UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

August 15, 2012

Mr. Regis T. Repko
Vice President
Duke Energy Carolinas, LLC
McGuire Nuclear Station
MG01VP/12700 Hagers Ferry Road
Huntersville, NC 28078

SUBJECT: MCGUIRE NUCLEAR STATION – NRC INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) INSPECTION REPORT NOS.: 05000369/2012009, 05000370/2012009 and 07200038/2012001

Dear Mr. Repko:

The enclosed report documents the inspection conducted between May 7 and July 26, 2012, at your McGuire Nuclear Station, Units 1 and 2. This inspection involved a review of the pre-operational demonstration (the dry run) of loading activities of spent fuel into the independent spent fuel storage installation facility (ISFSI) as they relate to safety and compliance with the Commission's rules and regulations, and with the conditions of your license. The inspection covered all aspects associated with the preparation, movement, and placement of spent fuel into the ISFSI facility and consisted of field observations, extensive examination of procedures and documents, and interviews with personnel. The inspectors reviewed your dry run preparations and determined that they were thorough, and that individuals were appropriately trained and qualified in the performance of ISFSI-related tasks. The inspectors observed sound, conservative decision-making throughout the performance of the dry run exercise for loading spent fuel into the ISFSI facility. The inspectors noted that ISFSI activities were implemented in a safe manner. Based on results of this inspection, no violations or findings were identified. The inspection results were discussed with Mr. Steven Capps and other members of your staff via a debriefing on May 10, 2012, and an exit meeting on July 26, 2012, which was conducted via the telephone.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its Enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the

NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Steven J. Vias, Chief
Engineering Branch 3
Division of Reactor Safety

Docket No. 50-369, 50-370, and 72-038
License No. NPF-9 and NPF-17

Enclosure:
Inspection Report 05000369, 370/2012009 and 07200038/2012001
w/Attachment: Supplemental Information

cc w/encl: (See page 3)

NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos:	50-369, 50-370, and 72-038
License Nos:	NPF-9, NPF-17
Report Nos:	05000369/2012009, 05000370/2012009 and 07200038/2012001
Licensee:	Duke Energy Carolinas, LLC
Facility:	McGuire Nuclear Station, Units 1 and 2
Location:	Huntersville, NC 28078
Dates:	May 7, 2012 through July 26, 2012
Team Leader:	Robert Carrion, Senior Reactor Inspector, Region II
Inspectors:	Cecil Fletcher, Senior Reactor Inspector, Region II Robert Williams, Reactor Inspector, Region II Jack Parrott, Storage and Transportation Safety Inspector, Office of Nuclear Materials Safety and Safeguards (NMSS) Zhian Li, Senior Criticality and Shielding Engineer, NMSS
Accompanying Personnel:	William Allen, Project Manager NMSS
Approved by:	Steven J. Vias, Chief Engineering Branch 3 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000369/2012009, 05000370/2012009 and 07200038/2012001; 05/07/12 - 07/26/12; McGuire Nuclear Station, Units 1 and 2, spent fuel pre-loading demonstration of the Independent Spent Fuel Storage Installation (ISFSI).

This report covers on-site inspection and in-office review by regional and headquarters-based inspectors of activities related to the dry cask storage of spent fuel, including the preparation for loading of spent fuel from the Unit 2 spent fuel pool (SFP) to the NAC International Inc. (NAC) Modular Advanced Generation Nuclear All-purpose STORage (MAGNASTOR®) System for irradiated fuel at the ISFSI. Units 1 and 2 were at power operations during this period.

The inspectors reviewed the pre-operational loading activities to confirm that personnel had been trained, equipment had been tested, and station programs and procedures had been developed and were adequate to safely load spent fuel into the ISFSI. The inspectors also confirmed that these activities were performed safely, in accordance with the approved procedures, the Certificate of Compliance (CoC), and Technical Specification (TS) requirements.

REPORT DETAILS

Summary of Facility Activities

Duke Energy Carolinas, LLC selected the NAC International Inc. (NAC) Modular Advanced Generation Nuclear All-purpose STORage (MAGNASTOR®) System for dry storage of spent nuclear fuel at the McGuire Nuclear Station (MNS), Units 1 and 2. The Nuclear Regulatory Commission (NRC) had certified the MAGNASTOR® system design under CoC No. 72-1031, Amendment No. 2, effective January 30, 2012.

Demonstrations of loading, processing, and moving spent fuel from the Unit 2 SFP to the ISFSI using the MAGNASTOR® System were conducted during this inspection period. Units 1 and 2 were at power operations during this period.

From May 7 – May 10, 2012, inspectors performed an evaluation to determine if the ISFSI personnel had been trained, the equipment had been tested, and the procedures had been developed to the extent necessary to safely load spent fuel into dry storage at the ISFSI.

Note: The licensee had demonstrated the ability to weld the MAGNASTOR® transportable storage canister (TSC) in July 2010 and it is documented in Section 4OA5.2 of NRC Integrated Inspection Report 05000369/2010004, 05000370/2010004, Emergency Preparedness Inspection Report 05000369/2010501 and 05000370/2010501, and Independent Spent Fuel Storage Installation Canister Welding Demonstration Inspection Report 07200038/2010001 (ML103020524).

