welding activities associated with DSC closure were performed in accordance with approved procedures. Personnel were qualified to perform their assigned functions.

Procedures governing the lifting of heavy loads contained the appropriate requirements specified in national standards. The lifting and movement of heavy loads were performed in accordance with approved procedures. Work evolutions were strictly controlled and performed in a safe manner. Maintenance and testing of equipment to ensure the ability of the equipment to safely handle anticipated loads were properly performed and documented in accordance with approved procedures.

The licensee demonstrated the capability to perform drain-down, vacuum drying, 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 Nuclear Oversight department provided effective independent review of ISFSI activities. Quality control and assurance efforts were appropriately incorporated into ISFSI activities. Quality Control personnel were actively engaged in field activities and verified that hold points, technical specifications, and work order requirements were implemented in accordance with approved procedures and related work documents. The identification and tracking of issues was implemented in accordance with the licensee's corrective action program, with the proper review and evaluation of action items performed prior to initial loading of spent fuel in the ISFSI facility.

The licensee implemented an effective program to identify personnel training requirements associated with the ISFSI program. Appropriate training modules were developed for the various tasks. Individuals were properly trained and qualified to perform their assigned functions. The licensee utilized extensive practice sessions and on-the-job training sessions to verify readiness of individuals to perform their assigned functions.

The licensee safely loaded the first DSC containing spent fuel into an HSM. Work activities were performed in accordance with approved procedures and met the requirements of technical specifications. Spent fuel loaded into the DSC was properly characterized. The DSC was properly sealed, tested, surveyed and inspected, and met the requirements of the CoC.

REPORT DETAILS

Summary of Facility Activities

Preparations for loading spent fuel from the Unit 2 SFP to the Transnuclear Inc. Standardized NUHOMS® Dry Storage Cask System were initiated during this inspection period. Upon completion of the dry run demonstrations, in early February 2005, the licensee began the transfer of Unit 2 spent fuel to the onsite ISFSI. Units 2 and 3 were at power operations, while Unit 1 is decommissioned and in long-term SAFSTOR status.

Millstone Unit 2 completed loading of two DSCs on February 26, 2005 to maintain full-core offload capability in support of the upcoming April 2005 outage. The next fuel movement campaign is planned for the summer of 2006.

1 Preoperational Test Program

B. Inspection Scope (60854)

The CoC for the NUHOMS Horizontal Modular Storage System requires the licensee to conduct preoperational testing to demonstrate the loading, closure, and transfer of the cask system prior to the first loading of spent fuel assemblies. The NRC conducted several onsite inspections to observe the licensee's demonstration of the activities required by the CoC. The inspection consisted of field observations, interviews with cognizant personnel, and review of licensee documentation.

B. Observations and Findings

The CoC for the NUHOMS dry cask storage system includes a requirement to demonstrate certain specific activities prior to loading the first DSC. These requirements are specified in Section 1.1.6 of the Technical Specifications as follows:

1. Functional testing of the TC with lifting yokes to ensure that the TC can be safely transported over the entire route for fuel loading, washdown pit and trailer loading.

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

3. Testing of TC on transport trailer and transported to ISFSI along a predetermined route and aligned with an HSM.

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

5. Loading a mock-up fuel assembly into the DSC.

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

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

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

Millstone developed Design Change (number MG-04010), "Design, Installation and Operation of an Independent Spent Fuel Storage Installation (ISFSI) for Millstone Station", that described the activities that would be conducted to comply with the preoperational test requirements. A test plan was detailed in the design change and included 5 phases:

- Phase 1 - DSC Dry in Aux Building
- Phase 2 - DSC Insertion into Horizontal Storage Module (HSM)
- Phase 3 - DSC Wet in Unit 2 Aux Building
- Phase 4 - Vacuum Drying of DSC Mockup Canisters
- Phase 5 - DSC Mockup Canister Inner and Outer lid Welding

Items 2, 3, 4, 5, and 8, noted above, are discussed below while items 1 and 6 are discussed elsewhere in this inspection report. Item 7, opening of a DSC was not required to be demonstrated as part of the dry run. The equipment and procedures utilized to open a sealed DSC have been successfully demonstrated by the contractor at another site utilizing the same methods and procedures that would be employed by Millstone in the unlikely event that the need arose to open a previously sealed DSC.

Various onsite inspections were performed by the NRC to observe the phases of the preoperational test plan. The licensee developed procedures, personnel training and qualification programs, and conducted practice sessions as part of the preoperational program.

The Work Package for the dry run activities was reviewed. The work package contained all the applicable procedures associated with the scope of the dry run activities. In addition, the work package contained purchase orders, vendor equipment and material qualification records and certifications, use "as is" dispositions, and nonconformance reports and their dispositions. Open items were reviewed to evaluate proper closure in accordance with licensee programs. Previous use "as is" dispositions associated with minor material issues (e.g., superficial indications on the outer concrete surfaces of some HSM modular components) were evaluated for proper closure by the licensee. These items were previously discussed with the inspector when initially identified by the licensee. No safety concerns were identified.