McGuire ISFSI Activities

1. Preoperational Test Program

a. Inspection Scope (60854)

The CoC for the MAGNASTOR® System for the storage of irradiated fuel 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 an on-site inspection to observe the licensee's demonstration of the required activities. The inspection consisted of field observations, interviews with licensee personnel, and review of licensee documentation.

b. Observations and Findings

CoC Technical Specification Section 5.8, Preoperational Testing and Training Exercises, requires the licensee to demonstrate specific activities prior to loading the first transportable storage canister. Specifically, a dry run training exercise on loading, closure, handling, unloading, and transfer of the MAGNASTOR® system shall be conducted by the licensee prior to the first use of the system to load spent fuel assemblies. The dry run shall include, but is not limited to, the following:

a. Moving the Concrete Cask (CC) into its designated loading area

b. Moving the Transfer Cask (TC) containing the empty TSC into the spent fuel pool

c. Loading one or more dummy fuel assemblies into the TSC, including independent verification

d. Selection and verification of fuel assemblies to ensure conformance with appropriate loading configuration requirements

e. Installing the closure lid

f. Removal of the Transfer Cask from the spent fuel pool

g. Closing and sealing of the TSC to demonstrate pressure testing, vacuum drying, helium backfilling, welding, weld inspection and documentation, and leak testing

h. Transfer Cask movement through the designated load path

i. Transfer Cask installation on the Concrete Cask

j. Transfer of the TSC to the Concrete Cask

k. Concrete Cask lid assembly installation

l. Transport of the Concrete Cask to the ISFSI

m. TSC removal from the Concrete Cask

n. TSC unloading, including re-flooding and weld removal or cutting

The on-site inspection was performed to observe selected phases of the pre-operational test plan. The licensee developed procedures, personnel training and qualification programs, and conducted practice sessions as part of the preoperational program.

The inspectors reviewed the procedures for the dry run activities. The procedures were comprehensive and adequately addressed key aspects of the evolutions; they contained sufficient detail to support safe handling and movement of the TC and CC, including loading the TC onto the CC, preparation of the CC for movement, and transport of the CC to the ISFSI.

During the period of May 7 to May 10, 2012, the inspectors observed the dry run activities, including fuel handling and TSC/TC movement in and around the SFP, loading of the TSC/TC into the CC, transportation of the loaded CC to the ISFSI along the designated haul path, and placement of the CC onto the ISFSI storage pad. The licensee conducted a pre-job briefing on May 7, and each subsequent day during the demonstration, with personnel involved with the dry run activities. The briefings were comprehensive and effectively covered all key aspects of the evolution, including procedural adherence expectations, safety aspects of the activities, Quality Assurance (QA) hold points, as well as a detailed overview of the tasks to be performed. Procedure compliance was strictly followed during the performance of the activities. Radiological conditions were simulated and appropriate measures implemented to provide a degree of realism during the performance of the dry run. The inspectors noted that the licensee had simulated radiological postings in order to prepare workers for the radiological

conditions that could be encountered during actual transfer of spent fuel. The inspectors interviewed cognizant personnel to verify their knowledge of procedural requirements and responsibilities. The inspectors also noted that activities were performed in a deliberate manner. The responsible supervisor maintained the work package/procedure in his possession throughout the performance of the activity and procedure steps were carefully followed.

The licensee demonstrated the capability to safely place the TSC into the TC and to safely load the TSC/TC into the CC and subsequently transport the loaded CC to the ISFSI. Rigging, movement, and placement of the TSC into the TC and subsequently into the CC were performed in a controlled manner with good coordination and communication observed among individuals involved in the activity. Throughout the entire dry run exercise, the work package was periodically reviewed by the inspectors to verify compliance with procedures and related work documents. The inspectors noted that procedure steps were initialed or otherwise notated by the responsible supervisor to signify completion of a given step and that work order documents were strictly followed.

ISFSI project personnel were qualified to perform their assigned functions and were knowledgeable of their responsibilities. Procedures and work-related documentation were accurate and strict procedural compliance was demonstrated by workers in the field.

No findings were identified.

2. Review of Evaluations

a. Inspection Scope (60856 and 60857)

A general license for the storage of spent fuel in an ISFSI at power reactor sites is granted per 10 CFR 72.210, “General license issued.” Per 10 CFR 72.212, “Conditions of general licenses issued under 72.210,” the holder of the general license is required to perform written evaluations prior to use (specifically under 72.212(b)(5)) to establish that the ISFSI design can be used at that site and that site operations can accommodate operation of an ISFSI. The MNS holds a general license for operation of its ISFSI.

McGuire documented the results of the required evaluations in the Independent Spent Fuel Storage Installation 10 CFR 72.212 “Evaluation Report MAGNASTOR® Casks,” Rev. 00. The inspectors reviewed the technical report and various referenced supporting documents to evaluate the licensee’s compliance with the requirements of 10 CFR 72.212. The inspectors also conducted interviews with cognizant licensee personnel.

b. Observations and Findings

72.212 Evaluation Report

The inspectors reviewed a copy of the McGuire 72.212 evaluation report. Based on the review, the inspectors assessed that, overall, the evaluation report was comprehensive and adequately addressed the areas required to be evaluated under 72.212(b)(5) through (13). The 72.212 report was found to be acceptable; it contained sufficient

objective evidence that the written evaluations confirmed that the conditions set forth in the CoC had been met, the ISFSI pad had been designed to support the stored load of the casks, and the requirements of 10 CFR 72.104 had been met for the radiological impact to members of the public.

However, one item was noted by the inspectors. The evaluation of the requirements of 72.212(b)(8), to use § 50.59(c) to screen activities related to the MNS ISFSI for the potential to require changes to the facility technical specifications or require a license amendment, indicated that a § 50.59 screening was not implemented to reflect the most recent update made to the haul path analysis for the MAGNASTOR® VCCs before dry run activities were undertaken. This issue was identified by the NRC inspectors upon review of the 50.59 screening analysis. In addition, the most recent revisions to the haul path analysis were not reflected in the 72.212 evaluation report. The revisions were to: (1) conduct a more conservative evaluation of any impact to the plant's condenser cooling water intake pipes from the previously evaluated MAGNASTOR® haul path, and (2) evaluate the construction of a concrete roadway in the ISFSI yard. Neither of these revisions were a change to the location of the haul path. Both revisions concluded that there was no impact to the plant systems, but the licensee had not yet updated the 50.59 screening evaluation or the 72.212 evaluation at the time of the inspection.