Over the period of February 8-11, 2005, the inspector observed the loading of the TC onto the TT, transport of the TC to the ISFSI along the designated haul path, and insertion and retrieval of the DSC into and from the HSM. The licensee conducted a pre-job briefing on February 8th with personnel involved with the dry run activities. The briefing was comprehensive and effectively covered key aspects of the evolution, including procedural adherence expectations, safety aspects of the activities, use of peer checks, use of three-way communications, QA hold points, as well as a detailed overview of the tasks to be performed. Radiological conditions were simulated and appropriate measures implemented to provide a degree of realism during the performance of the dry run. The inspector noted that the licensee had made arrangements to issue neutron dosimetry to workers and would post effected areas with

simulated radiological postings in order to prepare workers for the radiological conditions that could be encountered during actual transfer of spent fuel. The licensee had obtained radiological survey data from other licensees and used this data to communicate expected radiation levels to workers at key stages during the dry run.

The licensee developed the following procedures associated with loading the TC onto the TT, preparation of the TT for movement, transport of the TC to the ISFSI, DSC insertion into a HSM location, and retrieval of a DSC from a HSM:

- C OP 302.1, DSC Insertion Into HSM (ISFSI)
- C OP 302.2, DSC Retrieval From HSM (ISFSI)
- C OP 302.3, TT Prime Mover Pre-Op Inspection (ISFSI)
- C OP 302.4, Transfer Trailer Operations (ISFSI)

The procedures were comprehensive and adequately addressed key aspects of the above evolutions. Procedures contained sufficient detail to support safe handling, and movement of the TC and TT. Procedure compliance was strictly followed during the performance of the activities. The inspector interviewed cognizant personnel to verify their knowledge of procedural requirements and responsibilities.

The inspector noted that activities were performed in a deliberate manner. The work package contained the procedures that covered the various aspects of the work activities. The responsible supervisor maintained the work package in his possession throughout the entire performance of the activity. Procedure steps were followed and for those steps requiring the performance of a specific task (e.g., verification of equipment configuration or position of a control switch) repeat back communication techniques were employed at all times. The inspector noted effective use of focus briefings during critical stages of various evolutions (e.g., prior to insertion of the DSC). In addition, whenever extended delays were encountered due to the nature of a given task or stage of an evolution, the responsible supervisor held additional focus briefs to emphasize safety precautions and to confirm the readiness of workers to proceed to the next step.

The licensee demonstrated the capability to safely place a DSC into the TC. Rigging, movement and placement of the DSC into the TC was performed in a controlled manner with good coordination and communication observed among individuals involved in the activity. The inspector observed fuel handlers place a dummy fuel assembly into several different DSC storage cells while the TC was underwater in the cask laydown pit area of the SFP.

Throughout the entire dry run exercise, the work package was periodically reviewed by the inspector to verify compliance with procedures and related work documents. The inspector noted that procedure steps were signed - off as required and that work order documents were strictly followed.

C. Conclusions

The licensee demonstrated the ability to safely load the TC onto the TT and subsequently transport the loaded TC to the ISFSI. The placement of a DSC into the TC to verify fit and confirmation that the DSC fuel storage cells were capable of accepting Unit 2 spent fuel assemblies was successfully completed. The licensee successfully aligned the DSC with the HSM and demonstrated the ability to insert and retrieve a DSC. Individuals were qualified to perform their assigned functions and were knowledgeable of their responsibilities. Procedures and work-related documentation were accurate with strict procedural compliance demonstrated by workers in the field.

2 Review of Evaluations

A. Inspection Scope (60856 and 60857)

The inspector evaluated the licensee's compliance with the requirements of 10 CFR 72.212 and 10 CFR 72.48. The inspection consisted of interviews with cognizant personnel and review of licensee documentation.

B. Observations and Findings

The licensee is required as specified in 10 CFR 72.212(b)(1)(i) to notify the NRC of the intent to store spent fuel at an ISFSI at least 90 days prior to the first storage of spent fuel. Dominion Nuclear Connecticut notified the NRC on October 14, 2004, of their intent to use the Transnuclear NUHOMS-32PT cask system in accordance with CoC Number 1004. This letter met the requirements for the 90-day notification. The licensee is required as specified in 10 CFR 72.212(b)(1)(ii) to register the use of each cask with the NRC within 30 days of using that cask to store spent fuel. The licensee provided this registration to the NRC in a letter dated March 11, 2005.

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. DNC documented its written evaluation to confirm the ISFSI is within the licensed scope in "Millstone Unit 2 -10 CFR 72.212 Evaluation Report", dated February 15, 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 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). In addition, much of the evaluation required by 72.212 was addressed in detail in Design Change Request (DCR) MG-0410 (described in Section I of this report). The DCR identified as an open item that administrative incorporation of the ISFSI and references to 10 CFR Part 72 Millstone programs and procedures must be implemented during the 90-day DCR closeout period. The DCR also included the 10 CFR 50.59 screening and evaluation forms. The DCR stated that a 72.48 screening for the DCR was not appropriate and that changes to the ISFSI after "Release to Operations" of the DCR would be screened individually per the 72.48

screen/evaluation process. The 72.212 Evaluation Report was an attachment to the DCR.