Fire & Explosion Analysis of Hauling and Storage

The inspectors reviewed several supporting documents referenced in the 72.212 evaluation report, including; Calculation DUK-014-CALC-002, Explosion Hazards Evaluation for the McGuire Nuclear Station ISFSI Haul Path, Revision 0, Calculation DUK-014-CALC-003, Fire Hazards Evaluation for the McGuire ISFSI Cask Hauling and Storage, Revision 0, and Nuclear System Directive 313, "Control of Transient Fire Loads," Rev. 12. The fire/explosion hazard analyses were detailed and used a systematic approach and conservative assumptions to evaluate all potential fixed and transient fire/explosion hazards, and compared them to the design-basis fire event defined in the FSAR for all three types of spent fuel casks in use at the MNS which potentially could need to be transported along the haul path. The analysis concluded that all fire/explosion hazards along the proposed haul path are either bounded by the design-basis fire/explosion event, or are managed by administrative controls during haul activities and around the ISFSI area, and that no physical plant changes are required to prevent accidents during cask transfer. The explosion analysis also noted that compressed gas bottles could become missile risks without an ignition and explosion. Although technically not an explosion risk, this scenario was evaluated also to demonstrate that the missiles associated with ruptured compressed gas bottles do not compromise the integrity of the transfer cask or the storage casks.

NRC inspectors walked the haul path to be used for the initial transport of the MAGNASTOR® casks to the ISFSI pad and noted that all fixed sources of combustible material were sufficiently distanced from the haul path and ISFSI, or sufficiently shielded so as not to represent a hazard to the Transfer Cask/Concrete Cask or the arrangement of the CCs on the ISFSI pad. The MNS fire and explosion analyses identified all potential ignition and explosion sources and the location of combustible materials in proximity to the haul path and ISFSI pad. The inspectors noted that the combustible energy of transient combustibles, along the heavy haul path and at the ISFSI, was limited by administrative controls. In addition, for the dry run, all transient fire or

explosion hazards were moved away from the haul path. The inspectors verified that the Duke Energy Nuclear System Directive 313 identified the MNS ISFSI as a location for the control of transient fire loads.

MAGNASTOR® and ISFSI Dose Limits

10 CFR 72.104, Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS, requires that the annual dose equivalent to any real individual located beyond the controlled area must not exceed 25 millirem (mrem) to the whole body, 75 mrem to the thyroid, and 25 mrem to any other critical organ as a result of exposure to direct radiation from ISFSI operations. Section 6.0 of the 72.212 report provides the evaluation of meeting the dose requirements of 10 CFR 72.104. The report describes results of calculations that show that the annual total dose (from direct radiation) from the existing TN and NAC-UMS casks to be approximately 1.62 mrem to the nearest real individual using the conservative distance to the nearest uncontrolled area of approximately 700 meters from the ISFSI. The 72.212 report described that the calculations determined the total annual dose to any real individual from the MAGNASTOR® casks to be 2.02 mrem from both pads that will hold the MAGNASTOR® casks.

In addition to the off-site dose from the ISFSI, the annual dose from the McGuire Nuclear Station's liquid and gaseous effluents and power generation are each less than 1.0 mrem, respectively. The total annual dose from all of these operations would be less than 25 mrem. The licensee's conclusions regarding satisfying the dose requirements of 10 CFR 72.104 were determined to be reasonable by the inspectors in light of the conservatisms used in the calculations.

The 72.212 report also described the use of supplemental shielding on the MAGNASTOR® cask to reduce operational dose, as allowed in the MAGNASTOR® FSAR. The screening evaluated the use of nine types of removable supplemental shielding used for cask loading and unloading, and one type of semi-permanent shielding used on top of the Vertical Concrete Cask (VCC) lid while the VCC is stored on the ISFSI pad. The semi-permanent shielding is used to reduce dose rates on top of the VCC lid to less than 300 mrem/hr on contact and 80 mrem/hr at 30 cm if the dose rate limits are not met when the VCC is surveyed after loading. The inspectors noted that both types of shielding were evaluated under the 72.48 screening process and were found to not adversely affect any of the other functions of MAGNASTOR® system.

ISFSI Pad Parameters

The McGuire Nuclear Station is scheduled to begin using the MAGNASTOR® system on two existing storage pads that were originally constructed to store the lighter UMS casks. One of these existing pads already stores four UMS casks. The remaining space of this pad will be filled with MAGNASTOR® casks as will the entirety of the other pad. MNS personnel performed two calculations to verify that the storage pads, as built, could support the MAGNASTOR® casks without modifications. The inspectors noted that the calculations conclude that the existing pads are adequate to support the weight of the new MAGNASTOR® casks or a combination of the UMS and MAGNASTOR® casks.

Site-Specific Parameters

The licensee performed a review, documented in the 72.212 report, of the dry cask storage program to ensure compliance with the requirements of 10 CFR 72, Subpart K,

General License for Storage of Spent Fuel at Power Reactor Sites. The inspectors determined that applicable reactor site parameters, such as seismic loads, tornado winds and wind-generated missile impacts, flooding, normal and extreme temperatures, fire and explosion, and snow loading, were evaluated for acceptability with the bounding values specified in the MAGNASTOR® Safety Analysis Report (SAR) and the NRC Safety Evaluation Report (SER). The evaluations demonstrated that the design features for the MAGNASTOR® System enveloped the site-specific characteristics of the MNS, or were not applicable (snow loading on the cask transfer and loading facility, for example).

72.48 Screening and Evaluation

The inspectors noted that the MNS had implemented a process to make changes, under 10 CFR 72.48, to its dry fuel storage program. The licensee performed screenings of MAGNASTOR®-related changes to the facilities or storage systems, procedure changes, tests and experiments, and evaluations of other changes related to the dry fuel storage project. As of the date of the inspection, no MAGNASTOR®-related screened issue had required a 72.48 evaluation. The inspectors reviewed one MAGNASTOR®-related screened issue, and determined that the licensee procedures for 72.48 screening had been adequately followed, resulting in the licensee determination that a 72.48 evaluation was not required.