A 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 73.55 and 72.212(b)(5). The ISFSI has been incorporated into the Protected Area of the Millstone station. The NUHOMS system design parameters enveloped the reactor site parameters described in the Millstone Unit 3 FSAR, including analysis of earthquake intensity and tornado-generated missiles.

The inspector reviewed selected referenced records and procedure changes related to the security, emergency preparedness, training, health physics and quality assurance programs. The inspector interviewed cognizant personnel to confirm that they were knowledgeable of the impact of ISFSI-related activities. For instance, the inspector interviewed a Unit 2 shift manager concerning the availability and knowledge of the Emergency Action Levels (EALs) associated with ISFSI operations. The shift manager readily retrieved the EAL chart and demonstrated awareness of the ISFSI EALs. Discussions with the Security Manager indicated that response plans had been established in the event of an ISFSI-related security threat and such actions evaluated with regards to ensuring the maintenance of established security response measures for the operating units. 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.

C. Conclusions

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 Millstone site.

3 Fuel Characterization and Verification

A. Inspection Scope (60854)

The CoC for the NUHOMS-32PT dry cask storage system specifies the parameters that must be met in order to allow spent fuel to be stored at the ISFSI. The inspector evaluated licensee programs to verify that spent fuel assemblies selected for storage met the applicable requirements of the CoC. The inspection consisted of interviews with cognizant personnel and review of licensee documentation.

B. Observations and Findings

During the period of January 18 to January 20, 2005, the inspector reviewed the licensee's process for selecting and verifying fuel assemblies for placement in the first

two DSCs. The inspector reviewed various documents associated with the qualification, characterization, and selection of fuel assemblies for storage at the ISFSI. Documents reviewed included the following:

- TE M2-EV-04-15, Fuel Assembly Qualification for Dry Storage at the Millstone ISFSI
- TE M2-EV-04-14, Fuel Assembly Characterization and Criteria for Dry Storage at the Millstone ISFSI (Millstone Unit 2)
- EN 21024, Irradiated Fuel and Component Inspection
- NAF-202, Documentation and Disposition of Nonconforming Fuel, Insert Components, and Storage Casks
- NAF-208, ISFSI Fuel Selection and Certification
- NAF-221, Irradiated Fuel Assembly and Insert Component Inspection
- EN 21024, Fuel Assembly Visual Examination for Dry Storage - Inspection Forms
- Calculation Number: ISFSI-04034F2, Qualification of MP2 Fuel Assemblies for Placement in Dry Storage Casks
- Calculation Number: ISFSI-04087F2, Loading Patterns for DSC 1 and 2 at the Millstone ISFSI

Technical Specifications require that selected fuel assemblies be visually inspected, independently identified, be free of cladding defects, and be within specified limits for such parameters as fuel enrichment, burn-up, and decay heat output. The inspector discussed the fuel selection process with cognizant personnel and determined that individuals were knowledgeable of the technical specification requirements. The inspector noted that the visual examination records for five fuel assemblies selected for loading into DSC 1 identified minor discrepancies. These discrepancies involved the presence of small deposits of residual debris (e.g., tape residue) or minor material imperfections (e.g., small piece missing from a spacer grid). The inspector reviewed Condition Report Engineering Dispositions (CRED) 04-05709 and 04-05713 that addressed the results of the visual examinations of the fuel assemblies. CRED 04-05709, evaluated the presence of debris noted on fuel assemblies F-71, F-63, and F-58 while CRED 04-05713, addressed material imperfections noted for fuel assemblies F- 50 and F-54. These evaluations adequately addressed the results of the visual examinations and concluded that the fuel assemblies were suitable for placement into dry storage. The inspector noted that the selected fuel assemblies met all the appropriate technical specification requirements for placement into a DSC for dry storage. Supporting documentation adequately characterized the selected fuel assemblies for loading into DSCs 1 and 2.

C. Conclusions

The licensee had developed a cask loading plan in accordance with approved procedures. Licensee documentation supported the proper characterization of the first 64 fuel assemblies to be loaded into the first two DSCs and were in compliance with design parameters specified in the CoC.

4 Welding and Nondestructive Testing

A. Inspection Scope (IP 60854)

The inspector observed and evaluated the welding and NDE to determine whether the Millstone staff and Millstone's contractor had developed the capability to properly weld and perform NDE on the type of DSC to be used for storage of spent fuel at the Millstone site.

B. Observations and Findings

The licensee utilized the services of a dedicated contractor welding and nondestructive examination team experienced in the DSC type to be used by the licensee. Contractor personnel had performed similar services for other licensees, including welding and NDE on this DSC design.

The inspector observed the welding equipment setup, welding of the mockup shield plug, visual weld examination, penetrant testing, and helium leak-testing of the shield plug and drain/vent port covers. Portions of the applicable work instructions and procedures were reviewed. The inspection included verification that the activities were accomplished in accordance with the commitments and requirements contained in the SAR, the NRC's Safety Evaluation Report, the CoC, the licensee's QA program, and 10 CFR Part 72. The inspector discussed the work steps and plans with those involved and reviewed portions of various controlling procedures (work packages) to verify their adequacy. The inspector also examined the welding equipment, observed welding in progress on a shield plug and inner and outer DSC covers, reviewed welder qualification records, and reviewed portions of the welding and NDE procedures.