50.59 Screening and Evaluation

The loading, transportation, and storage operations of the MAGNASTOR® System at the MNS were reviewed by the licensee under the 10 CFR 50.59 process. Reliability of structures, systems, and components (SSCs) important to safety was evaluated. A 10 CFR 50.59 screening of the construction and operation of the ISFSI and plant interfaces had been performed by the licensee to demonstrate that neither changes to plant technical specifications nor a license amendment were required. The inspectors noted that the MAGNASTOR® System design parameters enveloped the reactor site parameters described in the MNS FSAR.

The 72.212 report, Section 9.2, “Evaluation,” states, “A 10 CFR 50.59 screen has determined that activities related to the MNS ISFSI do not involve a change in the facility Technical Specifications or require a license amendment pursuant to 10 CFR 50.59(c).” The 10 CFR 50.59 screen report concluded that the dry fuel storage activities associated with spent fuel storage in a MAGNASTOR® system would not adversely affect the design function of the spent fuel pool or its structural integrity. In addition, the dry fuel storage activities will have no adverse impact on any other SSC at MNS and concluded that the requirements of 10 CFR 72.212(b)(8) were satisfied. This evaluation did not identify any concerns that would require a change to the MNS TSs or require a Part 50 license amendment. However, the inspectors found that subsequent to the last 50.59 screening, dated February 25, 2011, MNS had made additional changes to the analysis of the path over which the MAGNASTOR® casks would be transported on their way to the ISFSI, and these changes were not screened for facility impacts. Also, the most recent revisions to the haul path analysis were not reflected in the 72.212 evaluation report. The revisions were to: (1) conduct a more conservative evaluation of any impact to the plant’s condenser cooling water intake pipes from the previously evaluated MAGNASTOR® haul path, and (2) evaluate the construction of a concrete roadway in the ISFSI yard. Neither of these revisions were a change to the location of the haul path.

Both revisions concluded that there was no impact to the plant systems but the licensee had not yet updated the 50.59 screening evaluation or the 72.212 evaluation at the time of the inspection.

3. Fuel Characterization and Verification

a. Inspection Scope (60854)

The CoC, as amended, for the MAGNASTOR® System specifies the parameters that must be met in order to allow spent fuel to be stored at the ISFSI. The inspectors 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 licensee personnel and review of licensee documentation.

b. Observations and Findings

The inspectors reviewed the licensee's process for selecting and verifying fuel assemblies for placement in the first two MAGNASTOR® TSCs. The inspectors reviewed documents associated with the qualification, characterization, and selection of fuel assemblies, for storage at the ISFSI. These documents were included in Engineering Calculation MCC-1553.12-00-0037, McGuire Nuclear Station, Units 1 and 2 *(ISFSI)* Selection of Fuel Assemblies and Non-Fuel Hardware for Storage in NAC MAGNASTOR® Transportable Storage Canister MNZ-057, and Procedure OP/0/A/6550/029, Duke Energy McGuire Nuclear Station MAGNASTOR® Fuel Assembly Loading/Unloading Procedure. Technical Specifications require that selected fuel assemblies be visually inspected; be within specified limits for parameters, such as fuel enrichment, burn-up, and decay heat output; be independently identified; and be limited as to the number of damaged fuel assemblies allowed per TSC. The inspectors noted that for non-fuel hardware, the TSs require the maximum exposure and minimum cooling time.

The inspectors discussed the fuel selection process with licensee personnel and determined that they were knowledgeable of the TS requirements and translation of the core follow records to the fuel burnup of individual fuel assembly. The licensee had developed detailed calculations for the fuel assembly burnup and cooling times to determine fuel assemblies eligible for loading into the storage casks. The inspectors noted that the selected fuel assemblies met all applicable TS requirements for placement into a TSC for dry storage. Supporting documentation adequately characterized the selected fuel assemblies, and non-fuel hardware, for initial loading at the ISFSI.

The licensee had developed a cask loading plan in accordance with approved procedures. Licensee documentation supported the proper characterization of the first 74 PWR fuel assemblies to be loaded into the MAGNASTOR® TSCs, and the selected assemblies complied with the design parameters specified in the CoC. The operating procedures developed by the licensee require the fuel handling staff to verify the identification of each fuel assembly before moving it to its cask fuel cell. The operating procedures also require the fuel handling staff to produce a final loading pattern by visual verification of the identifications of the loaded fuel assemblies, and send the

loading pattern to the spent fuel management team for concurrence of the correct loading before closing the canister lid.

No findings were identified.

4. Records

a. Inspection Scope (60854)

10 CFR 72.72 requires that a licensee keep records showing the receipt, inventory (including location), disposal, acquisition, and transfer of all special nuclear material (SNM). In addition, 10 CFR 72.212(b) requires that a licensee maintain a copy of the CoC, and documents referenced therein, for each cask model used for storage of spent fuel, until use of the cask model is discontinued, and that a copy of the 10 CFR 72.212 Evaluation Report shall be retained until spent fuel is no longer stored under the general license issued under § 72.210.

Additional general license requirements dealing with the review of the reactor emergency plan, quality assurance program, training program, and radiation protection program must also be satisfied pursuant to 10 CFR 72.212(b)(10). Records and procedural requirements for the general license holder are described in 10 CFR 72.212(b)(11), (12), (13), and (14).

b. Observations and Findings

The licensee had established records for SNM accountability. The inspectors reviewed procedure PT/0/A/4150/035, Inspection and Storage of New Fuel, which recorded the fuel assembly identification numbers upon receipt; OP/0/A/6550/011, Internal Transfer, which tracked the locations at which the fuel assemblies are stored in the spent fuel pool; OP/0/A/6550/029; MAGNASTOR® Fuel Assembly Loading/Unloading Procedure, which outlined the steps for identifying the fuel assemblies to be loaded, placing the fuel assemblies into the TSC, and verifying that the TSC had been correctly loaded; and PT/0/A/4550/003, Physical Inventory of Reportable Special Nuclear Material, which verified the locations of fuel assemblies within the fuel pool and the location of storage casks, on the ISFSI pad. The inspectors determined that the records were complete and were being properly maintained. The inspectors reviewed the measures established by the licensee to ensure that the 10 CFR 72.212 Report, Certificate of Compliance, and related documents were being maintained for as long as spent fuel was stored at the ISFSI. The inspectors noted that the licensee had made the required 90-day notification to the NRC prior to loading their first cask on the ISFSI (several years ago), and had established procedural requirements to register each cask with the NRC within 30 days after loading per procedure MP/0/A/7650/227, Loading Spent Fuel Assemblies into MAGNASTOR Cask, Revision 000.