The inspector attended the pre-job briefing on February 16, 2005, for welding the inner lid onto the first DSC that had been loaded with spent fuel. The pre-job briefing was thorough and covered key aspects of the activity. The inspector noted a thorough review of industry operating experience, associated with issues relating to welding of DSC lids, was provided. During the pre-job briefing, the contractor informed the licensee of the need to perform tack welds on the inner cover. This task was not previously evaluated from a radiological exposure perspective. Based on details discussed during the pre- job briefing, the licensee decided that a revision to the Radiation Work Permit (RWP) would be required. This resulted in a short work delay and the need for Health Physics' staff to confirm dose rates in the specific work areas. No safety concerns were identified.

The inspector observed preparations for welding the inner and outer DSC covers on February 16 and 17. Contractor personnel were knowledgeable of their work activities and worked closely with licensee personnel. Rigging and handling of the lids, welding machine, and associated equipment were performed in a safe manner. The inspector discussed the methods employed by the crane operator and rigger regarding the selection of slings, inspecting slings prior to use, and confirmation that slings were approved for use. The individuals were knowledgeable of procedural requirements and followed approved rigging and lifting practices.

The welding machine was prepared for use in accordance with approved procedures. Personnel were meticulous in ensuring proper alignment of the welding machine and that support equipment was properly prepared before welding was allowed to commence. Liquid penetrant testing and visual inspection of welds was performed in a methodical manner in accordance with procedural and CoC requirements.

C. Conclusions

The inspector concluded that the capability to adequately weld and perform NDE of DSCs was demonstrated by the mockup work. Welding activities associated with DSC closure were performed in accordance with approved procedures. Personnel were qualified to perform their assigned functions.

5 Heavy Loads Program

A. Inspection Scope (60854)

The licensee was required to demonstrate the adequacy of their heavy loads program pertaining to the movement of the DSC and TC from the spent fuel pool to the wash-down pit and loading and unloading the TC from the transfer trailer in the Unit 2 Auxiliary Building truck bay. The inspection consisted of field observations, interviews with cognizant personnel and review of licensee documentation.

B. Observations and Findings

The Millstone Unit 2 (MP2), Spent Fuel Cask Crane is a single trolley, seismic Category 1 overhead crane with a 125-ton capacity main hoist. The licensee implemented Design Change, DCR number M2-02003, “Cask Crane Upgrade Project - MP2 Cask Crane”, in July 2003. The design modification replaced the existing cask crane trolley with an upgraded trolley that met the single-failure-proof criteria specified in NUREG-0612 and NUREG-0554. Analyses and modifications, which included upgrades to the craneway connections, were also performed to support the main hoist capacity re-rating from 100 tons to 125 tons. The inspector reviewed the design modification and noted that the MP2 spent fuel cask crane modifications met the requirements of ASME NOG-1, “Rules for Construction of Overhead and Gantry Cranes” and NUREG-0554, “Single Failure Proof Cranes for Nuclear Power Plants”, and NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants”. The upgraded crane included various crane control system features to ensure that loads could be stopped and held in a safe manner in the event of fault indications or if certain parameters exceeded specified limits (e.g., over-speed, over-travel, and over-load).

The inspector reviewed the site load test plan for the MP2 Spent Fuel Cask Crane. This test plan was specified in licensee procedure VPROC ENG04-2-01, “Site Load Test Plan for Unit 2 Spent Fuel Cask Crane”. The load test was performed in November 2004, after installation of the new trolley. This test was performed by the supplier of the crane and witnessed by DNC personnel. The test plan included 100% and 125% load tests on the main hoist, trolley, and bridge components. The test plan also included testing of emergency brakes and limit switches, and verification of operational

parameters. The inspector reviewed the completed test package and noted that test results were within prescribed specifications provided in the test plan. No concerns were identified.

To ensure that the crane cannot travel over areas of the SFP where spent fuel is stored, the licensee has designated restricted load paths. These restrictions were specified in procedure SP 2614C, "MP2 Cask Crane Restricted Load Path Checks". This surveillance procedure provides instructions for verifying the operability of the crane interlocks, which prevent travel over stored spent fuel assemblies. The inspector confirmed that the most recent surveillance was performed in accordance with the procedural requirements. The most recent surveillance was completed in December 2004 with no problems noted.

The MP2, Spent Fuel Cask Crane, is used to move the TC containing a DSC from the cask wash pit to the cask laydown pit located in the northeast corner of the SFP and back again. The crane is also utilized to lift the TC from the TT in the Unit 2 Auxiliary Building truck bay to the cask wash pit and back again. The DSC was loaded with dummy fuel assemblies to reflect the weight of a fully loaded DSC containing 32 fuel assemblies. A specially designed lift yoke is provided for use with the TC. This yoke is designed to engage the TC lifting trunnions. Procedure C SP 604.3, "Transfer Cask Lift Yoke Inspections", addressed the various lift yoke inspection requirements and specified the applicable acceptance criteria. The procedure was reviewed by the inspector with the inspection requirements thoroughly addressed. The inspector observed personnel performing visual inspections of the yoke prior to performing lifts of the TC in accordance with approved procedures.

Over the course of the dry run, the inspector observed all the movement pathways of a fully-loaded TC. Pre-lift job briefings were thorough and emphasized safety aspects of heavy load lifts. Individual responsibilities were clearly communicated during pre-job briefings. Crane operators, spotters and members of the lifting team were knowledgeable of their responsibilities. Movements of heavy loads were performed in a deliberate and safe manner. The inspector noted that effective communication was maintained between the Load Director, crane operator and members of the lifting team while lifts were in progress. Positive controls were established to keep non-essential personnel away from the work area to minimize distractions of the lift team.

C. Conclusions

Procedures governing the lifting of heavy loads contained the appropriate requirements specified in national standards. The lifting and movement of heavy loads were performed in accordance with approved procedures. Work evolutions were strictly controlled and performed in a safe manner. Maintenance and testing of equipment to ensure the ability of the equipment to safely handle anticipated loads were properly performed and documented in accordance with approved procedures.

6 Vacuum Drying and Helium Backfill Operations

A. Inspection Scope (60854)

The licensee was required to drain the DSC, vacuum dry the DSC, and backfill the canister with helium. The inspection consisted of a review of the licensee's equipment and procedures, field observations, and interviews with cognizant personnel.

B. Observations and Findings

On February 1 and 2, 2005, NRC inspectors reviewed the vacuum drying sequence. The vacuum drying sequence involves draining water from the DSC, vacuum drying the DSC, backfilling the DSC with helium, and helium leakage testing. The licensee utilized a vacuum drying system (VDS) to perform these activities. The VDS is a modular system equipped with a control panel to operate pumps, manipulate valve positions and display overall equipment configuration during the vacuum drying and helium backfilling activities. Licensee procedure C OP 302.5, "Vacuum System Operations (ISFSI)", provides the instructions for operating the Vacuum Drying System which is utilized for pumping down the DSC, vacuum drying the DSC and backfilling the DSC with helium.

The inspector observed the pre-job briefing on February 1, 2005. The briefing was thorough and addressed pertinent aspects of the relevant procedures and CoC. The licensee provided simulated radiological conditions based on industry experience. The inspector noted that values were not provided for radiation levels associated with the vacuum drying discharge piping during the pump-down and blow-down stages of the evolution. The inspector noted that the licensee provided these simulated radiation levels during the actual performance of the dry run to promote as low as reasonably achievable (ALARA) awareness. A Quality Control (QC) inspector observed the activity and was active in suggesting improvements or enhancements to performance. Procedure steps were strictly followed. The field supervisor frequently read several steps ahead to anticipate the results of actions that were being taken.

The VDS was equipped with a control monitor display panel. The VDS was staged immediately adjacent to the DSC in the cask wash down pit. The control panel was "touch" activated and the operator had the capability to display all pertinent operating parameters such as pump operating status, valve positions, flow indications, and the specific gas supply. A second control monitor was positioned in a low background radiation area that could be utilized by the operators as conditions required. Operators demonstrated a thorough knowledge and understanding of the VDS system operating parameters and the function and purpose of the various display indicators.

The licensee demonstrated the capability, using a mockup, to drain a DSC and to perform drying and helium backfilling of a DSC during the preoperational tests. The technique for the helium leak testing of the final closure welds was demonstrated on the mockup canister. The helium leak testing was performed by experienced contract personnel qualified to perform NDE on these components. These activities were also successfully demonstrated on the first loaded DSC on February 16 and 17. The vacuum drying process was performed in accordance with approved procedures. The

required vacuum pressure was achieved and the pressure maintained well within the limits for holding time as required by technical specifications. Helium backfilling operations were also performed in accordance with approved procedures and achieved the helium backfill pressure limits required by the technical specifications. Individuals performing the leak test demonstrated good understanding of the requirements for performing helium leak tests and the acceptance criteria associated with the testing.

C. Conclusions

The licensee demonstrated the capability to perform drain-down, vacuum drying, 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.

7 Quality Assurance Program

A. Inspection Scope (60854)

The involvement and role of the Nuclear Oversight Group associated with ISFSI activities was evaluated. The scope of the inspection was to ensure that sufficient independent involvement by Nuclear Oversight was established to verify that the ISFSI program was effectively developed and implemented to support the safe operation of the ISFSI facility. The use of the condition reporting program in support of ISFSI activities was also evaluated. The inspection consisted of field observations, interviews with cognizant individuals and review of licensee documentation.

B. Observations and Findings

The inspector interviewed the Director of Nuclear Oversight and a Lead Auditor. Nuclear Oversight is organized with a QA function performing audits, a QC function performing inspections, and specialists performing assessments of ISFSI activities. Nuclear Oversight developed an Integrated Assessment Plan for the ISFSI project using QA audits, QC inspections, and field observations. Issues were to be reported through audits, Condition Reports (CRs), and biweekly site vice president briefings.