The inspectors reviewed selected referenced records and procedure changes related to the emergency preparedness, fire protection, training, health physics, and quality assurance programs. The inspectors interviewed cognizant personnel to confirm that they were knowledgeable of the impact of ISFSI-related activities. For instance, the

inspectors interviewed Emergency Preparedness management with respect to coordination with off-site organizations which may be called upon to respond during a major fire at the plant. The inspectors also interviewed the Emergency Preparedness Manager concerning the Emergency Action Levels (EALs) associated with ISFSI operations. The emergency plan, quality assurance program, training program, radiation protection program, and fire protection program had been evaluated and their effectiveness was determined not to be decreased by ISFSI activities.

No findings were identified.

5. Procedures and Technical Specifications

a. Inspection Scope (60854)

The CoC for the MAGNASTOR® System, in conjunction with the associated Technical Specifications (Appendix A to CoC 1031, Amendment 2), specifies requirements to ensure the safe handling and storage of spent nuclear fuel. The inspectors confirmed that copies of the CoC and referenced documents were current.

b. Observations and Findings

The inspectors reviewed licensee procedures and documentation to confirm that the TS requirements were incorporated into ISFSI work-related documents and work packages. The inspectors noted that TS requirements were incorporated into a series of ISFSI-related procedures. The licensee developed procedures to address preparing the TSC to receive spent fuel assemblies; placing the TSC into the TC; moving the TSC/TC into the Spent Fuel Pool (SFP) to receive spent fuel assemblies; removing the TSC/TC from the SFP for de-watering, welding, vacuum drying, and helium backfilling; loading the TSC/TC onto the Vertical Concrete Cask (VCC); preparing the VCC for transport to the ISFSI; and retrieving the TSC from the VCC. The procedures were comprehensive and adequately addressed key aspects of the evolutions. Procedures contained sufficient detail to support safe handling and movement of the TSC, TC, and VCC. The inspectors noted that the procedures covered all aspects of dry spent fuel handling, loading, and storage requirements, as required by the TSs.

The inspectors verified that the ISFSI Concrete Cask Heat Removal System was operable, in accordance with the FSAR thermal evaluation. Specifically, the inspectors verified that there were adequate procedures to monitor the thermal performance of the Concrete Cask Heat Removal System.

No findings were identified.

6. Quality Assurance (QA) Program

a. Inspection Scope (60854)

Per CoC 1031, Condition 3, Quality Assurance, activities at the ISFSI shall be conducted in accordance with a Commission-approved quality assurance program, which satisfies the applicable requirements of 10 CFR Part 72, Subpart G, Quality Assurance, and which is

established, maintained, and executed with regard to the cask system. 10 CFR 72.140(d), Previously-approved programs, accepts a quality assurance program previously approved by the Commission which satisfies the requirements of Appendix B to Part 50 to be acceptable as satisfying these requirements.

As notified by letter dated August 4, 2000, to the U.S. Nuclear Regulatory Commission, QA associated with ISFSI activities was executed through the licensee's existing previously-approved QA program that satisfies the applicable criteria of 10 CFR 50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants. The involvement and role of QA were evaluated to ensure that sufficient independence 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 licensee personnel, and review of licensee documentation.

b. Observations and Findings

The inspectors reviewed the licensee's control of measuring and test equipment to verify that measures were established to ensure that tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specific periods to maintain accuracy within necessary limits. The inspectors also verified that the referenced measuring and testing devices were incorporated into a maintenance scheduling system and reviewed recent calibration records to verify that the calibrations were current and performed on a schedule that complied with the frequency set forth by the maintenance scheduling system. The inspectors reviewed the QA program and procurement documents to determine whether the licensee had any material or equipment that required special handling or storage and, if so, that procedures and controls were in place to ensure adequate handling or storage of that material or equipment. In addition, the inspectors performed a walkdown of the canister and lid storage area to verify that the surfaces to be welded were being stored to prevent damage, including rusting or weathering.

The inspectors reviewed the QA program documents and procedures related to non-conformances to verify that measures were established to control materials, parts, or components that do not conform to their requirements in order to prevent their inadvertent use or installation. The inspectors noted that, in accordance with site procedures, non-conforming materials, parts, and components were immediately segregated; problem identification program (PIP) reports generated; and appropriate parties notified of the non-conformances. The inspectors also reviewed the QA program documents and procedures to verify that measures were established to ensure that procurement of material, equipment, and services was adequately controlled, conformed to procurement documents, and required the documentation to be maintained for the life of the ISFSI.

The inspectors reviewed licensee self-assessments. The results of the audited areas were documented and tracking items identified for unresolved items. The inspectors reviewed PIPs to verify that the licensee was adequately implementing its 10 CFR Part 50 corrective action program, as it pertained to the ISFSI program and related activities. The inspectors 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 completed or closed. The inspectors reviewed the corrective actions related to issues concerning ISFSI activities to verify that resolution was appropriate, the issue was properly documented, and that appropriate levels of management were notified.

The inspectors noted that QA personnel attended the dry run briefings and 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.

No findings were identified.

7. 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 also reviewed to verify that the required elements described in 10 CFR 72, Subpart I, Training and Certification of Personnel, and TS Section 5.7, Training Program, were incorporated into the ISFSI training program to ensure the safe handling and storage of spent nuclear fuel. The inspection consisted of a review of licensee documentation, interviews with cognizant personnel, and field observations. The NRC inspectors confirmed that copies of the CoC and referenced documents were current.

b. Observations and Findings

The inspectors interviewed training personnel regarding the training and qualification of personnel performing ISFSI-related activities. Overview training was provided to personnel with ISFSI-related responsibilities. Several training modules were specifically developed for the ISFSI activities, including a general overview of the ISFSI project and job/task-specific modules, which covered activities such as moving the TSC/TC into the SFP, loading spent fuel into the TSC, welding the closure lid onto the TSC, and transferring of the TSC/TC into the VCC.