The inspector noted that QC personnel attended the dry run briefings and were present in the field to observe work activities. The inspector interviewed a QC Technical Analyst to gain an understanding of their role throughout the dry run process. The analyst had developed the plan for QC observation of ISFSI activities. Field observations were not formally scheduled, and not all dry run activities were scheduled to be observed. QC Inspectors performing field observations did not use inspection checklists but used the applicable procedures during their observations. QC Technical Analysts performed the Nuclear Oversight review of ISFSI procedures. During the review, QC Analysts would prescribe QC hold points and designate procedural steps requiring independent verification.

The inspector reviewed six vendor surveillances performed by DNC. These surveillances were performed on vendor premises that were suppliers of various ISFSI components. Activities inspected included various construction stages associated with DSC and HSM fabrication. The inspection reports identified various items as being closed and items that needed followup. The reports also addressed the status of previously identified followup items. The surveillances were noted to be adequate with no safety concerns identified.

The inspector reviewed the draft of Audit 04-16, "Millstone ISFSI (Special Audit)". The results of the audited areas were documented and tracking action requests identified for unresolved items. The unresolved items were listed in a separate matrix including the action to be taken and the responsible individual or group. The matrix indicated that resolution of many of the items would be completed by DCR closeout. One unresolved item concerned overall review and approval that unresolved items have been implemented or are being tracked to completion in accordance with station programs, prior to the first loading of an HSM. Since DCR closeout could occur up to 90 days after first fuel loading, the inspector discussed the importance of ensuring Nuclear Oversight understood the impact of any unresolved item and concurred in their resolution prior to first fuel loading. It was also noted that CRs applicable to ISFSI activities should be identified and reviewed for resolution or status of corrective actions confirmed prior to first fuel loading.

The inspector reviewed the CRs issued by the licensee pertaining to the ISFSI program and activities. The inspector noted that action items were identified and being tracked to closure and that issues required to be addressed prior to the first loading of spent fuel were identified. The inspector noted that a CR was issued associated with damage sustained to the TT steering system during an earlier practice exercise. Failure to follow procedure was identified as the cause of the event. This event resulted in mechanical damage to a steering pinion that was subsequently repaired. The licensee's review of the incident and corrective actions were reviewed and found to be adequate. No findings of safety significance were identified.

The licensee issued Memorandum # DESENG-05-08 on February 15, 2005. The subject of the memorandum was the declaration of readiness for Unit 2 spent fuel transfer to the ISFSI. This memorandum served as an "Engineering Record Correspondence" and documented the readiness of responsible organizations, including Nuclear Oversight, to the Operations and Maintenance - Director, that supported readiness to proceed with loading of fuel in the ISFSI. The inspector noted that the document contained a matrix of various action items. The majority of the items were complete and any open item, required to be completed prior to fuel loading identified. All open items were administrative in nature with no safety concerns identified.

The licensee has a program to designate the level of use for a given procedure. The level of use may be signified as "information", "reference", or "continuous" use. Based on interviews with licensee personnel and review of procedures, it was not clear to the inspector if there was a common understanding and consistent use of these procedure level designations with respect to signing off procedural steps in the field. Personnel generally indicated that regardless of the procedure "level of use" designation, the Work

Order was the controlling document with regard to sign-off requirements for ISFSI procedures. Once a procedure was incorporated into the Work Order, the sign-off for any procedure step became a formal part of the work activity in the field, regardless of the level of use designation for a given procedure. The inspector noted that all pertinent procedures for a given ISFSI task were included in the Work Order with procedure steps strictly followed in the field. The QC Technical Analyst stated that after completion of a work order, a responsible planner determines what documentation from a work order package is maintained as part of the historical QA record base. No safety concerns were identified.

C. Conclusions

The Nuclear Oversight department provided effective independent review of ISFSI activities. Quality control and assurance efforts were appropriately incorporated into ISFSI activities. QC personnel were actively engaged in field activities and verified that hold points, technical specifications, and work order requirements were implemented in accordance with approved procedures and related work documents. The identification and tracking of issues was implemented in accordance with the licensee's corrective action program, with the proper review and evaluation of action items performed prior to initial loading of spent fuel in the ISFSI facility.

8 Training and Qualifications

A. Inspection Scope (60854)

The licensee's training program was reviewed to verify that appropriate training requirements were identified for ISFSI-related tasks and that personnel were qualified to perform ISFSI-related activities. The licensee's training program was reviewed to verify that the required elements described in 10 CFR 72 Subpart I were incorporated into the ISFSI training program. The inspection consisted of a review of licensee documentation, interviews with cognizant personnel and field observations.

B. Observations and Findings

The inspector interviewed the Operations Instructor regarding training and qualification of personnel performing ISFSI activities. Overview training was provided to personnel, starting approximately six months prior to ISFSI work activities. Initial training activities utilized normal station processes for the development and implementation of the training program, although they were not as formal. The Operations Instructor reviewed changes to procedures for impact and determined appropriate actions to ensure personnel were aware of changes and retrained as necessary. The training and qualification status for ISFSI personnel was documented on a Student Qualification Matrix, MD-006 Millstone ISFSI Training Matrix. Training and qualification consisted of satisfactory completion of classroom training and a written examination, followed by on-the-job training and evaluation.