The inspectors reviewed selected training modules, and noted that they were comprehensive, and adequately covered training aspects of a given task. The inspectors noted that the licensee designated individuals qualified to perform a given task based upon successful completion of the required training modules. Although this operation had been delayed for some years, the licensee was still in the process of documenting some of the "gap" training, which covered changes of the ISFSI operations from the date of the last training to the current revision of the procedures. The inspectors reviewed selected names from the qualification matrix and reviewed training records to verify that the individuals observed in the field were qualified for the tasks that they were performing. Based on this sample of personnel reviewed, the inspectors concluded that the individuals conducting ISFSI activities were properly trained and qualified to perform their assigned functions.

No findings were identified.

8. Radiation Protection

a. Inspection Scope (60854)

The licensee's radiation protection program was evaluated to verify that the elements of 10 CFR 72.126, Criteria for radiological protection, had been incorporated into procedures for ISFSI-related tasks, and that they were effectively implemented by licensee personnel. Compliance with 10 CFR 72.104, Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS, and 10 CFR 72.106, Controlled area of an ISFSI of MRS, was reviewed. The inspectors evaluated the effectiveness of the licensee's plans and preparations for controlling radiological activities by direct observation, by reviewing documents, and interviewing individuals with radiation protection responsibilities.

b. Observations and Findings

The inspectors reviewed the licensee's radiation protection program. The inspectors reviewed documents associated with the operating procedures of the ISFSI, the radiation protection program of the loading campaign, and radiation protection program for the controlled area boundary of the ISFSI. These documents included Procedure TH/2/B/9500/029; Radiation Protection Controls for MAGNASTOR® Dry Run Evaluations; the Radiological Evaluation of the VCC, MAGNASTOR® Transfer Cask (MTC) for Use at McGuire Nuclear Station for Dry Storage of Spent Fuel, dated November 3, 2010; and Procedure HP/0B/1003/063, Duke Energy McGuire Nuclear Station Routine Surveillance.

The inspectors discussed the radiation protection program with licensee personnel and determined that they were knowledgeable of the TS requirements. The licensee provided a detailed description of the radiation protection program for the general public at the ISFSI controlled area boundary, as well as for the occupational workers, including the ISFSI loading operators, within the controlled area boundary. The inspectors noted that the estimated doses met all requirements of 10 CFR 72.104 and 10 CFR 72.106 with reasonable estimates of the expected time of any real individual, per the definition of NUREG-1536, Standard Review Plan for Dry Cask Storage Systems. Supporting documentation adequately characterized the dose rate versus distance between the ISFSI and controlled area boundary.

The licensee had developed a cask loading plan in accordance with approved procedures. Licensee documentation supported the conclusion that the ISFSI, when loaded with the MAGNASTOR® dry casks, will meet the requirements of 10 CFR 72.104 and 10 CFR 72.106. The operating procedure developed by the licensee required the loading staff to reduce the operating time and to use remote operation tools as much as practically possible. This practice is consistent with the guidance of the As Low As Is Reasonably Achievable (ALARA) principle.

During the dry run, the licensee demonstrated strict adherence to the operating procedures. ISFSI project personnel were qualified to perform their assigned functions and were knowledgeable of their responsibilities.

No findings were identified.

9. Spent Fuel Cask Crane

a. Inspection Scope (60854)

Because the crane had been used for previous dry cask storage campaigns, that imposed greater loads than the MAGNASTOR system, the inspectors reviewed selected inspection and maintenance activities in the form of Work Orders and procedures.

b. Observations and Findings

The inspectors noted that the inspections and tests of components such as hooks and wire ropes were included in the periodic inspections, and that the periodic inspections were performed at the required frequency.

No findings were identified.

Exit Meeting

The preliminary results of the inspection were discussed at an exit meeting conducted via teleconference on July 26, 2012, with Mr. Steven Capps, McGuire Station Manager, and other members of the staff.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel
K. Ashe, McGuire Regulatory Affairs Manager
N. Austin, McGuire Reactor Engineering Manager
P. Bailey, Fleet Spent Fuel Management
D. Brenton, Operations Manager
D. Brewer, McGuire Organizational Effectiveness Manager
S. Capps, Station Manager
R. Davis, McGuire Reactor Engineering
C. Edgemon, McGuire Radiation Protection
J. Gleen, Maintenance
P. Guill, Fleet Regulatory Affairs
M. Keene, Fleet Reactor Services
M. Leisure, McGuire Regulatory Affairs
D. McCarthy, McGuire Major Projects
S. Mooneyhan, Radiation Protection
T. Moore, Principal Engineer, Reactor Engineering.
K. Murry, Emergency Planning Manager
D. O'Brien, FRS
E. Price, Fleet Reactor Services
R. Repko, Vice-President
S. Snider, Engineering
J. Verbos, Principal Engineer, Fleet Spent Fuel Management

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed
None

Closed
None

Discussed
None

List of Documents Reviewed

Specifications

MCC-1151.03-00-0004, Spent Fuel Cask Transport Path Evaluation of Buried Components, Revision 15
MCC-1553.12-00-0017, Assembly Specifications for Fuel Qualification for Dry Storage Canisters at McGuire Nuclear Station, Revision 5
MCC-1553.12-00-0036, Fuel Selection Calculation, Determination of Requirements for Selecting Spent Fuel for Use of NAC MAGNASTOR Storage System at McGuire, Revision 00
MCS-1140.04-00-0001, Design Basis Specification for the Licensing Basis Requirements for Selecting Spent Fuel for Use of NAC-MAGNASTOR System at McGuire General License Independent Spent Fuel Storage Installation, Revision 0
MCS-1465.00-00-0008, Design Basis Specification for Fire Protection, Revision 12
MNZ-057, Selection of Spent Fuel Assemblies and Non-Fuel Hardware for Storage in NAC MAGNASTOR Transportable Storage Canisters, Revision 00

Procedures

HP/0/B/1003/063, Routine Surveillance, Revision 036
MC-RP-0435, RP Job Coverage for Loading and Unloading Spent Fuel into MAGNASTOR Dry Storage Cask, Revision 0
MP/0/A/7650/204, Spent Fuel Dry Storage Cask Troubleshooting, Revision 006
MP/0/A/7650/231, Operation of Dry Cask Transporter, Revision 002
MP/0/A/7650/234, ISFSI MAGNASTOR Spent Fuel Cask Loading Contingencies McGuire ISFSI Training Modules, Revision 000
MP/0/A/7650/ 227, Loading Spent Fuel Assemblies into MAGNASTOR Cask, Revision 000
MP/0/A/7650/230, Unloading Spent Fuel Assemblies from MAGNASTOR Casks, Revision 0
MP/0/A/7650/234, MAGNASTOR Spent Fuel Cask Loading Contingencies, Revision 0
MP/0/A/7700/131, MAGNASTOR Transportable Storage Canister Welding, Revision 000
Nuclear System Directive (NSD) 10 CFR 72.48 Process, Revision 7
NSD 313, Control of Transient Fire Loads, Revision 12
NSD 327, 10 CFR 72 Independent Spent Fuel Storage Installation Program, Revision 0
NSD 406, Control of Measuring and Test Equipment, Revision 12
OP/0/A/6550/011, Internal Transfer, Revision 056
OP/0/A/6550/029, MAGNASTOR Fuel Assembly Loading/Unloading Procedure, Revision 001
OP/1/A/6102/001, OAC Alarm Responses, Revision 012
PT/0/A/4150/035, Inspection and Storage of New Fuel, Revision 011
PT/0/A/4550/003, Physical Inventory of Reportable Special Nuclear Material, Revision 009
PT/0/A/4550/039, Annual Inspection of ISFSI Lifting Devices, Revision 008
PT/1/A/4600/003/B, McGuire Nuclear Station Daily Surveillance items, Revision 142
RP/0/A/5700/025, Fire Brigade Response, Revision 019
RP/0/B/5700/000, Classification of Emergency, Revision 018
RP/0/B/5700/030, ISFSI Dry Casks Surveillance After an Off-Normal Accident or Natural Phenomena Event, Revision 002
RPMP 7-8, Maintaining RCZs Associated with ISFSI, Revision 001
Supply Chain Directive (SCD) 311, QA Inspection & Training, Revision 10
SCD 450, Putaway, Storage, and Inspection, Revision 12
TH/2/B/9500/029, Radiation Protection Controls for MAGNASTOR Dry Run Evaluations, Revision 01
TT/2/A/9100/627, MAGNASTOR Spent Fuel Cask Dry Run, Revision 004
TTC 819, Duke MNT MAGNASTOR Dry Cask Training, Lesson Plan, and Presentation, Revision 00

Calculations

MCC-1140.00-00-0054, Soil-Structure Interaction Analysis of the McGuire ISFSI Storage Pads, Revision 2
MCC-1140.00-00-0056, Site-Specific Tornado Missile Evaluation for MAGNASTOR Cask, Revision 000
MCC-1140.00-00-0066, MAGNASTOR Dry Cask Storage System Temporary Supplemental Shielding Evaluation, Revision 0
MCC-1140.00-00-0069, New Soil-Structure Interaction Analysis of the McGuire ISFSI Storage Pads, Revision 0
MCC-1151.03-00-0004, Spent Fuel Cask Transport Path Evaluation of Buried Components, Revision 15
MCC 1229.00-00-0051, Calculation Package for MAGNASTOR and ISFSI Existing Casks (28 UMS, 10 TN-32A), Revision 00
MCC-1229.00-00-0051, MAGNASTOR Augmented Shield VCC Skyshine Evaluation of McGuire ISFSI, Revision 1
MCC-1229.00-00-0053, McGuire ISFSI Dose Rate Evaluation, Revision 0
MCC-1553.12-00-0017, ISFSI Assembly Specifications for Fuel Qualification for Dry Storage Canisters at McGuire Nuclear Station, Revision 5
MCC-1553.12-00-0036, ISFSI Determination of Requirements for Selecting Spent Fuel for use of NAC MAGNASTOR Storage System at McGuire General License Independent Spent Fuel Storage Installation, Revision 0

Corrective Action Documents

Action Request (AR) 00332678, 10 CFR 50.59 Screening for the Preparation of the 10 CFR 72.212 Evaluation Report of the New MAGNASTOR Dry Storage Design
AR 00352802, New Procedure MP/0/A/7700/131 Revision 000, MAGNASTOR Transportable Storage Canister Welding
AR 00376363, Revision 002 to RP/0/B/5700/030, ISFSI Dry Cask Surveillance After an Off-Normal Accident or Natural Phenomena Event
AR 00387445, Procedure Revision PT/0/A/4550/039, Revision 008
AR 00392881, ISFSI Radiation Protection Controls for MAGNASTOR Dry Run Evolutions TH/2/B/9500/029, Revision 0
AR 00394661, Procedure Revision TT/2/A/9100/627, Revision 002
AR 00398069, Procedure Revision TT/2/A/9100/627, Revision 003
AR 00400557, Procedure Revision MP/0/A/7650/231, Revision 002
AR 00401408, Procedure Revision MP/0/A/7700/131, MAGNASTOR Transportable Storage Canister Welding, Revision 001.
AR 00401821, ISFSI Radiation Protection Controls for MAGNASTOR Dry Run Evolutions TH/2/B/9500/029, Revision 1
Problem Investigation Program (PIP) M-11-03741, The NAC UMS RTDs used to perform TS Surveillance A 3.1.6.1 have been in service since December 2004 without being checked for accuracy
PIP M-11-03863, The soil condition in the ISFSI storage yard has been identified as poor quality for several years without a permanent solution
PIP M-12-00911, When loaded with the MAGNASTOR Transfer Cask plus the TSC and the trolley bridged to the west travel path the bridge would not travel South
PIP M-12-02572, Summary of MAGNASTOR Spent Fuel Cask Internal Dry Run Exercise
PIP M-12-02638, During the performance of a contingency test for the MAGNASTOR Dry Cask System the bottom seal failed to inflate in the MTC
PIP M-12-02750, Issues with MAGNASTOR Dry Cask Retainer Ring Fitting