Several training modules were specifically developed for ISFSI activities. These modules covered such activities as general overview of the ISFSI project to job-task

specific modules, covering such activities as operation of the transfer trailer, DSC/HSM alignment operations, and TC/DSC preparation and drying. The inspector reviewed selected training modules and noted that they were comprehensive and adequately covered training aspects of a given task. The inspector noted that the licensee had developed a student qualification matrix that designated individuals qualified to perform a given task based upon successful completion of the required training modules. The inspector reviewed selected names from the qualification matrix and reviewed training records to verify that individuals observed in the field were qualified for tasks they were performing. Medical qualifications for crane operators were confirmed to be current.

C. Conclusions

The licensee implemented an effective program to identify personnel training requirements associated with the ISFSI program. Appropriate training modules were developed for the various tasks. Individuals were properly trained and qualified to perform their assigned functions. The licensee utilized extensive practice sessions and on-the-job training sessions to verify readiness of individuals to perform their assigned functions.

9 Initial Loading of the HSM

A. Inspection Scope (60855)

The inspector observed the first loading of spent fuel into the ISFSI on February 19, 2005. The inspection consisted of field observations, review of licensee documentation and interviews with cognizant personnel.

C. Observations and Findings

The inspector observed the first loading of spent fuel into an HSM from the pre-job brief to insertion of the DSC at the ISFSI facility. The pre-job brief was conducted with the same thoroughness observed at several other pre-job briefings. The inspector reviewed the DSC loading documentation to confirm that the selected fuel assemblies that had been previously characterized for loading were configured as described. The fuel transfer forms were independently witnessed by a second individual during loading of the spent fuel assemblies into the DSC. Documentation was accurate and completed in accordance with approved procedures.

Several criteria were specified by the NRC in support of the licensee's exemption from the requirements of 10 CFR 50.68(b)(1). The exemption concerned the need to conduct certain spent fuel handling operations related to dry cask storage when unborated water was present, without being subcritical under the most adverse moderation conditions feasible. These criteria included verification of soluble boron concentration in the SFP, availability of radiation monitors to provide early warning of excessive radiation levels, and maintenance of SFP cooling flow to maintain adequate mixing. The licensee incorporated these requirements in procedure OP 2209H, "Dry Shielded Canister Loading (ISFSI)", and established other measures to ensure compliance with the established criteria detailed in the exemption approval. The inspector reviewed the

procedural requirements and noted proper implementation of the criteria in accordance with the approved procedure. Several radiation monitors were staged at strategic locations in the immediate vicinity of the SFP and areas adjacent to DSC handling operations. These monitors were equipped with local alarms and remote readout displays.

The movement of the TT was performed in a controlled and deliberate manner. The prime mover pre-operational checks and preparation of the TT for movement were completed in accordance with approved procedures. The field supervisor maintained custody of the work package and confirmed that procedure steps were performed and properly signed-off. Individuals escorted the prime mover and TT during the entire movement from Unit 2 to the ISFSI facility. The haul path was inspected for any debris that could interfere with the safe movement of the TT. Security was notified prior to the movement that spent fuel would be in transit within the site Protected Area.

During insertion of the DSC, the licensee encountered the need to apply greater pressure to the hydraulic ram unit. Since this situation was not encountered during the dry run or any of the practice exercises, the supervisor elected to stop work to evaluate the situation. Step 4.4.19 of procedure C OP 302.1, “DSC Insertion Into HSM (ISFSI)”, provides the pressure limits for the various ram stages. Pressure limits were not exceeded and licensee personnel demonstrated conservative decision-making in the approach taken while evaluating the situation. Additional subject matter experts were consulted, along with a vendor technical representative called to the field to assist with the evaluation. After considerable discussion and evaluating possible scenarios, DNC concluded that the issue was most likely associated with cold weather effects on the ram hydraulic fluid. The licensee decided to withdraw the ram back beyond the transitional phase between the first and second stages of the ram before continuing with the insertion process. The job supervisor performed a job briefing in the field before authorizing the resumption of activities. These actions were successful and the DSC properly inserted in accordance with approved procedures.

The inspector reviewed radiation and contamination survey data for the TC and DSC. Radiation levels and contamination levels must be within certain limits to satisfy criteria specified in the Technical Specifications. The inspector observed licensee personnel as they obtained radiation survey data after the DSC was placed into the HSM to ensure compliance with technical specification limits. Radiological conditions of the DSC met the applicable requirements.

B. Conclusions

The licensee safely loaded the first DSC containing spent fuel into an HSM. Work activities were performed in accordance with approved procedures and met the requirements of technical specifications. Spent fuel loaded into the DSC was properly characterized. The DSC was properly sealed, tested, surveyed and inspected, and met the requirements of the CoC.

Exit Meeting Summary

The inspector presented the inspection results to Mr. Alan Price and members of his staff at the conclusion of the dry run inspection on February 11, 2005.

The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. Some proprietary items were reviewed during the inspection but proprietary information is not presented in this report.

ATTACHMENT 1
PARTIAL LIST OF PERSONS CONTACTED

Licensee

*William Barton, Licensing
*Joe Bergin, Supervisor - Nuclear Operations
Richard Boehner, Supervisor - ISFSI Project
Phil Calandra, Radiation Protection
*G. Crisman, Operations
Jeff Davis, Rigger
*Sandra Doboe, Nuclear Oversight
*Dave Dodson, Supervisor - Licensing
*Mike Dolishny, Supervisor - Nuclear Fuel Handling
Mike Finneran, Radiation Protection
Tom Gilbert, Emergency Planning
*C. Gladding, Manager - Design Engineering
*John Guerci, Nuclear Fuel Engineering
*R. Griffin, RP/Chemistry
Tom Guarino, Nuclear Engineering - ISFSI Project
Dylan Hinson, Crane Operator
*Brian Krauth, Licensing
*Al Johnson, RP/Chemistry
William Lacy, Nuclear Oversight
Steve LaClerc, Supervisor - Quality Control
Bob Montgomery, Quality Control Analyst
*G. Olsen, Supervisor, Nuclear Engineering
Joe Parillo, Nuclear Fuels
*Frank A. Perry, RP/Chemistry
* Alan Price, Site Vice President
*Peter Quinlan, Design Engineering
*Mike Rutkoske, Design Engineering
Larry Salyards, Quality Control Analyst
Phillip Smith, Framatome
*Steve Sarver, Director - Operations and Maintenance
*Steve Scace, Director - Safety and Licensing
James Smith, Security
*Gary Sturgeon, Operations - Training
*Kent Wietharn, Fuel Performance Analysis

***Denotes those present at the exit meeting.**

INSPECTION PROCEDURES USED

60854 Preoperational Testing of an Independent Spent Fuel Storage Installation
60855 Operation of an Independent Spent Fuel Storage Installation
60856 Review of 10 CFR 72.212(b) Evaluations
60857 Review of 10 CFR 72.48 Evaluations

SUPPLEMENTAL INFORMATION

LIST OF DOCUMENTS REVIEWED
(Additional to Those Listed in Body of Inspection Report)

TE M2-EV-04-0010, Rev 0, Review of Potential Hazards During Cask Transport and Storage at the ISFSI

VPROC ENG04-2-010, Rev 000, Closure Welding of Dry Storage Canisters (ISFSI)

VPROC ENG04-2-001, Rev 0, Site Load Test Plan for Unit 2 Spent Fuel Cask Crane

VPROC ENG04-2-013, Rev 000, Visual Examination of Welds

VPROC ENG04-2-014, Rev 000, Helium Mass Spectrometer Leak Test Procedure (ISFSI)

ML-LP-4, Rev. 000-04, Liquid Penetrant Examination (LPE) Procedure

VPROC ENG04-2-012, Rev 000, High Temperature LPE and Acceptance Standards for Welds, Base Materials and Cladding (ISFSI)

VPROC ENG04-2-015, Rev 000, Welding Procedure Specification 8-MN-GTAW/SMAW (ISFSI)

VPROC ENG04-2-016, Rev 000, Welding Procedure Specification 8-MC-GTAW (ISFSI)

VPROC ENG04-2-017, Rev 000, General Welding Standard 1 GWS-1-ASME Applications (ISFSI)

DCR M3-02007, Rev 0, Independent Spent Fuel Storage Installation (ISFSI) Design

ERC 25205-ER-04-0015, Rev 00, Internal Dry Runs and NRC Demonstration of Dry Shielded Canister Closure Welding, NDE, and Helium Leak Testing

MP 2712BI, Rev 010-01, Control of Heavy Loads

MP 2712B2, Rev 002, Overhead Crane Operating Information

REP-20365-022, Rev 0, American Crane and Equipment Corp. - Factory Functional Test Plan for Unit 2 Spent Fuel Cask Crane

NC REF01, Rev 003-04, Millstone Lifting and Handling Program Manual

EN 21024, Fuel Assembly Visual Examination for Dry Storage (Attachment 2 Forms)

OP 2209H, Rev 000, Dry Shielded Canister Loading (ISFSI)

NC REF01, Rev 003-04, Millstone Lifting and Handling Program Manual

Materials Transfer Form (2-05-001)

C SP 604.2, Rev 000-02, Transfer Cask Pre-Job Inspection and Shipping Instructions (ISFSI)

C SP 604.4, Rev 000, Transfer Trailer Receipt and Pre-Op Testing (ISFSI)

PI-900461-01, Rev 1, Project Instruction for Closure Welding of Dry Shielded Canister

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
CoC	Certificate of Compliance
CFR	Code of Federal Regulations
CR	Condition Report
CRED	Condition Report Engineering Deposition
DCR	Design Change Request
DCSS	Dry Cask Storage System
DNC	Dominion Nuclear Connecticut
DSC	Dry Storage Canister
EAL	Emergency Action Level
FSAR	Final Safety Analysis Report
HSM	Horizontal Storage Module
IP	Inspection Procedure
ISFSI	Independent Spent Fuel Storage Installation
MP2	Millstone Unit 2
NDE	Nondestructive Examination
NRC	Nuclear Regulatory Commission
QA	Quality Assurance
QC	Quality Control
RWP	Radiation Work Permit
SAR	Safety Analysis Report
SER	Safety Evaluation Report
SFP	Spent Fuel Pool
TC	Transfer Cask
TT	Tansfer Trailer
VDS	Vacuum Drying System