PIP M-12-02785, MAGNASTOR Tech Spec allows fuel assembly lengths greater than the storage container can accommodate
PIP M-12-02991, Actions Associated with Observed Leakage from MAGNASTOR for Crane Failure Contingency
PIP M-12-03017, Summary of MAGNASTOR Mini Dry Run
PIP M-12-03030, The MAGNASTOR Readiness Assessment Challenge Board raises concerns with Fleet Reactor Services (FRS) ability to provide 24 hour coverage for a loading evolution in the event we have to enter a long duration contingency action
PIP M-12-03173, INOS Deficiency – MAGNASTOR Dry Cask System is utilizing a seal without specific design criteria related to leakage/leak-by
PIP M-12-03202, INOS Assessment – MAGNASTOR Duke Dry Run
PIP M-12-03288, Rubber Seal Dropped in U2 Cask Pit
PIP M-12-03290, New MAGNASTOR Cask Annulus Cooling Water System Did Not Function As Expected during NRC Dry Run Exercise
PIP M-12-03292, Documentation of NRC Dry Cask Run Observation Feedback Associated with the Installation of Tungsten Shielding on the MAGNASTOR TSC Closure Lid
PIP M-12-03299, During the NRC Observed MAGNASTOR Dry Run, the Inspection Team Made an Observation Concerning the Setting of the TSC Lid that Warrants Capturing in the PIP Database
PIP M-12-03325, Use of External SharePoint for NRC Inspectors
PIP M-12-03346, Water Sprayed Out of MTC/TSC Annular Gap during MAGNASTOR NRC Dry Run Exercise
PIP M-12-03347, Documentation of NRC Cask Dry Run Observation Feedback Associated with the Personnel Exposure while Working On and Around the MAGNASTOR TSC Closure Lid
PIP M-12-03364, Inadequate Documentation of NRC Safety Evaluation Report Review
PIP M-12-04172, NRC-Identified Issue with 50.59 Screen for AR# 00332678
PIP M-12-05238, Issue Identified by NRC Inspection Team - MAGNASTOR Dry Run

Others
Dry Storage Certification for contents of first MAGNASTOR cask to be stored on-site, Page 55 of 59 of MCC-1553.12-00-0036, Revision 0
Duke Drawing MCM 1201.28-0017.001, Sheet 1, Assembly, MAGNASTOR Transfer Cask (MTC), Revision 10
Duke Energy Independent Nuclear Oversight-Audit (INOS), McGuire ISFSI Program Audit 11-7
Emergency Planning Functional Area Manual, Section 3.1, Administration of the Emergency Plan and Emergency Plan Implementing Procedures, Revision 9
Independent Nuclear Oversight – Audit McGuire Independent Spent Fuel Storage Installation Program Audit 11-7 (INOS)(ISFSI)(MNS)
Instrument Certification for Digital Pressure Gauge MCMNT28458
Instrument Certification for Dual Capacitance (0 to 10 mBar) Pressure Gauge MCMNT28302
Instrument Certification for Torque Wrench MCMNT28377
Letter from H. B. Barron to U.S. Nuclear Regulatory Commission, Independent Spent Fuel Storage Installation (ISFSI) Quality Assurance Program, August 4, 2000
Lifting Program Manual, Revision 017
McGuire 2011 Land Use Census Results
McGuire Nuclear Station Independent Spent Fuel Storage Installation 10 CFR 72.212 Evaluation Report MAGNASTOR® Casks, Revision 00
NAC International Drawing 087, Reduced O. D. Closure Ring, MAGNASTOR Duke, Revision 0
Nuclear Policy Manual (NPM), Nuclear System Directive (NSD) 211, 10 CFR 72.48 Process, Revision 7
NPM, NSD 313, Control of Transient Fire Loads, Revision 12

Project Plan for ISFSI Haul Path and Yard Upgrade, Revision 2, dated April 9, 2012
Radiological Evaluation of the Vertical Concrete Cask (VCC), MAGNASTOR® Transfer Cask (MTC) for Use at McGuire Nuclear Station for Dry Storage of Spent Fuel, dated November 3, 2010
RP-MC-RFT-290, MAGNASTOR Dry Cask Storage Lesson Plan and Presentation
Vendor Surveillance (VS) 10283, Procurement Quality Supplier Surveillance Report for MAGNASTOR™ Transportable Storage Canisters (TSCs)
VS10283, Procurement Quality Supplier Surveillance Report for MAGNASTOR™ Vertical Concrete Cask (VCCs) – Lid Assemblies
VS11176, Procurement Quality Supplier Surveillance Report for MAGNASTOR™ Vertical Concrete Cask (VCC) Weldments and Liners
Work Order (WO) 1956467, PM-2EXHCN A111A/A111B - Inspect Spent Fuel Crane, dated 1/20/2011
WO 1967125, 2EXCHCN A111A: Replace Oil In Hoist Gearbox A "125-Ton," dated 7/10/2012
WO 1982336, PM-2EXHCN A111A/A111B - Inspect SFP Crane, dated 8/1/2011
WO 1997790, PM-2EXHCN A111A/A111B - Inspect SFP Crane, dated 10/25/2011
WO 2008895, PM-2EXHCN A111A/A111B - Inspect SFP Crane, dated 1/17/2012
WO 2027919, 2EXHCN A111A: Replace All Wheel Bearings and Perform Inspection, dated 3/8/2012
WO 2025497, PM-2EXHCN A111A/A111B - Inspect SFP Crane dated 4/10/2012